ORDINARY COUNCIL MEETING
12 DECEMBER 2017

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REPORTS BY COUNCIL OFFICERS

ITEM-145 CCL 12/12/17 - RAIL CORRIDOR LAND - ADOPTION OF AMENDMENT TO NEWCASTLE LOCAL ENVIRONMENTAL PLAN 2012, DEVELOPMENT CONTROL PLAN 2012 AND PLANNING AGREEMENT

Attachment A - Planning Proposal to rezone surplus rail corridor between Worth Place and Watt Street Newcastle

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RAIL CORRIDOR LAND - ADOPTION OF AMENDMENT TO NEWCASTLE LOCAL ENVIRONMENTAL PLAN 2012, DEVELOPMENT CONTROL PLAN 2012 AND PLANNING AGREEMENT

Attachment A: Planning Proposal to rezone surplus rail corridor between Worth Place and Watt Street Newcastle

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PLANNING PROPOSAL

To rezone surplus Rail Corridor between Worth Place and Watt Street Newcastle

Version 3.0 - Final

December 2017

For enquiries please call 4974 2881.

For more information visit:
www.newcastle.nsw.gov.au

The City of Newcastle

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Attachments

Attachment A: Urban Design Analysis - by Hassell Architects, dated 24 March 2017

Attachment B: Assessment of Retail Impact - by MacroPlanDimasi, dated March 2017

Attachment C: Geotechnical and Contamination Assessment - by Douglas Partners, dated March 2017

Attachment D: Heritage Impact Assessment - by RPS, dated June 2017

Attachment E: Flood Risk Assessment - by BMT WBM, dated March 2017

Attachment F: Flora and Fauna Assessment - by RPS, dated March 2017

Attachment G: Visual Impact Statement - by Moir Landscape Architects, dated 15 March 2017

Attachment H: Shadow Impact Analysis, by Hassel, dated September 2016

Attachment I: Traffic Impact Assessment - by GHD, dated May 2017

Attachment J: Social Impact Assessment - by Elton, dated 8 March 2017

Attachment K: Economic Assessment - by SGS Economics and Planning, dated May 2017

Attachment L: Servicing Investigation - by ADW Johnson, dated March 2017

Attachment M: Noise and Vibration - by SLR, dated 22 March 2017

Amend Newcastle LEP 2012 for rail corridor land between Worth Place and Watt Street Newcastle

Summary of Proposal

<table>
<tr><td>Proposal</td><td>The planning proposal intends to rezone the rail corridor and certain adjacent land between Worth Place and Watt Street, Newcastle and apply relevant planning controls in relation to building height, floor space ratios and minimum lot size. It also identifies a key site.</td></tr>
<tr><td>Property Details</td><td>
<table>
<tr><th>Title</th><th>Address</th><th>Status</th></tr>
<tr><td>Lot 2 DP1226145</td><td>430 Hunter Street, Newcastle</td><td>Rail Corridor (Worth Place to Merewether Street)</td></tr>
<tr><td>Lot 1 DP1192409</td><td>1R Merewether Street, Newcastle</td><td>Road (Merewether Street)</td></tr>
<tr><td>Part Lot 3 DP1111305</td><td>6 Workshop Way, Newcastle</td><td>Land adjoining corridor (open space at rear of Newcastle Museum)</td></tr>
<tr><td>Lots 1 & 2 DP1226551</td><td>280 Hunter Street, Newcastle</td><td>Rail Corridor</td></tr>
<tr><td>Lot 3 & part Lot 4 DP 1226551</td><td>150 Scott Street, Newcastle</td><td>Rail Corridor</td></tr>
<tr><td>Lots 5 & 6 DP1226551</td><td>110 Scott Street, Newcastle</td><td>Rail Corridor & Newcastle Station and surrounds</td></tr>
<tr><td>SP21188</td><td>342 Hunter Street, Newcastle</td><td>Land adjoining corridor (Building)</td></tr>
<tr><td>Lot 1 DP1008183</td><td>336 Hunter Street, Newcastle</td><td>Land adjoining corridor (Building)</td></tr>
</table>
</td></tr>
<tr><td>Applicant Details</td><td>UrbanGrowth NSW</td></tr>
</table>

Summary of land uses proposed for the rail corridor

A number of changes have been made to Urban Growth's original request to amend the LEP to allow redevelopment of the rail corridor between Worth Place and Watt Street. These changes were made as a result of Council's assessment of the proposal against its strategies for the area and to respond to the Gateway conditions.
The current planning proposal includes the following land uses:

- Between Worth Place and Civic - proposed for education purposes (university).
- Civic Station - public recreation
- Corridor between Civic Station and Merewether Street - mixed use development, potential site for affordable housing
- Corridor between Merewether Street and Brown Street - mix of dwellings, retail and commercial and public recreation.
- The corridor between Brown Street and Perkins - removed from the proposal by the Department of Planning and Environment. This will remain zoned SP2 Infrastructure until a separate planning proposal is prepared for this site.
- Corridor between Perkins Street and approximately Newcomen Street - public recreation.
- The Newcastle Railway Station - Tourist zone

As a result of these changes, the originally predicted dwelling yields and commercial/retail floor areas have been reduced while areas of public open space have increased. The education use has been introduced for a significant part of the rail corridor.

It is now estimated that approximately 100 - 150 dwellings may be provided within the rail corridor land (excluding the area designated for university purposes). This is down from the originally predicted 500 - 600 dwellings. Land for commercial / retail purposes has been reduced by about 1000m^2, from the originally predicted 5000m^2. Land zoned for public recreation within the rail corridor has been increased by approximately 3,238m^2. This planning proposal discusses these matters in detail. Please also refer to the zoning maps for an indication of the location of these land uses.

Background

Council has received a request to amend Newcastle Local Environmental Plan (LEP 2012) in order to enable the rail corridor land between Worth Place and Watt Street Newcastle to be redeveloped for mixed use, public open space and tourist uses.

The submitted request outlined the following background.

> *"The Newcastle Urban Transformation and Transport Program (NUTTP) has been established to deliver the Newcastle Urban Renewal Strategy (NURS) and to implement the NSW Government's around $500 million commitment to revitalise the city centre through:*
> - *The truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange.*
> - *The provision of a new light rail line from Wickham to the Beach.*
> - *The delivery of a package of urban transformation initiatives.*
>
> *The Program aims to bring people back to the city centre by strengthening connections between the city and the waterfront, creating employment opportunities, providing more*

public space and amenity, preserving and enhancing heritage and delivering better transport.

The vision and objectives of the program builds upon the principles developed in NURS and has been informed by feedback from the community, Newcastle City Council, government agencies and city renewal experts.

Community engagement undertaken in 2014 and 2015 provided a clear direction that people favoured a combination of mixed use development with open space and new community assets. This feedback has influenced the overall Newcastle Concept plan for the surplus rail corridor."

The Urban Design Analysis, that includes the Master Plan, is at **Attachment A** to this planning proposal.

The submitted request indicates that the desired amendments to the Newcastle LEP support the objectives of the NSW Government's NUTTP.

"The Program (NUTTP) *is underpinned by six objectives which will drive successful urban revitalisation:*

1. Bring people back to the city centre

Re-imagine the city centre as an enhanced destination, supported by new employment, educational and housing opportunities and public domain that will attract people.

2. Connect the city to its waterfront

Unite the city centre and the harbour to improve the experience of being in and moving around the city.

3. Help grow new jobs in the city centre

Invest in initiatives that create jobs, with a focus on innovative industries, higher education and initiatives to encourage a range of businesses to the city centre.

4. Create great places linked to new transport

Integrate urban transformation with new, efficient transport to activate Hunter and Scott Streets and return them to thriving main streets.

5. Creating economically sustainable public domain and community assets

Leave a positive legacy for the people of Newcastle. Ensure that new public domain and community facilities can be maintained to a high standard into the future.

6. Preserve and enhance heritage and culture

Respect, maintain and enhance the unique heritage and character of Newcastle city centre through the revitalisation activities."

The NUTTP objectives are consistent, and build upon, the objectives of the Newcastle Urban Renewal Strategy (NURS), and are also generally consistent with broader objectives of Council's Newcastle 2030 Community Strategic Plan (CSP) and Local Planning Strategy (LPS).

The submitted request to amend the Newcastle LEP summarised the requested LEP amendments as follows:

> *The planning proposal proposes to amend the NLEP to rezone the surplus rail corridor to provide for additional public domain, entertainment, mixed use, commercial and residential development within the rail corridor lands. The rezoning also proposes maximum building heights and floor space ratio controls that respect the existing controls that apply to surrounding land.*

Upon reviewing this request it was identified that there was also an opportunity to expand the scope of the planning proposal to rationalise zoning and planning controls on certain adjacent land to ensure the land will integrate with the future uses of the rail corridor land. This additional land includes[1] [2]:

- Land to the rear of the Newcastle Museum where it is appropriate to expand the application of the RE1 Public Recreation zone to cover the existing open space area that is currently zoned B4 Mixed Use.

- Proposed to correct mapping anomalies for land adjoining the rail corridor at 336 and 342 Hunter Street which is currently zoned B4 Mixed use zone but the height and floor space ratio maps do not provide development controls. These sites are proposed to have building heights and floor space ratios consistent with the corridor adjacent.

The request to amend Newcastle LEP 2012 has been processed in accordance with Council's 'LEP – Request for Amendment Policy'. The request has been considered by Council's Urban Design Consultative Group (UDCG) and their advice has informed the planning proposal.

As a result of the above, this planning proposal has been prepared and explains the need and justification for the proposed amendment to Newcastle LEP 2012.

[1] The original planning proposal submitted for Gateway determination included reservation acquisition of 484 to 488 Hunter Street for an open space pedestrian link. This has been removed from the planning proposal to address Gateway condition 1)(e). A through site link is encouraged in the general area between 462 - 492 Hunter Street, under the draft Development Control Plan to facilitate connection between Hunter Street and Civic Lane. The location of the through site link can be determined through the development application process in the redevelopment of sites in this area.

[2] 414 - 426 Hunter Street was also previously included in the Planning Proposal as land in addition to the rail corridor land. Following review of submissions and further review of shadowing, the Planning Proposal has been amended to remove these parcels of land.

Site

The site is located within the Newcastle city centre. The rail corridor land is approximately 1.53km in length and is bounded by Wright Lane and Wharf Road to the north, Watt Street to the east, Hunter and Scott Streets to the south and Worth Place to the west. The planning proposal also encompasses certain adjacent land to the rail corridor and comprises the following land parcels*:

Title	Address	Status
Lot 2 DP1226145	430 Hunter Street, Newcastle	Rail Corridor (Worth Place to Merewether Street)
Lot 1 DP1192409	1R Merewether Street, Newcastle	Road (Merewether Street)
Part Lot 3 DP1111305	6 Workshop Way, Newcastle	Land adjoining corridor (open space at rear of Newcastle Museum)
Lots 1 & 2 DP1226551	280 Hunter Street, Newcastle	Rail Corridor
Lot 3 & part Lot 4 DP 1226551	150 Scott Street, Newcastle	Rail Corridor
Lots 5 & 6 DP1226551	110 Scott Street, Newcastle	Rail Corridor & Newcastle Station and surrounds
SP21188	342 Hunter Street, Newcastle	Land adjoining corridor (Building)
Lot 1 DP1008183	336 Hunter Street, Newcastle	Land adjoining corridor (Building)

(See **Figure 1:** Context of Site and Land Application Map).

The rail corridor land has a total area of approximately 4.2 hectares.

*The land parcels have been updated post-Gateway to reflect new lot / DPs from recent subdivisions, to remove parcels no longer proposed for acquisition and to remove Parcel 12 to comply with the Gateway conditions.

Figure 1- Site Context and Land Application

The City of Newcastle

Newcastle Local Environmental Plan 2012

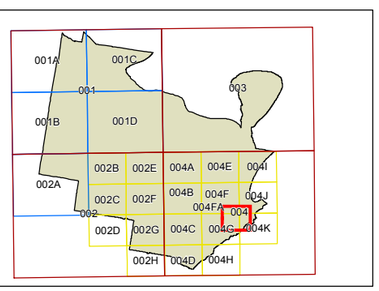
Site Map
Planning Proposal PP2016/0004

Subject Site

Cadastre Base data 01/08/2007 copyright Land and Property Information (LPI), addendum data 27/11/2017 copyright Newcastle City Council

Imagery copyright Jacobs 2015





N

Projection: GDA 1994
MGA Zone 56

Scale: 1:7,000 @ A3

Map Identification Number: ECM 4951342, Date: 27/11/2017 3:36:55 PM

Part 1 - Objectives or Intended Outcomes

1. To enable former rail corridor land between Worth Place and Watt Street, Newcastle to be developed for commercial, educational, residential accommodation, public recreation and visitor and tourism uses.

2. To ensure built form respects the unique built and cultural heritage of the City Centre by being compatible with the existing and desired urban environment.

3. To ensure active, vibrant and high amenity streetscapes and public open spaces which are well connected, including strengthening the connection between the City and the waterfront.

Part 2 - Explanation of Provisions

The objectives of the planning proposal will be achieved by amending the Newcastle LEP 2012 as follows:

1. Land zoning map to reflect a change in zone from SP2 Infrastructure (Railway) to B4 Mixed Use zone, RE1 Public Recreation zone and SP3 Tourist zone.

2. Height of building map to provide for a range of heights from 14m to 30m above ground, that are compatible with the surrounding existing height limits, respect the built heritage of the City and facilitate reasonable daylight access to developments and the public domain.

3. Floor space ratio map to provide for a range of densities from 1.5:1 to 4:1, to ensure building density, bulk and scale is compatible with the existing surrounding densities, respect the built heritage of the City and facilitate quality and high amenity building design.

4. Including the Newcastle Railway Station on the Key Sites Map[2] .

6. Introduction of a new SP3 Tourist zone:

Zone SP3 Tourist

1 Objectives of zone

- To provide for a variety of tourist-oriented development and related uses.
- To provide for an inclusive and accessible environment for everyone.
- To provide for a range of compatible land uses.

2 Permitted without consent

Environmental protection works

3 Permitted with consent

Amusement centre; Car park; Child care centre; Commercial premises; Community facility; Earthworks; Educational establishment; Emergency services facility; Entertainment facility; Environmental facility; Filming; Flood mitigation work; Food and drink premises; Function centre; Health services facility; High technology industry; Information and education facility; Passenger transport facility; Public administration building; Recreation area, Recreation facility (indoor); Recreation facility (outdoor); Registered club; Respite day care centre; Roads; Signage; Temporary structure; Tourist and visitor accommodation.

4 Prohibited

Any development not specified in item 2 or 3.

Notes[3 and 4]

[3] The planning proposal submitted for Gateway determination has been amended in response to Gateway conditions, including:

- Removal of two sites from the key sites map, being land to the west of the 'Darby Plaza' - Lot 1000 DP1095836 and part Lot 2 DP1226551, 352 & 280 Hunter Street and also corridor land between Brown and Perkins Street, being part of Lot 4 DP 1226551- 150 Scott Street.

[4] The explanation of provisions has been amended post exhibition, to remove the requirement of a minimum lot size for the RE1 Public Recreation land. The minimum lot size has been removed to allow for the subdivision and dedication of land to Council as outlined in the draft Planning Agreement.

Part 3 – Justification

Section A - Need for the planning proposal

1. Is the planning proposal a result of any strategic study or report?

UrbanGrowth NSW has prepared the NUTTP which provides the following objectives.

1. Bring people back to the city centre

Re-imagine the city centre as an enhanced destination, supported by new employment, educational and housing opportunities and public domain that will attract people.

2. Connect the city to its waterfront

Unite the city centre and the harbour to improve the experience of being in and moving around the city.

3. Help grow new jobs in the city centre

Invest in initiatives that create jobs, with a focus on innovative industries, higher education and initiatives to encourage a range of businesses to the city centre.

4. Create great places linked to new transport

Integrate urban transformation with new, efficient transport to activate Hunter and Scott Streets and return them to thriving main streets.

5. Creating economically sustainable public domain and community assets

Leave a positive legacy for the people of Newcastle. Ensure that new public domain and community facilities can be maintained to a high standard into the future.

6. Preserve and enhance heritage and culture

Respect, maintain and enhance the unique heritage and character of Newcastle city centre through the revitalisation activities."

The planning proposal is not a result of any specific Council study or report. However, the above objectives build upon the objectives of the Newcastle Urban Renewal Strategy (NURS), and the broader objectives of Council's Newcastle 2030 Community Strategic Plan (CSP) and Local Planning Strategy (LPS). Alignment of the proposal to these strategic plans is outlined under Section B, of this planning proposal.

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

In relation to the rail corridor land, a change of zoning, and associated development controls, is required for the land to be used in a manner consistent with the objectives of the planning proposal. The land is currently zoned SP2 Infrastructure (Railway). The land use table for this zone only permits development for purposes shown on the land zoning map (ie Railway) including any development that is ordinarily incidental or ancillary to development for that purpose.

The current zoning therefore places significant constraints on the use of the land for any alternative purposes. An option of nominating additional permitted uses under Schedule 1 could also achieve the objectives. However, such uses would clearly be inconsistent with the existing objectives of the SP2 Infrastructure (Railway) zone and would therefore not provide a clear strategic direction for the future use of the land.

It is noted that the recommended zoning under Part 2 does not preclude the use of the corridor land for access purposes such as roads, pedestrian paths and cycling as required.

In relation to the certain additional land outside the rail corridor the proposed amendments are the best means of achieving the objectives[5]:

- Land to the rear of the Newcastle Museum - it is appropriate to expand the application of the RE1 Public Recreation zone to cover the existing open space area that is currently zoned B4 Mixed Use as this will correspond with the RE1 Public Recreation zone proposed for the adjacent rail corridor land.

- It is appropriate to correct mapping anomalies for land adjoining the rail corridor, at 336 and 342 Hunter Street which is currently zoned B4 Mixed use zone but building heights and floor space ratios are not provided. These sites are proposed to have heights and floor space ratios consistent with the corridor land adjacent.

Section B - Relationship to strategic planning framework

3. Is the planning proposal consistent with the objectives and actions contained within the applicable regional or sub-regional strategy (including the Sydney Metropolitan Strategy and exhibited draft strategies)?

Hunter Regional Plan 2036

The Hunter Regional Plan 2036 was released by the NSW Government in October 2016. The Plan contains an overarching vision for the Hunter Region, supported by four goals, 27 directions and associated actions. It also contains local government narratives.

- Vision

The additional mixed use and recreation zones proposed under the planning proposal enables additional land uses that can support the role of the Newcastle City Centre, within the vision of the Hunter Region:

"Newcastle City Centre is the heart of Greater Newcastle and the capital of the region. The city centre has been transformed by capitalising on its active port, vibrant waterfront and heritage. It hosts more residents, students, businesses, researchers, educators and entrepreneurs than ever before."

- Goals, directions and actions

[5] The Planning Proposal has been amended post exhibition to remove 414-426 Hunter Street following review of the submission. The height limit for these buildings will remain at 24 metres.

The relevant goals, directions and actions are outlined below.

Goal	Directions	Actions
The planning proposal particularly supports Goal 1 - The leading regional economy in Australia. This goal includes a priority for revitalisation of the Newcastle City Centre.	The planning proposal supports Direction 3 - Revitalise Newcastle City Centre, by proposing additional mixed use and recreation land use that can facilitate the following actions:	• Promote the growth and renewal of Newcastle City Centre through local strategies and controls. • Leverage the increased presence of the University of Newcastle in the city centre. • Focus investment in developing infrastructure to: o alleviate pinch points, delivering large-scale renewal projects including site amalgamation and remediation o enhance the public domain and relevant services to make it easier to get around the city centre, recognising Wickham as the public transport gateway into the centre.
The planning proposal supports Goal 3 - Thriving communities	The planning proposal includes additional public recreation zoned land and supports Direction 18 - Enhance access to recreational and connect open space.	
The planning proposal supports Goal 4 - Greater housing choice and jobs.	The planning proposal includes additional mixed use zoned land which could facilitate additional housing and support Direction 21 - Create a compact settlement and also supports Direction 23 - Grow centres and renewal corridors.	• Identify opportunities for urban redevelopment or renewal in urban locations with access to public transport and services in the Greater Newcastle metropolitan area and where there may no longer be a need

	This supports the following actions:	for employment land. • Promote new housing opportunities in urban areas to maximise the use of existing infrastructure. • Concentrate growth in strategic centres, local centres and urban renewal corridors to support economic and population growth and a mix of uses.

- Newcastle - Local Government Narrative

The narrative of the Regional Plan builds upon the above vision, goals and directions and applies these to the Newcastle Local Government Area. The planning proposal supports the priorities for the Newcastle City Centre. The proposal includes areas of public recreation zoned land that will *"Strengthen connections between the city and the waterfront and improve civic spaces"*.

Lower Hunter Regional Strategy (2006)

The Lower Hunter Regional Strategy applies to the land[6]. The aim of this Strategy is to ensure that adequate land is available to accommodate the projected housing and employment growth in the Hunter Region over the next 25 years.

The Strategy promotes Newcastle as the regional city for the Lower Hunter with the key functions of the City Centre being to service the Region with higher order administration, education, health services, cultural and recreational facilities and higher density commercial and residential development. The City is to have a commercial centre focus with large retail and commercial floor area, including department stores.

The Strategy aims to create an additional 10,000 jobs within the city centre and an additional 4000 dwellings.

The proposal will contribute to generating employment and housing opportunities within the city centre and is consistent with this Strategy.

[6] The Lower Hunter Regional Strategy has been superseded by the Hunter Regional Plan 2036, however the Ministerial Direction under section 117 of the *Environmental Planning and Assessment Act 1979* was updated 13 January 2017, after the submission of the Planning Proposal to Gateway and therefore the Strategy still applies to this Planning Proposal.

4. Is the planning proposal consistent with the local council's Community Strategic Plan, or other local strategic plan?

Newcastle 2030 Community Strategic Plan

Council adopted the Newcastle 2030 Community Strategic Plan (CSP) in February 2011, as revised in 2013. The vision for Newcastle is:

> *"In 2030 Newcastle will be a Smart, Liveable and Sustainable City. We will celebrate our unique city and protect our natural assets. We will build resilience in the face of future challenges and encourage innovation and creativity. As an inclusive community, we will embrace new residents and foster a culture of care. We will be a leading lifestyle city with vibrant public places, connected transport networks and a distinctive built environment. And as we make our way toward 2030, we will achieve all this within a framework of open and collaborative leadership."*

The proposal is consistent with this vision in that it provides for a number of new public open space areas which will improve the connection between the City and the harbour. The proposed heights are responsive to the built environment of the City. The proposal includes a specific objective for the SP3 Tourist zone to provide for an inclusive and accessible environment for everyone.

The vision of the CSP is supported by seven strategic directions. The proposal aligns with the strategic directions, including:

- Vibrant and Activated Spaces

The planning proposal meets the objectives as it provides additional zoned public open space. A written offer by UrbanGrowth NSW commits to entering into a formal Planning Agreement for the embellishment and dedication of this space to Council. This facilitates achievement of the CSP objectives for public spaces that provide for diverse activity and activation day and night. Another CSP objective is that culture, heritage and place are valued, shared and celebrated. The offer also commits to the adaptive reuse of heritage items Newcastle Railway Station and Signal Box.

The limited development of land between Brown and Perkins Street will provide a balance between celebrating the connection between the historic northern city edge while also enabling activation of the edges of the 'Harbour Lawns' of the 'Entertainment Precinct' as depicted in the Master Plan (**Attachment A**).

- Caring and Inclusive Community

Accessible tourism is an emerging social trend that needs to be considered when planning tourism. Inclusion and accessibility is also a key theme under Council's Disability Inclusion Action Plan. It is important that new tourism uses within the city centre will be inclusive and accessible for everyone. A specific objective has therefore been included for the new SP3 Tourist zone to ensure development must be inclusive and accessible for everyone.

- Liveable and Distinct Built Environment

The Proposal supports the strategic objective for "*Greater diversity of quality housing for current and future community needs*". Also the proposed heights across the land have been managed to achieve the strategic objective "*A built environment that maintains and enhances our sense of identity*".

- Open and Collaborative Leadership

In December 2015 Council received a report on the outcomes of the 'Revitalising Newcastle' community engagement. This community engagement was a collaboration between UrbanGrowth NSW and Newcastle City Council. The engagement was independently facilitated and reviewed and was held across June and July 2014 and involved 950 stakeholders. That engagement gathered feedback on people's vision and aspirations for a thriving city centre.

The Engagement Report indicated that people strongly supported the objectives to bring people back to the city, grow new jobs and connect the city to its waterfront. These objectives have been included in the planning proposal masterplan through the proposed mixed use development zone, open space and new community assets.

Compliance with the LEP amendment process, in particular Section 57 – community consultation of the *Environmental Planning and Assessment (EP&A) Act 1979*, will assist in achieving the strategic objective; "*Consider decision-making based on collaborative, transparent and accountable leadership*" and the identified strategy 7.2b, which states:

"*Provide opportunities for genuine and representative community engagement in local decision making*".

Local Planning Strategy (LPS)

The LPS is Council's comprehensive land use strategy to guide the future growth and development of Newcastle to 2030 and beyond. The LPS acknowledges the role of the NURS released by the NSW Department of Planning and Environment in 2012, and updated in 2014 and states, in relation to the NURS:

> *"The LPS aims to complement this parallel strategy."*

The visions and objectives under the LPS for Newcastle and Newcastle West is:

> ***"Vision***
>
> *Newcastle will continue to grow and evolve to strengthen its position as the Hunter region's capital. The city centre's location and setting between the river and ocean make Newcastle a compact, people friendly city with unique attributes.*
>
> *Newcastle city centre will be a vibrant regional hub and attractive destination for businesses, residents and visitors, providing accessible and suitable employment opportunities, a choice of retail and other services, and local, national and international investment opportunities.*
>
> ***Objectives***
>
> - *Land use and development will reinforce Newcastle city centre as a vibrant regional hub and attractive primary destination for businesses, residents and visitors, providing a mix of housing options, accessible and suitable employment opportunities, a choice of retail and other services, and local, national and international investment opportunities.*
>
> - *Land use and development will enhance access to the harbour from and to the city centre for the community and provide high quality public domain that will support the activation and revitalisation of the Newcastle city centre.*

- *Refer to Newcastle Urban Renewal Strategy 2012 and 2014 update (DPE 2014) for further objectives."*

The Proposal meets the objectives as it provides additional land zoned for mixed use, tourist uses and public open space. In particular the proposed recreation land will enhance access to the harbour from and to the city centre. A written offer by UrbanGrowth NSW commits to entering into a formal Planning Agreement for the embellishment and dedication of this space to Council.

The Newcastle Employment Lands Strategy (NELS) was prepared to underpin the employment directions of the LPS. In regard to the Newcastle city centre, the NELS recommended the provision of:

- 53,000m^2 of retail floor space.
- 143,000m^2 of commercial floors pace.
- 65,000m^2 of special uses floor space.

The planning proposal is consistent with the NELS as it will assist in providing retail / commercial floor space within the city centre. The assessment of retail and commercial impacts on the centres hierarchy at **Attachment B** indicates that the retail/commercial component of the corridor lands is expected to be around 5,000m^2. The report indicates that this floor area is a small addition to the retail network in the context of the broader offer within the Newcastle city centre. The report notes that the commercial / retail floor space will be dispersed across the corridor land and will not adversely impact other commercial centres across the region.

The assessment is based on the planning proposal as submitted for gateway determination. The proposal has been amended post-gateway with a reduction in the area of land proposed to be zoned B4 Mixed Use between Brown and Wolfe Streets. These post-gateway amendments could potentially result in the provision of about 1000m^2 less non-residential floorspace than what was originally proposed.

Economic Development Strategy

The Economic Development Strategy 2016-2019 builds upon the vision and objectives of the CSP, to support economic development in Newcastle. Theme 5 of the Strategy is 'Developing the visitor economy'. The inclusion of a new dedicated SP3 Tourist zone and new public open space will support this initiative.

Parkland and Recreation Strategy

The Parkland and Recreation Strategy was adopted by Council in 2014 to guide the sustainable provision of parkland and recreation facilities for current and future communities.

This strategy includes a vision for parkland and recreation, which represents the culmination of consultation with sports groups, management committees, Council staff, industry experts and the wider community:

> *"The City of Newcastle will provide, promote and support a range of facilities, events and programs aimed at:*
>
> - *Meeting the diverse parkland and recreational needs and interests of residents, visitors, students and workers;*
>
> - *Creating vibrant, activated and sustainable public places; and*

- *Promoting health, happiness, community connections and wellbeing."*

The planning proposal includes new areas of RE1 Public Recreation zone and SP3 Tourist zone and therefore will facilitate the achievement of this vision. The applicant, UrbanGrowth NSW, has provided a letter of offer to enter into a Planning Agreement for the embellishment of this open space (attachment to report to Council).

The Foreshore Plan of Management

The Foreshore Plan of Management (PoM) was updated by Council in 2015. The PoM does not cover the subject land, however, encompasses the harbour foreshore open space under the care and control of Council to the north of the corridor between Brown and Watt Streets. It is therefore important that proposed land use zones within this section of the corridor integrate with the intent of the PoM. The PoM provides values, objectives and strategies to guide the future management of the foreshore land.

The values include:

- Scenic (including expansive harbour views)
- Recreation
- Accessibility
- Heritage
- Community use and special events.

Specific objectives include:

- Maintain the park's visual amenity and views to the harbour and the city.
- Encourage informal and organised recreational use of the park.
- Provide appropriate facilities and services and flexible spaces consistent with a city scale park to meet the current and future needs of the local community and broader public.
- Improve accessibility and connectivity both within the park and with surrounding areas.
- Improve activation through promotion and appropriate development of the park.
- Foster community awareness, understanding and interpretation of the heritage themes evident in the park.
- Manage the park in an effective, efficient and sustainable manner.

The planning proposal includes new RE1 Public Recreation zone adjacent to the foreshore area which is considered to support these values. In particular the increased RE1 Public Recreation zone, when compared to the Master Plan, will support the desire for views to the harbour and also importantly the view from the foreshore back to the city. The inclusion of SP3 Tourist zone to the eastern and western ends of the recreation zoned land will assist with activation and promoting a range of activities within the open space.

Newcastle Urban Renewal Strategy (NURS)

The Newcastle Urban Renewal Strategy (NURS) 2012 and 2014 update is the principal land use strategy for the Newcastle City Centre. It is guided by nine guiding principles outlined below, with comment on alignment included.

1. Opportunities to grow and expand

The planning proposal provides additional zoned land to support the ongoing economic sustainability of the city and accommodate anticipated growth and trends.

2. Economic viability and competition

The proposed B4 Mixed Use zone and inclusion of a new SP3 Tourist zone supports a diversity of land uses including retail, commercial and residential uses. This promotes development that provides increased consumer choice and strong, diverse services. Section 9 of this planning proposal identifies that economic impacts will be positive.

3. Busy and vibrant city centre

The planning proposal includes additional RE1 Public Recreation areas. The inclusion of a new SP3 Tourist zone will ensure vibrant uses within the former Newcastle Railway Station precinct.

4. Integrity and viability

The planning proposal includes additional RE1 Public Recreation areas that would integrate with existing open space areas, promoting connection between the city and waterfront. The proposed heights respect the unique heritage of Newcastle and open space areas.

5. Investment, employment and growth

The proposed B4 Mixed Use zone and SP3 Tourist zone, support a diversity of land uses including commercial, residential and tourism.

6. Transport, access and connectivity

The proposed RE1 Public Recreation zone promotes connectivity between the city and waterfront.

7. Housing mix and affordability

The proposed B4 Mixed Use zone enables a variety of residential accommodation. The offer by the applicant UrbanGrowth NSW to enter into a Planning Agreement commits to the provision of affordable housing.

8. Retail variety and choice

The proposed B4 Mixed Use zone and SP3 Tourist zone support retail variety and choice.

9. Provide for future employment growth

The proposed B4 Mixed Use zone and SP3 Tourist zone support employment growth.

A specific initiative of the NURS 2014 update was to connect the city with its waterfront. The provision of additional RE1 Public Recreation zoned land facilitates this connection. Some built form between Brown and Perkins Street is reasonable to enable improved activation to the adjacent open space.

5. Is the planning proposal consistent with applicable State Environmental Planning Policies?

Consistency (of the planning proposal) with State Environmental Planning Policies is outlined in the Table 1.

Table 1 - Consideration of State Environmental Planning Policies

Name of SEPP	Applicable	Consistency
State Environmental Planning Policy No 1 (Development Standards)	No	
State Environmental Planning Policy No 14 (Coastal Wetlands)	No	
State Environmental Planning Policy No 19 (Bushland in Urban Areas)	No	
State Environmental Planning Policy No 21 (Caravan Parks)	No	
State Environmental Planning Policy No 26 (Littoral Rainforests)	No	
State Environmental Planning Policy No 30 (Intensive Agriculture)	No	
State Environmental Planning Policy No 33 (Hazardous and Offensive Development)	No	
State Environmental Planning Policy No 36 (Manufactured Home Estates	No	
State Environmental Planning Policy No 44 (Koala Habitat Protection)	Yes	The SEPP applies to the entire LGA, however, the land is urban and does not consist of areas of koala habitat.
State Environmental Planning Policy No 47 (Moore Park Showground)	No	
State Environmental Planning Policy No 50 (Canal Estate Development)	No	
State Environmental Planning Policy No 52 (Farm Dams and Other Works in Land and Water Management Plan Areas	No	

Name of SEPP	Applicable	Consistency
State Environmental Planning Policy No 55 (Remediation of Land)	Yes	A preliminary geotechnical assessment by Douglas Partners (**Attachment C**) has been carried out. In accordance with Clause 6 Contamination and remediation to be considered in zoning or rezoning proposal, of the SEPP. • The land is identified as contaminated and the SEPP applies. • As per the recommendations of the geotechnical assessment the land can be made suitable after remediation for all the purposes for which the land is permitted to be used. See Section 8 of this planning proposal for further details.
State Environmental Planning Policy No 62 (Sustainable Aquaculture)	No	
State Environmental Planning Policy No 64 (Advertising and Signage)	No	

Name of SEPP	Applicable	Consistency
State Environmental Planning Policy No 65 (Design Quality of Residential Flat Development)	No	Yes. The proposal will facilitate the delivery of residential flat building development on the land and is considered applicable. Clause 27 of the SEPP outlines functions of design review panels, including that they may "*carry out a review of provisions relating to the design quality of development to which this policy applies in any local environmental plans and development control plans in the area for which it is constituted, and advise the relevant council whether or not it endorses the provisions*". An Urban Design Analysis has informed the preparation of this planning proposal by proposing a preferred Master Plan for the site. The Master Plan has been considered by Council's Urban Design Consultative Group (UDCG), being Council's design review panel. The UDCG were generally supportive of the Master Plan proposed, subject to some height reductions around Civic and deletion of the majority of building footprints between Brown and Wolfe Streets. A comprehensive assessment of the UDCG comments was included as an attachment to the report to Council. The amendments to the LEP are intended to also be supported by Development Control Plan (DCP) guidelines, which complement the LEP controls to put into effect the Master Plan for the land, including incorporating appropriate building separations and upper level setbacks. These DCP guidelines will be developed post Gateway. In accordance with Clause 21A of the *Environmental Planning and Assessment Regulations 2000*, Council's UDCG has reviewed the draft DCP and their comments have been considered. The UDCG comments are attached to the report to Council (22 August 2017) on the DCP. The draft guidelines are consistent with the objectives, design criteria and design guidance of the Apartment Design Guide as required by Clause 21A of the Regulations and Clause 6A of the SEPP. The draft Development Control Plan guidelines will be exhibited concurrently with the planning proposal.

Name of SEPP	Applicable	Consistency
State Environmental Planning Policy No 70 (Affordable Housing (Revised Schemes))	No	
State Environmental Planning Policy No 71 (Coastal Protection)	Yes	The subject land is within the Coastal Zone. The planning proposal is acceptable in relation to the matters for consideration specified under Clause 8 as applying to the preparation of a draft LEP. • Access to foreshores will not be affected. Access between the City and the harbour will be improved. • The controls proposed are suitable for the location and relationship with surrounding areas. • There will be no adverse impacts on the foreshore. • The scenic qualities of the coast will be protected. • The land is not subject to coastal hazards. Flood impacts would be assessed at future development application stage. • Aboriginal cultural aspects can be managed (refer Section 8 for further discussion). • The proposal will not impact coastal waterbodies. • The HOB under the proposal responds to surrounding heritage conservation and heritage items. The proposal encourages compact cities by increasing density responsive to site context and access to transport and services.
State Environmental Planning Policy (Affordable Rental Housing) 2009	No	
State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004	No	Compliance with SEPP (BASIX) will be demonstrated under future development applications.
State Environmental Planning Policy (Exempt and Complying Development Codes) 2008	No	
State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004	No	
State Environmental Planning Policy (Infrastructure) 2007	No	The SEPP may apply to future development.
State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007	No	
State Environmental Planning Policy (Rural Lands) 2008	No	

Name of SEPP	Applicable	Consistency
State Environmental Planning Policy (Sydney Region Growth Centres) 2006	No	
State Environmental Planning Policy (Urban Renewal) 2010	No	The SEPP has been amended to exclude the Newcastle City Centre as a potential precinct and therefore no longer applies.
State Environmental Planning Policy (State and Regional Development) 2011	No	
State Environmental Planning Policy (Three Ports) 2013	No	
State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017	Yes	Only applies if vegetation is proposed to be cleared as part of future development applications.

6. Is the planning proposal consistent with applicable Ministerial Directions (s.117 directions)?

Consistency (of the planning proposal) with State Environmental Planning Policies is outlined in the table below.

Table 2 - Consideration of Section 117 Directions

S117 Direction	Applicable	Consistent
1. Employment and Resources		
1.1 Business and Industrial Zones	Yes	Yes The planning proposal does not reduce existing business and industrial zones, or the total potential floorspace area for employment uses in business or industrial zones. The planning proposal will lead to net additional business zoned land (B4 Mixed Use zone) being provided in an appropriate location, being a regional centre, rather than being at the expense of existing employment lands. In this regard, the planning proposal achieves the following objectives of this direction by: • encouraging employment growth in suitable locations • supporting the viability of identified strategic centres.
1.2 Rural Zones	No	
1.3 Mining, Petroleum Production and Extractive Industries	No	
1.4 Oyster Aquaculture	No	
1.5 Rural Lands	No	
2. Environment and Heritage		
2.1 Environment Protection Zones	No	

S117 Direction	Applicable	Consistent
2.2 Coastal Protection	Yes	Yes The Proposal is within the Coastal Zone but does not impact or would be impacted by coastal processes or hazards. The proposed HOB is compatible with the context of the area.
2.3 Heritage Conservation	Yes	Yes The planning proposal relates to land containing heritage items and potential Aboriginal cultural items as detailed under the Heritage Assessment Report **Attachment D**. This planning proposal does not propose to alter the heritage conservation provisions of the LEP. The proposed HOB map has had regards to heritage items, including scale interface with built heritage items. A heritage interpretation framework has been included in the heritage assessment to guide a consistent interpretation strategy across the rail corridor, which will be developed at development application stage.. Refer to Section C, clause 8 for further discussion.
2.4 Recreation Vehicle Areas	No	
3. Housing, Infrastructure and Urban Development		
3.1 Residential Zones	Yes	Yes The planning proposal proposes to rezone some of the land to B4 Mixed Use zone. This will broaden housing choice, make more efficient use of infrastructure and services, reduce demand for housing on the urban fringe and facilitate good design, responsive to the context. The proposal will not reduce the permissible density of the land and future development will be able to be adequately serviced. The planning proposal therefore achieves the objectives of this direction by: • Encouraging a variety and choice of housing types to provide for existing and future housing needs, • Make efficient use of existing infrastructure and services and ensure that new housing has appropriate access to infrastructure and services, and • Minimise the impact of residential development on the environment and resource lands.

S117 Direction	Applicable	Consistent
3.2 Caravan Parks and Manufactured Home Estates	No	
3.3 Home Occupations	No	
3.4 Integrating Land Use and Transport	Yes	Yes The proposal will facilitate commercial and residential development within walking distance to transport and services and is therefore consistent with the objectives by: • Improving access to housing, jobs and services by walking, cycling and public transport. • Increasing the choice of available transport and reducing dependence on cars. • Reducing travel demand including the number of trips generated by development and the distances travelled, especially by car. • Supports the efficient and viable operation of public transport services.
3.5 Development Near Licensed Aerodromes	No	
4. Hazard and Risk		
4.1 Acid Sulfate Soils	Yes	Yes The planning proposal relates to land affected by Acid Sulfate Soils (ASS) under Newcastle LEP 2012. Any potential impact from ASS can be managed with the remediation works to be carried out and with the implementation of an ASS management plan. The Department of Planning and Environment has advised that the inconsistency with this Direction is of minor significance and no further approval is required.

S117 Direction	Applicable	Consistent
4.2 Mine Subsidence and Unstable Land	Yes	The site is within the Newcastle Mines Subsidence District. The submitted geotechnical and contamination assessment by Douglas Partners (**Attachment C**), includes a letter from Mine Subsidence Board (MSB), dated 14 January 2016, outlining preliminary consultation with the MSB. The letter confirms that future development would require approval from the MSB and that larger scale development would be subject to merit assessment based upon engineered solutions having regards to further detailed investigations. The letter from MSB does not indicate that future development would be precluded. The gateway determination issued 22 December 2016 has confirmed no further consultation with MSB is required for the planning proposal. Future development would require approval from MSB at the development application stage.
4.3 Flood Prone Land	Yes	Generally consistent. A Flood Risk Assessment by BMT WBM is at **Attachment E** which details consistency with the direction in detail. The Newcastle LEP does not contain flood management provisions and this is not proposed to be altered. Flood management provisions are contained in the Newcastle DCP 2012 and these will continue to apply and are consistent with the NSW Flood Prone Land Policy and Floodplain Development Manual 2005, as required by the direction. The planning proposal is inconsistent with the direction in that it will rezone land from a special purpose zone (SP2 Infrastructure) to a business zone (B4 Mixed Use). However, the areas are generally classified low risk and application of the DCP requirements would provide management of the risk. The planning proposal is inconsistent with the direction in that it will permit a significant increase in the development of the land. However, the land is generally classified as low risk and the risk can be managed by application of the DCP requirements. The inconsistencies with the direction are justified and the planning proposal does not compromise the achievement of the objective of the direction. The Department of Planning and Environment has confirmed that the inconsistency with this Direction is of minor significance and no further approval is required.

S117 Direction	Applicable	Consistent
4.4 Planning for Bushfire Protection	No	
5. Regional Planning		
5.1 Implementation of Regional Strategies	Yes	Yes The Lower Hunter Regional Strategy has been superseded by the Hunter Regional Plan 2036, however the Ministerial Direction under section 117 of the *Environmental Planning and Assessment Act 1979* was updated 13 January 2017, after the submission of the planning proposal to gateway and therefore the Strategy still applies to this planning proposal. The Lower Hunter Regional Strategy applies to the land. The aim of this Strategy is to ensure that adequate land is available to accommodate the projected housing and employment growth in the Hunter Region over the next 25 years. The proposal will contribute to generating employment and housing opportunities, including diversity of housing, and is therefore consistent with this aim. The proposal will facilitate employment and housing in a location that will facilitate efficient travel patterns and more sustainable modes of transport, support increased walking and cycling and improved connectivity. The proposal is likewise also consistent with the Draft Hunter Regional Plan and Draft Plan for Growing Hunter City.
5.10 Implementation of Regional Plans	Yes	Yes. The Hunter Regional Plan 2036 applies to the land. As outlined under section 3 previously, this planning proposal is consistent with the vision, goals, directions and actions, along with the narrative for Newcastle Local Government Area, within the Regional Plan. In summary the planning proposal supports the role for the Newcastle City Centre within the overall vision for the Hunter Region by capitalising on the vibrant waterfront and heritage, facilitating more residents, businesses and education uses, within an existing urban area to maximise use of infrastructure and services.

S117 Direction	Applicable	Consistent
6. Local Plan Making		
6.1 Approval and Referral Requirements	Yes	Yes The planning proposal does not include any additional concurrence, consultation or referral requirements for development applications to a Minister or public authority. It is therefore consistent with the objective to encourage efficient and appropriate assessment of development. Identification of the Newcastle Train Station as a key site has been agreed in the Gateway determination.
6.2 Reserving Land for Public Purposes	Yes	Yes The planning proposal includes rezoning for public recreation. Council will obtain the agreement of the Secretary, Department of Planning and Environment, prior to the plan being made to comply with this Direction.
6.3 Site Specific Provisions	Yes	Yes The planning proposal introduces a new SP3 Tourist zone, however, it does not include any unnecessarily restrictive site specific controls. It is noted that local provisions for Newcastle city centre currently exist in the Newcastle LEP, and this planning proposal does not seek to alter the application of those provisions.

Section 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 site was formerly developed for railway purposes and the planning proposal has no potential for critical habitat or threatened species, populations or ecological communities, or their habitats, to be adversely affected. This is confirmed in the Flora and Fauna Assessment (**Attachment F**).

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

City centre revitalisation

The LEP amendment request was supported by an economic assessment that identifies that redevelopment will contribute to the supply of additional floorspace for commercial, retail and residential purposes within the city centre. While beneficial, the stronger justification for the planning proposal is based on the opportunities it creates for city centre revitalisation. In particular, the provision of additional public open space and improved north south connections to the waterfront are considered positive outcomes for the city.

UrbanGrowth NSW has provided a letter of offer (as attached to Council report) to enter into a Planning Agreement, in association with the requested rezoning, to facilitate delivery of the following aspects:-

i) Dedication of the land proposed to be zoned RE1 Public Recreation.

ii) Enhancement of the public open space.

iii) Repurposing heritage buildings, particularly Newcastle Railway Station and Signal Box.

iv) Remediation of the open space.

v) Commitment to provision of affordable housing.

The scope of the offer is considered acceptable in-principle and Council resolved on 22 August 2017 to publicly exhibit the draft Planning Agreement with the planning proposal and draft DCP. The process of preparing the Planning Agreement will be carried out in accordance with Council's Planning Agreement Policy 2009.

Master Plan

The planning proposal is informed by an Urban Design Analysis (**Attachment A**) and Visual Impact Statement (**Attachment G**), submitted by the proponent. The Urban Design Analysis developed a Master Plan for the subject land, which also included proposed heights and floor space ratio (FSR) controls for the land. The Master Plan has been reviewed by Council's Urban Design Consultative Group (UDCG), and is supported in-principle. Advice from Council's UDCG is attached to the report to Council.

The Master Plan establishes that the development controls were based primarily upon analysis of surrounding controls. While this approach provides a logical starting point to developing the controls, it was evident from the UDCG advice that due to the constrained nature of the corridor, along with supporting high amenity open space and consideration of heritage, that further refinement to the development controls was required for the planning proposal. Council officers subsequently requested more detailed building massing diagrams from the applicant to demonstrate compatibility of urban form and impacts. In response, the proponent submitted a shadow analysis (**Attachment H)**. The information supplied is considered sufficient to inform the development controls under the planning proposal.

Based upon the Master Plan (including the visual impact statement), advice from Council's UDCG and further information supplied, the principal changes between those under the requested amendment and those under the planning proposal are as follows.

- Between Worth Place and Civic - Generally unchanged from the proposed height of 30m, other than a reduction in height to 24m adjoining the 'Civic Link' area. Given the desire for high amenity public open space this reduced height would provide a more comfortable scale and more compatible scale with nearby heritage items, including the Newcastle Museum.[7 and 8]

  Urban Growth has advised that this area is also to be used for education purposes (university).

- Civic - Zoning of RE1 Public Recreation zone supported and expanded to include the landscaped area at the rear of the Newcastle Museum (which is currently zoned B4 Mixed Use). These open space areas should seamlessly integrate and therefore the recreation zone should apply to both.

- Parcel between Civic and Merewether Street - Height was proposed at 24m but has been reduced to 18m. The planning proposal has also been expanded beyond the corridor land to encompass the properties fronting Hunter Street. These properties currently have a maximum height limit of 24m which if developed to the full height would overshadow Wheeler Place. A consistent height of 18m for this land would ensure higher amenity public open space for both Wheeler Place and the proposed 'Civic Link' under the Master Plan and would also relate better to the scale of the heritage listed Newcastle Museum which is approximately 13m in height.

[7] Building height between Worth Place and Civic - condition 1)(g) of the Gateway determination required clarity of building height between the planning proposal and discussion within the Attachment E to the Council report. It is confirmed that it is intended that the height of building map apply a 30m height limit reducing to 24m, adjoining the 'Civic Link' area.

[8] The Planning Proposal has been amended post exhibition to remove 414-426 Hunter Street following review of the submission. The height limit for these buildings will remain at 24 metres.

- The corridor between Brown Street and Wolfe Street - This area was proposed for development. The submitted request by UrbanGrowth NSW proposed a B4 Mixed Use Zone for this area. However, this would likely encourage residential development that could conflict with vibrant outdoor uses planned for the entertainment precinct within the adjacent RE1 Public Recreation area. The planning proposal therefore intends to include the corridor area extending from Perkins Street to approximately Newcomen Street within the RE1 Public Recreation Zone. The corridor land between Brown Street and Perkins Street has been removed from the planning proposal by the Department of Planning and Environment as part of the Gateway determination[9].

- The Newcastle Railway Station - The proposed SP3 Tourist zone for this site is supported. This provides for a range of land uses that would provide activation to this site. This land use zone does not allow residential development which is an incompatible land use for desired high activity areas. The height limit for this site has been reduced from the requested 20m to 15m within the area over the existing station buildings. A 15m height accommodates the existing station buildings.

A more detailed analysis is included as an attachment to the Council report and includes consideration of advice from Council's UDCG.

Given the above changes, originally predicted dwelling yields and commercial/retail floor areas have been reduced while areas of public open space have increased.

It is now estimated that approximately 100 - 150 dwellings may be provided within the rail corridor land (excluding the area designated for university purposes). This is down from the originally predicted 500 - 600 dwellings. Land for commercial / retail purposes has been reduced by about 1000m^2, from the originally predicted 5000m^2. Land zoned for public recreation within the rail corridor has been increased by approximately 3,238m^2.

Zoning

It is proposed to introduce a new zone SP3 Tourist Zone into the LEP. This new zone was requested by the applicant for the Newcastle Train Station area. This is an important, positive initiative to ensure a vibrant use for the railway station repurposing and supports an entertainment precinct as envisaged under the Master Plan. See Note 5 below regarding the removal of the parcel of rail corridor land between Brown and Perkins Streets from the planning proposal, part of this parcel was also proposed to be zoned SP3 Tourist.

Two additional objectives are proposed (in addition to the standard LEP instrument) that seek to ensure compatible land uses and also inclusive and accessible tourism, which supports the objective for a caring and inclusive community under Council's Newcastle 2030 Community Strategic Plan and Council's Disability and Inclusion Access Plan.

[9] The planning proposal submitted for Gateway determination has been amended in response to Gateway conditions, including the removal of the parcel between Brown and Perkins Streets from the proposal. The Department of Planning stated in the Gateway determination that a separate planning proposal should be prepared for this site that includes the adjacent Council owned car park. Council's original planning proposal supported some redevelopment of this parcel to 'book-end' and activate the proposed open space area, however it was acknowledged that the extent of built form would need to be carefully managed so as not to compromise the strategic objectives of reconnecting the city with the harbour. Therefore Council intended in the planning proposal submitted for Gateway, to restrict development to the western half of the parcel and zone this area SP3 Tourist zone to ensure more compatible uses with the adjacent public open space are achieved. The land was also nominated on the key site map which under the LEP requires a greater degree of design excellence. However, the key site designation has also been removed.

The proposed land use table of the SP3 Tourist zone permits a range of uses that would facilitate active and vibrant uses, but importantly does not permit residential accommodation.

The rail corridor will also include the B4 Mixed Use zone, RE1 Public Recreation zone, SP2 Electricity Generation and SP2 Railway zone. Refer to zoning maps at Part 4.

Development Control Plan

Detailed development control plan (DCP) guidelines have been developed. The DCP guidelines provide further guidance on matters such as setbacks to control building footprints along with access. The draft DCP guidelines have been reviewed by Council's UDCG and will be exhibited concurrently with the planning proposal.

Pedestrian link between Hunter Street and Civic Lane

The original planning proposal submitted for Gateway determination included amendments to the land reservation acquisition map applying to land at 484 to 488 Hunter Street, intended for public open space to achieve a pedestrian connection between Civic Lane and Hunter Street. This link generally corresponded with a proposed contiguous link through the corridor land and existing street to the harbour. This proposed reservation acquisition has now been removed from the planning proposal to address Gateway condition 1)(e).

During the exhibition period Council received three submissions regarding the proposed through site link from Hunter Street to Civic Lane included in the draft DCP. The *Network Access Map* in the draft DCP shows the preferred location of the link between 462 - 492 Hunter Street.

The submissions raised concern that Council would compulsorily acquire and demolish the properties outlined in the draft DCP; which would impact significantly on people's homes and business. One of the submissions also noted that the University owns a property within the preferred site link location and this building would be better served to provide a link as it would enable students to safely cross at the Auckland Street intersection and continue through to the proposed Honeysuckle Campus, without displacing any existing residents or businesses.

Following review of these submissions, the *Network Access Map* in the draft DCP has been amended to remove the ‘preferred arcade / through site link’ and the associated performance criteria / acceptable solution has been deleted.

Although increased permeability in this location is desirable (from Hunter Street to Civic Lane), the clause has created some confusion amongst property owners. There is no proposal for compulsory acquisition at this location. It is considered that the design/development controls for arcades and through site links provide appropriate controls, should property owners in this area choose to redevelop and incorporate through site links to capitalise on the redevelopment of the rail corridor.

Heritage

The submitted request to amend the Newcastle LEP was supported by a Heritage Assessment Report (**Attachment D**). The Assessment identified the heritage and archaeology present within the land of the rail corridor:

- A search undertaken of the Aboriginal Heritage Information Management System (AHIMS) identified that no Aboriginal sites are present in the Rezoning Study Area. However, the literature review and previous archaeological work suggests that subsurface Aboriginal heritage will be present in the Rezoning Study Area.

- In reference to built heritage there are six heritage places in or abutting the proposed rezoning footprint; the Newcastle Railway Station and the Newcastle Railway Station Additional Group (both on the State Heritage Register and of State heritage significance); the Civic Railway Workshop Group (Newcastle Museum); the remains of AA Co. Bridge and Fence and the former Tramway Substation (NLEP 2012 Schedule 5 and of local heritage significance). The Civic Station (Section 170 Register) is not listed under NLEP.
- There are a number of archaeological sites and potential archaeological sites in the Rezoning Study Area including the: Mortuary Station; Civic Railway Station; Civic Railway Workshops curtilage; Newcastle Railway Station; and Convict Huts.

The Report considered the potential impact of works on potential Aboriginal sites, built heritage structures and archaeological and potential archaeological sites if the rezoning progresses as planned. The Report has provided advice on the planning approval process required and provides recommendations for mitigation against adverse heritage impact.

The Report's recommendations are supported and have demonstrated that heritage matters can be addressed under future development by:

- Mitigation methods for Aboriginal archaeological sites including that a heritage interpretation strategy be prepared.
- The mitigation for built heritage including visual analysis, construction considerations, adaptive reuse and full consideration of any demolition.

The adaptive reuse of heritage items is seen as a positive initiative and the commitment to this is confirmed within the Planning Agreement offer by Urban Growth NSW (attachment to Council report).

In relation to visual analysis the Report states:

"While the proposed rezoning will not physically impact on the heritage items, the works that follow the rezoning will. The construction of buildings to heights of 14m; 24m (Parcels 05 &14); 20m (Parcel 12); and 30m (Parcels 01; 02; 03; 06; 07) will have a potential visual impact on the heritage value of the Newcastle City Centre Heritage Conservation Area. It is considered however that the impact will be, in most instances, positive with adaptive re-use of heritage items and in a number of instances improved view corridors."*

**Parcel 12 now removed from the planning proposal*

The report indicates that *"Any new buildings should be designed in accordance with the requirements of the Newcastle City Council requirements for the Newcastle City Centre Heritage Conservation Area."*

It is agreed that additional heritage assessment will occur at development application (DA) stage, however the appropriate built form (bulk and scale) cannot be entirely deferred until assessment of a DA. It is important at this stage of preparing the development controls for the subject land (ie the planning proposal) that consideration is given to the general scale and massing of future development. Having regards to advice from Council's UDCG the scale of development surrounding the Civic have been set to appropriately relate to the heritage listed Newcastle Museum (listed as the Civic Railway Workshops Group).

The Heritage Assessment Report includes:

- Details regarding the timing and preparation of heritage interpretation strategies for each parcel in accordance with the heritage interpretation framework included in the Heritage Assessment Report.

- Table identifying heritage items planned for adaptive reuse or identified for demolition.

- A schedule with indicative timing for lodging applications for permits / approvals and proposed archaeological methods (eg. use of ground penetrating radar, testing and/or monitoring).

- An indication of contamination testing/clearing if the archaeological program requires subsurface investigation.

- Details of how Aboriginal Traditional Owners, NGOs (eg Local Aboriginal Land Councils) and how the community in general might be engaged and informed of the progress of archaeological investigations over the corridor.

Traffic and Parking

The submitted request to amend the LEP was supported by a Traffic Impact Assessment (TIA) (**Attachment I**). The TIA identified demand generated by approximately 585 dwellings and 5,200m^2 of gross floor area for non-residential uses. This included adjacent sites on Wright Lane between Worth Place and Civic that would likely be amalgamated with the corridor land. It is noted that the TIA was based upon the submitted request not this planning proposal (ie. a reduced floor space yield). The TIA would therefore tend to overestimate impacts and is considered acceptable for this planning proposal. The TIA predicted 3,900 (two-way) additional traffic movements, which modelling shows could be accommodated within the existing road network.

Future development would be subject to on-site parking requirements of the Newcastle DCP 2012.

The TIA found that the rezoning itself will not impact public off-street parking supply, however, the adjacent car park off Wright Lane would likely be amalgamated for redevelopment and some 190 spaces lost from the existing at-grade car park. The TIA found that in the context of overall supply of off-street parking in the city centre, with the removal of these spaces, the peak utilisation would remain at less than 70%.

A strategic approach to parking within the Newcastle city centre is required and is a wider issue then just relating to the rail corridor. Transport for NSW, through UrbanGrowth NSW, in consultation with Council, is developing a car parking strategy for the city centre.

The Master Plan includes a number of north-south pedestrian connections. These will be achieved by either zoning to RE1 Public Recreation or otherwise under DCP guidelines.

Services

Council's Infrastructure Planning Section has identified a need to ensure that there is sufficient room within the corridor for 'future proofing' of services, in particular adequate space for stormwater infrastructure and overland flow paths. The critical aspect will be to ensure future building footprints provide space between for these services to be accommodated. Following Gateway, Urban Growth NSW have prepared a concept services map, with required spaces between buildings specified in the draft DCP guidelines.

Geotechnical and Contamination

The submitted request to amend the Newcastle LEP was supported by a geotechnical and contamination assessment by Douglas Partners (**Attachment C**).

The Assessment outlined that Douglas Partners has conducted contamination investigations within the rail corridor between Newcastle Station in the east and Worth Place in the west. The results of the investigation indicated the following with respect to contamination at the site:

- The presence of hydrocarbon contamination in soil associated with the former gas works in the eastern portion of the site (ie. current bus interchange).
- The presence of hydrocarbon contamination in near-surface soils in the vicinity of Newcastle Station and the Newcastle Signal Box as a results of historical train use.
- The presence of heavy metal-impacted near-surface soils to the west of Civic Station, likely to be as a result of impacted historical filling and/or historical ash dumping in the area.
- The presence of minor soil contamination in filling across the site, likely due to historical use as a railway and historical filling of the site.The Assessment recommends that contamination in soil at the site should be addressed due to the potential for impacts on human health and the environment, including groundwater impact. The Assessment proposes a remediation strategy for the site for localised removal and/or remediation of impacted soils, with capping of the remainder of the site with structures, pavements or soils. The contamination assessment and Remediation Action Plan (RAP) will be subject to review and approval by a NSW EPA accredited auditor.

Council's Compliance Services Unit has reviewed the Assessment and are satisfied that the land can be made suitable after remediation for all the purposes for which the land is to be used. Further details and agreement of contaminants remaining in-situ will be established for land intended to be dedicated to Council.

In terms of geotechnical suitability of the site for future development the Assessment identifies that the rail corridor land is considered to be geotechnically suitable for residential and commercial type developments. The Assessment adds that prior to the detailed design of any proposed developments specific geotechnical investigation will be required, appropriate to the nature of the proposed development. Investigation and design will need to consider some or all of the following matters:

- The presence and depth of uncontrolled fill.
- The presence, depth and likely variation in groundwater levels.
- Appropriate treatment and management of acid sulphate soils where encountered.
- Excavation conditions and shoring requirements, if relevant.
- Earthworks procedures and whether any ground improvement measures (such as removal and compaction) are required, taking into account the requirements of the Remediation Action Plan (RAP).
- Suitable footing options and design parameters for support of structures.
- Requirements relating to potential mine subsidence, where relevant.

The Assessment identified that it could be expected that with suitable investigation, design and construction in accordance with accepted engineering practice, that the above matters can be readily managed.

Having regards to the above, the land is acceptable from a contamination and geotechnical perspective for the intended land uses proposed.

Mine Subsidence

The site is within the Newcastle Mine Subsidence District. The submitted geotechnical and contamination assessment by Douglas Partners (**Attachment C**), includes a letter from Mine Subsidence Board (MSB), dated 14 January 2016, outlining preliminary consultation with the MSB. The letter confirms that future development would require approval from the NSW MSB and that larger scale development would be subject to merit assessment based upon engineered solutions having regards to further detailed investigations.

Flooding

The land is subject to flooding. A Flood Risk Assessment by BMT WBM is at **Attachment E** which details that flooding can occur from three mechanisms (and combination thereof), oceanic flooding, local catchment flooding and Hunter River flooding. The Assessment identifies that future development constraints, in accordance with Council's Development Control Plan 2012, include a flood planning level (ie. minimum floor level), and flood refuge areas. These could be accommodated under future development.

Bushfire

According to Newcastle Bush Fire Hazard Map the land is not affected by bushfire risk or in the vicinity of such a risk.

Acid Sulphate Soils (ASS)

The land is identified as Class 3 ASS under the Newcastle LEP 2012. Future development must comply with the provisions of the Newcastle LEP 2012 relating to ASS.

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

Social Impacts

A Social Impact Assessment (SIA) (**Attachment J**) was submitted in support of the request to amend the Newcastle LEP. The SIA identified the social issues that may occur as a result of the rezoning and subsequent implementation of the Master Plan to include:

- The impact of the forecast additional population and employment levels on local and regional social infrastructure.
- Demand for public transport services and pedestrian / cyclist access routes through the City Centre.
- Perceptions that certain areas have relatively high crime rates.

The SIA found that the benefits of the rezoning for the local community, wider Newcastle community, business and visitors are expected to be:

- Provision of a range of dwelling styles, mixed uses (retail, office and business) and open spaces to revitalise this important city area.
- Diversity in dwelling prices, including affordable housing that will appeal to a broad cross-section of households.
- Improvements to the public domain, including access to the Harbour area from the city and surrounding streets, new areas of open space and new pedestrian and cycling linkages, with the potential for community health benefits.

- Stimulation and revitalisation of local economic activity, during the day, evening, night-time and weekends.
- Preservation and enhancement of unique and valued heritage.
- New community uses and activities around the Newcastle Station precinct.

The SIA has also highlighted the following issues that may have the potential to create some adverse social impacts:

- Impacts of the forecast additional population and employment levels on community services and facilities and demands for quality open space.
- Impacts on community structure - integration of existing and new residents.
- Community perceptions of risk - to changing character, reduced affordability and crime risk.
- Social equity impacts - including a lack of affordable housing options for lower income and leading to potential displacement.
- Construction impacts.

The SIA recommended a number of measures to mitigate impacts. These are generally supported. Some measures are beyond the scope of the planning proposal, however, they demonstrate that mitigation methods are available as future development progresses.

The mitigation measures applicable to the planning proposal are outlined below, with comment under:

- Urban Growth NSW working with Newcastle City Council to identify further opportunities to upgrade or embellish new and existing areas of open space or identify suitable community uses within the rail corridor land.

  Comment
  Embellishment and dedication of open space included as part of the Planning Agreement exhibited with the planning proposal.

- Continuing discussions and liaison with social infrastructure providers (particularly the City of Newcastle Council, Department of Education and NSW Health) to ensure capacity issues, plans for future growth and service delivery can best accommodate the needs of this additional population and workforce.

  Comment

  The Gateway determination issued 22 December 2016 did not require any public authority consultation for the planning proposal.

- Strengthening design elements to formalise pedestrian and cyclist access through the city, towards the Harbour precinct and major community destinations, including planned light rail stops and heritage areas, with clear signage targeted at a culturally diverse community to help people navigate through the city.

  Comment

  Relevant aspects have been developed further as part of site specific DCP guidelines and are being exhibited with the planning proposal.

- Creation of an attractive and safe public domain and meeting places to attract people at all times of the day and assist with social integration.

Comment

Embellishment of open space included as part of the Planning Agreement exhibited with the planning proposal.

- Public safety and adherence to CPTED principles in design, including consultation with police.

  Comment

  Relevant CPTED principles are included within Newcastle DCP 2012. The Gateway determination issued 22 December 2016 did not require any public authority consultation for the planning proposal.

- Streets and public open spaces that allow natural surveillance from windows, balconies, passing vehicles and pedestrian and cyclist traffic.

  Comment

  Relevant aspects included as part of site specific DCP guidelines and exhibited with the planning proposal.

- Urban Growth NSW to work with Newcastle City Council and other interest groups to investigate opportunities to provide affordable housing options.

  Comment

  The Planning Agreement with Urban Growth NSW includes a commitment to the provision of affordable housing in the redevelopment of part of the corridor land adjacent to Civic Link. The Planning Agreement is being exhibited with the planning proposal.

In addition to the above mitigation methods, given the alignment of the planning proposal with the established strategic planning framework (as outlined under Section B of this proposal), it is considered that, on balance, the planning proposal will result in positive social impacts.

Economic Impact

Attachment K contains an Economic Assessment by SGS Economics and Planning.

This Assessment considered the range of economic impacts associated with the proposed rezoning of the rail corridor lands. The Assessment included analysis of employment market dynamics within the Newcastle city centre, residential market dynamics and the job creation potential of the rezoning proposal. The findings are summarised below.

- Commercial floorspace
  - By 2031 demand will increase by 58,000m^2 within the Newcastle city centre.
  - The proposed development is estimated to deliver 2,020m^2 of commercial which contributes to a small (3.5%) but important addition to accommodate forecast growth to 2031.

- Retail floorspace
  - By 2031 demand will grow to 182,300m^2 in the Newcastle.
  - The proposed development is estimated to deliver 2,020m^2 of retail floorspace which contributes to a small (1.1%) but valuable addition to accommodate forecast growth within the LGA.

- Residential - the rezoning proposal will deliver estimated 400 - 500* additional apartments within the corridor. A further 221 apartments will be delivered by land adjacent to the corridor that is already zoned. The Assessment identifies:

  There are a range of benefits associated with residential development in and around centres. The benefits accrue in the form of more sustainable travel, economies of agglomeration and optimal use of infrastructure. It will also improve the vitality and viability of the Newcastle city centre, given that new residents will stimulate demand for services, such as restaurants, cafes, tourism, recreation, entertainment and cultural activities in the centre and drive associated local employment growth. Residential development contributes to activity outside of core business hours and on weekends.

  Increasing the population will assist in providing a better mix of dwellings and greater housing diversity within the Newcastle LGA.

**potential number of dwellings has been further reduced since this assessment was prepared.*

- Job creation - An additional 550 - 660 jobs could potentially be established within the rail corridor and adjacent lands. This is based on the development of the mixed use sites as well as demand for services from the people within the apartments:

  - Newcastle Station: 160-270 total jobs
  - Mixed Use development: 310 total jobs
  - Residential apartments: 80 total jobs

The direct impact of the anticipated increase in construction activity is estimated to contribute to an additional $124.5 million in industry output, 600 additional jobs within the centre and a gross value add of $98 million to the local economy.

Retail Impact

Attachment B contains an Assessment of Retail Impact prepared by MacroPlanDimasi. The Assessment concludes:

"In summary, the proposed rezoning of the rail corridor lands to enable the potential development of around 5,000 m^2 of retail/commercial floorspace is considered appropriate, and would represent only a small addition to the retail network. Even in combination with the proposed redevelopment of the Hunter Mall precinct, cumulative impacts across the retail hierarchy are expected to be moderate.

Impacts of the order estimated are highly unlikely to result in any detrimental impacts on the surrounding retail / centres hierarchy across the region, nor other retail precincts within the Newcastle CBD. Additional retail / commercial development within the Newcastle CBD is likely to boost the overall profile and attractiveness of the CBD as a retail, entertainment and commercial destination."

The economic and retail impacts resulting from the planning proposal are considered to be positive.

Section D - State and Commonwealth interests

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

A Servicing Investigation, by ADW Johnson (**Attachment L)** supports the submitted request to amend the Newcastle LEP. The Investigation identifies that there are no issues that would preclude the proposed rezoning on the basis of water and wastewater infrastructure servicing, electricity and communications. Future proofing a corridor for the provision of services for development within the rail corridor is part of the DCP prepared for the land and exhibited with the planning proposal.

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

No State or Commonwealth public authorities have been formally consulted as there were no requirements in the Gateway determination to consult with public authorities.

Part 4 – Mapping

The planning proposal seeks to amend the following maps within Newcastle LEP 2012.

- Land Zoning Map
- Height of Buildings Map
- Floor Space Ratio Map
- Minimum Lot Size Map
- Key Sites Map

The Matrix below indicates (with an "X"), which map sheets (of Newcastle LEP 2012) are to be amended as a result of this planning proposal (eg FSR_001C)

	FSR	LAP	LZN	WRA	ASS	HOB	LSZ	LRA	CL1	HER	URA
001											
001A											
001B											
001C											
001D											
002											
002A											
002B											
002C											
002D											
002E											
002F											
002G											
002H											
003											
004											
004A											
004B											
004C											
004D											
004E											
004F											
004FA											
004G	X		X			X			X		
004H											
004I											
004J											
004K	X		X			X			X		

Map Codes:

FSR	=	Floor Space Ratio map
LAP	=	Land Application Map
LZN	=	Land Zoning Map
WRA	=	Wickham Redevelopment Area Map
ASS	=	Acid Sulfate Soils Map
HOB	=	Height of Buildings Map
LSZ	=	Lot Size Map
LRA	=	Land Reservation Acquisition Map
CL1	=	Key Sites Map & Newcastle City Centre Map
HER	=	Heritage Map
URA	=	Urban Release Area Map

The following maps illustrate the proposed amendments to the Newcastle LEP 2012 maps:

- **Figure 2:** Existing Land Zoning Map
- **Figure 3:** Proposed Land Zoning Map
- **Figure 4:** Existing Height of Buildings Map
- **Figure 5:** Proposed Height of Buildings Map
- **Figure 6:** Existing Floor Space Ratio Map
- **Figure 7:** Proposed Floor Space Ratio Map
- **Figure 8:** Existing Key Sites Map
- **Figure 9:** Proposed Key Sites Map

Figure 2

Newcastle Local Environmental Plan 2012

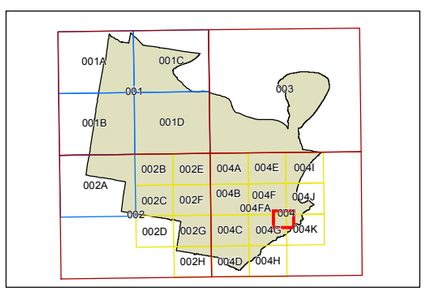
Existing Land Zoning Map
Planning Proposal PP2016/0004

Subject Site

Land Zoning

- B1 Neighbourhood Centre
- B2 Local Centre
- B3 Commercial Core
- B4 Mixed Use
- B5 Business Development
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- IN1 General Industrial
- IN2 Light Industrial
- IN3 Heavy Industrial
- R2 Low Density Residential
- R3 Medium Density Residential
- R4 High Density Residential
- RE1 Public Recreation
- RE2 Private Recreation
- SP2 Infrastructure
- SP3 Tourist
- W2 Recreational Waterways
- UL Unzoned Land

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N

Projection: GDA 1994 MGA Zone 56

Scale: 1:5,000 @ A3

Map Identification Number: ECM 4951346. Date: 27/11/2017 3:54:46 PM

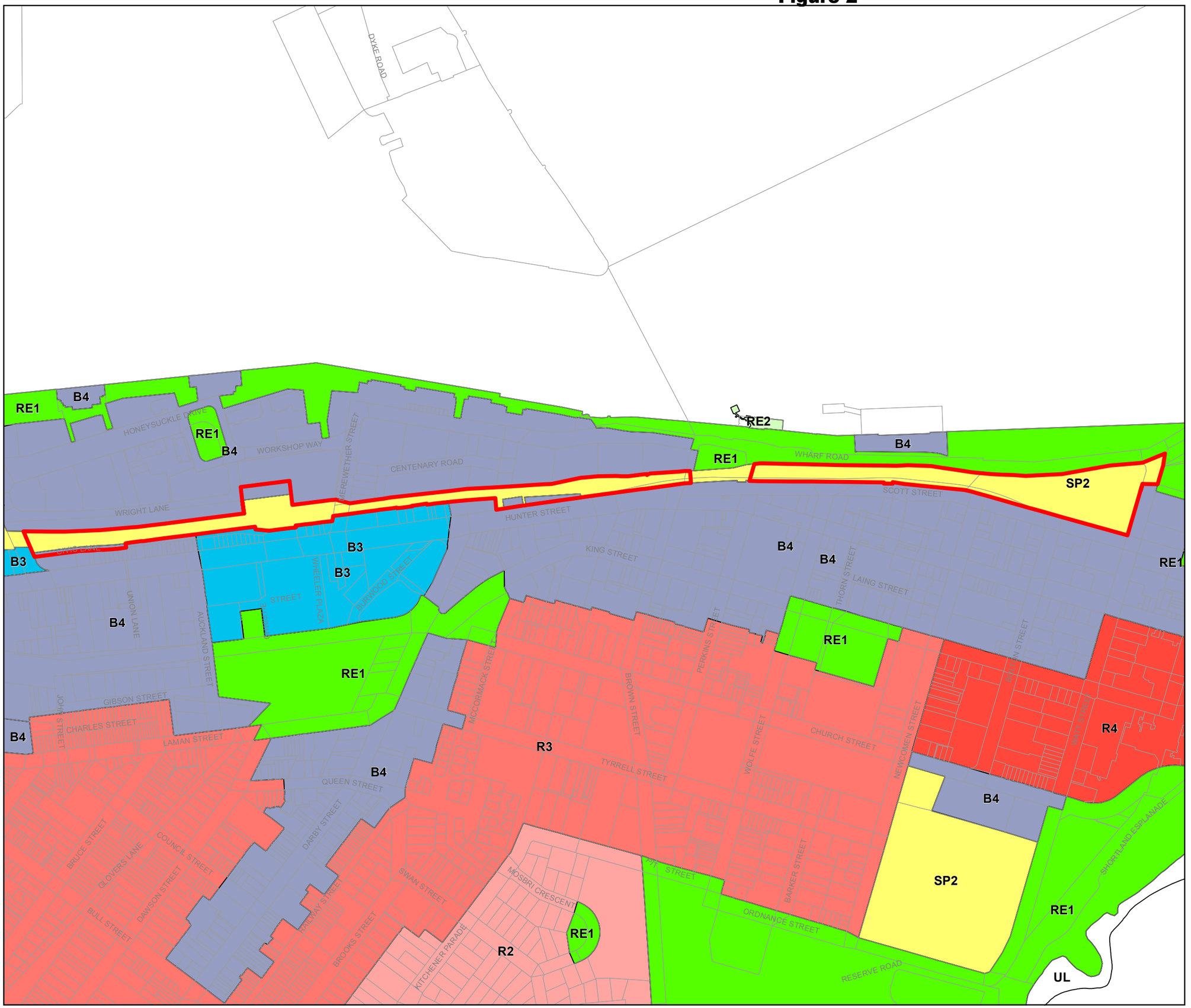


Figure 3

Newcastle Local Environmental Plan 2012

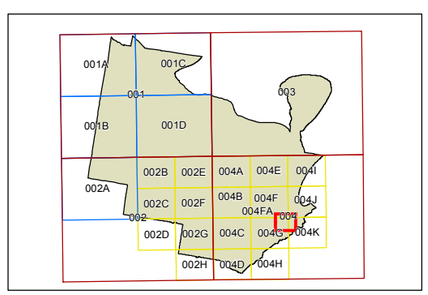
Proposed Land Zoning Map
Planning Proposal PP2016/00006

Subject Site

Land Zoning

- B1 Neighbourhood Centre
- B2 Local Centre
- B3 Commercial Core
- B4 Mixed Use
- B5 Business Development
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- E4 Environmental Living
- IN1 General Industrial
- IN2 Light Industrial
- IN3 Heavy Industrial
- R2 Low Density Residential
- R3 Medium Density Residential
- R4 High Density Residential
- RE1 Public Recreation
- RE2 Private Recreation
- SP2 Infrastructure
- SP3 Tourist
- W2 Recreational Waterways
- UL Unzoned Land

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N

Projection: GDA 1994 MGA Zone 56

Scale: 1:5,000 @ A3

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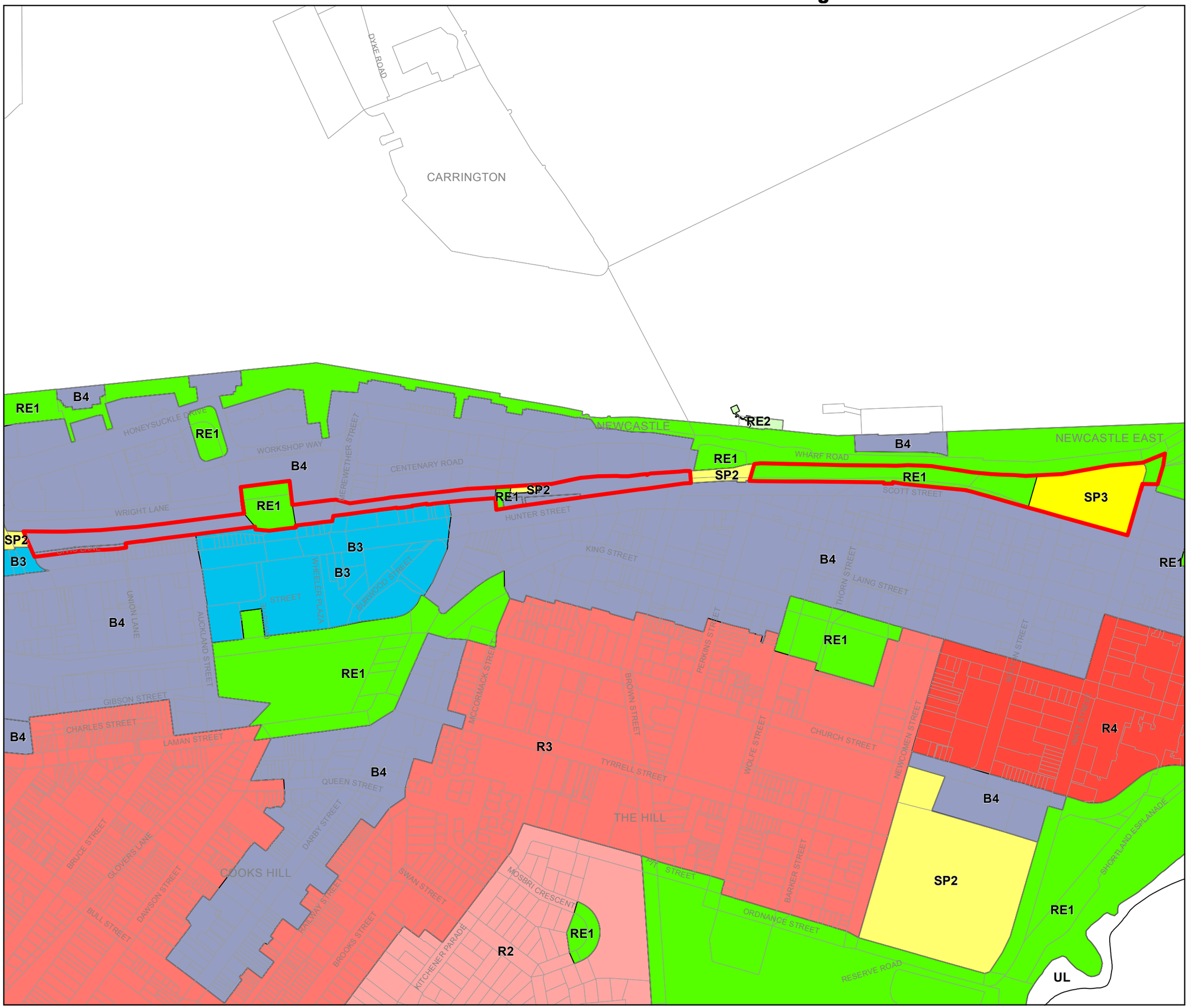


Figure 4

The City of Newcastle

Newcastle Local Environmental Plan 2012

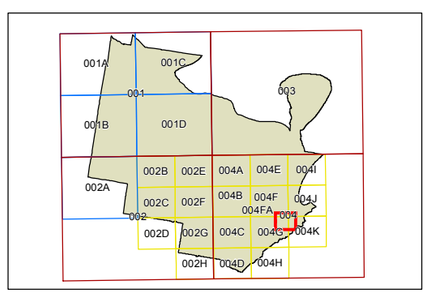
Existing Height of Buildings Map
Planning Proposal PP2016/0004

Subject Site

Maximum Building Height (m)

I	8.5
K	10
L	11
M	12
N	14
P1	17
P2	18
Q	20
R	21
S	24
T	27
U	30
V	35
X	45
AA	60
AB	90
RL1	0 - 20
RL2	20 - 40
RL3	40 - 60

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N

Projection: GDA 1994 MGA Zone 56

Scale: 1:5,000 @ A3

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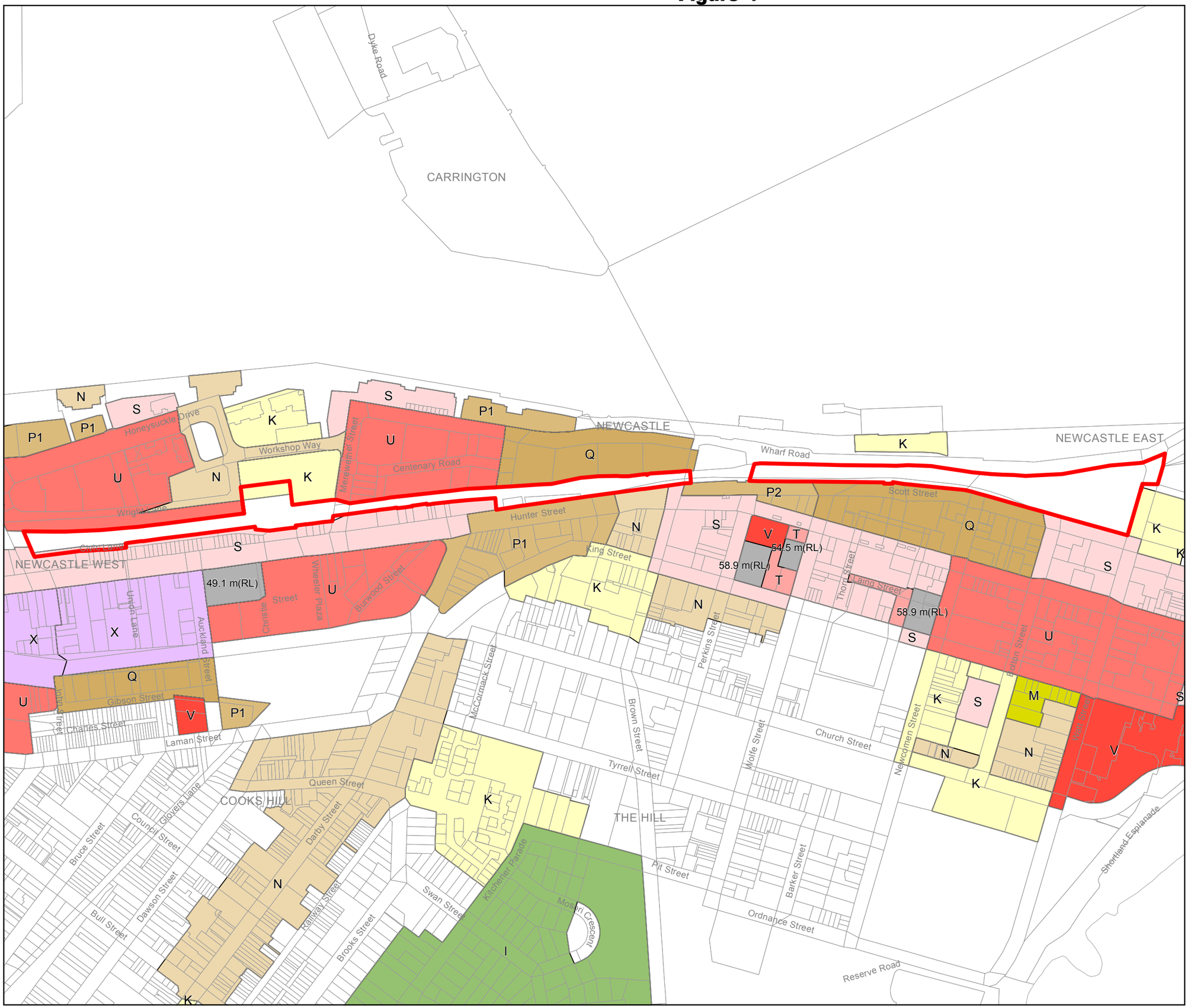


Figure 5

Newcastle Local Environmental Plan 2012

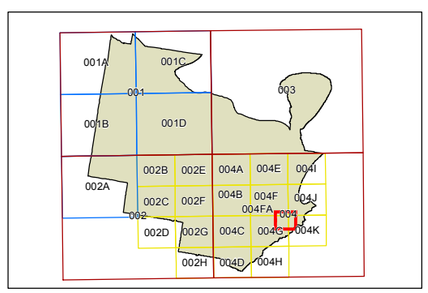
Proposed Height of Buildings Map
Planning Proposal PP2016/0004

Subject Site

HOB - Proposed

I	8.5
K	10
L	11
M	12
N	14
O	15
P1	17
P2	18
Q	20
R	21
S	24
T	27
U	30
V	35
X	45
AA	60
AB	90
RL1	0 - 20
RL2	20 - 40
RL3	40 - 60

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N

Projection: GDA 1994 MGA Zone 56

Scale:1:5,000 @ A3

Map Identification Number: ECM 4951345, Date: 27/11/2017 4:02:38 PM

CARRINGTON

NEWCASTLE

COOKS HILL

THE HILL

49.1 m(RL)

54.5 m(RL)

58.9 m(RL)

58.9 m(RL)

Figure 6

Newcastle Local Environmental Plan 2012

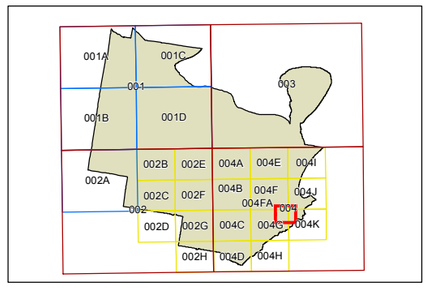
Existing Maximum Floor Space Ratio
Planning Proposal PP2016/0004

Subject Site

Maximum Floor Space Ratio

F	0.6
I	0.75
L	0.9
N	1
S	1.5
T	2
U	2.5
V	3
X	4
Z	5
AA	6
AC	8

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N

Projection: GDA 1994
MGA Zone 56

Scale: 1:5,000 @ A3

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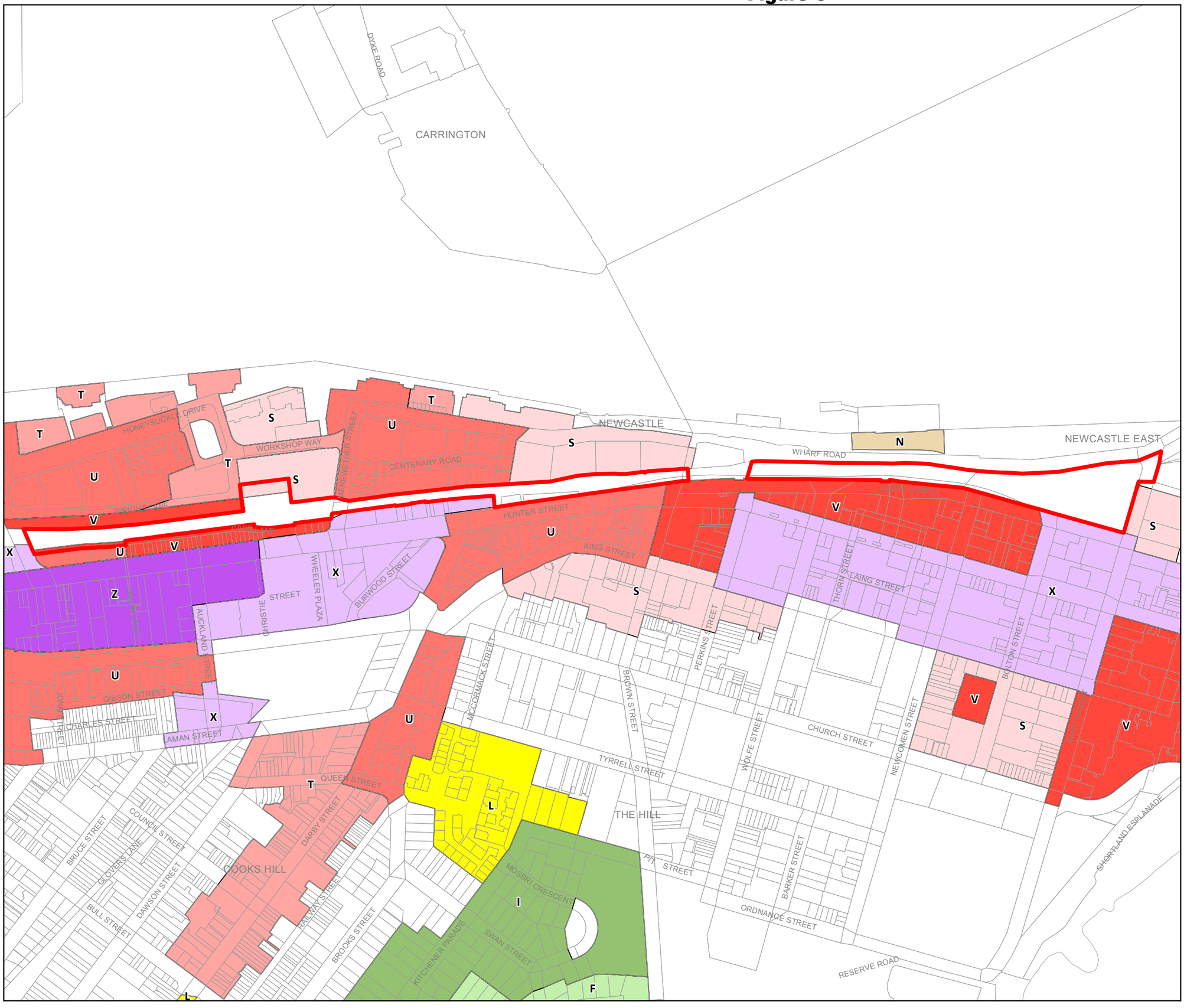


Figure 7

Newcastle Local Environmental Plan 2012

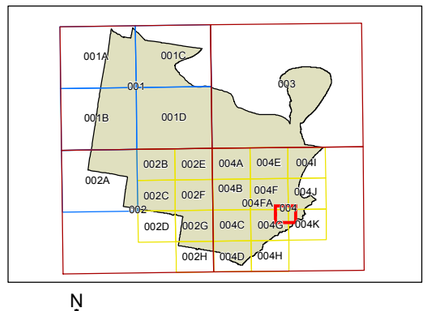
Proposed Maximum Floor Space Ratio
Planning Proposal PP2016/00006

Subject Site

Maximum Floor Space Ratio

F	0.6
I	0.75
L	0.9
N	1
S	1.5
T	2
U	2.5
V	3
X	4
Z	5
AA	6
AC	8

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N

Projection: GDA 1994
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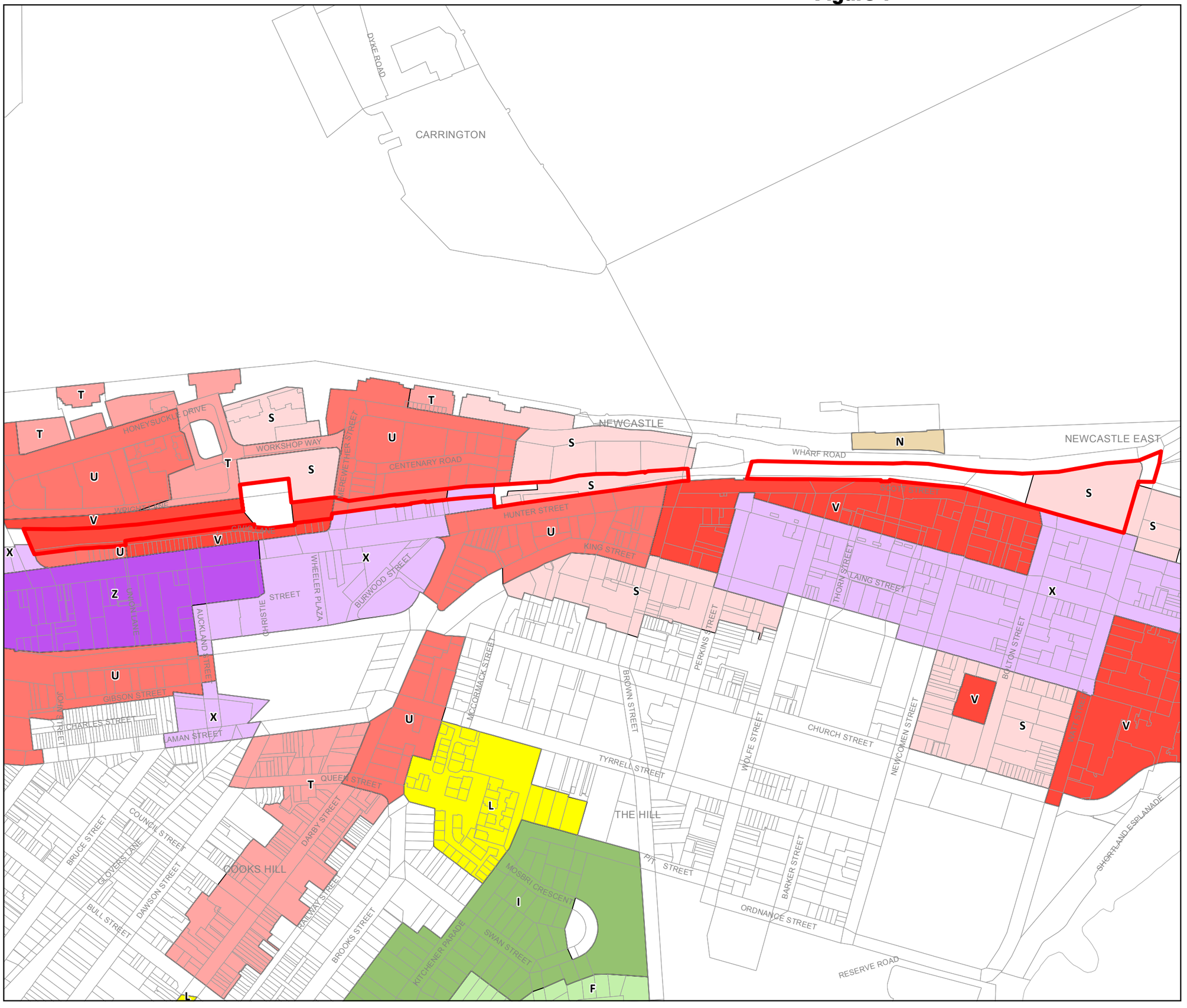


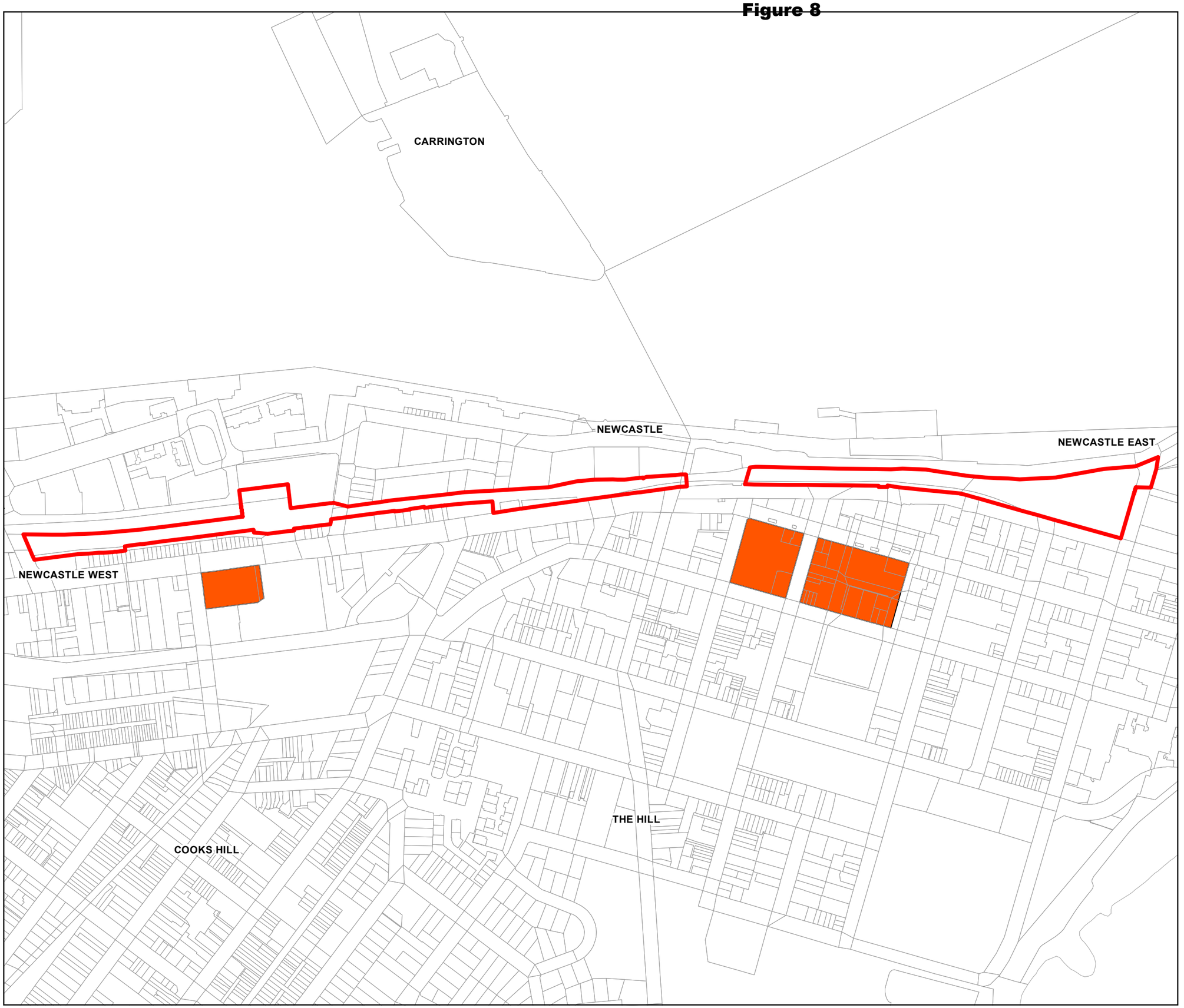
Figure 8

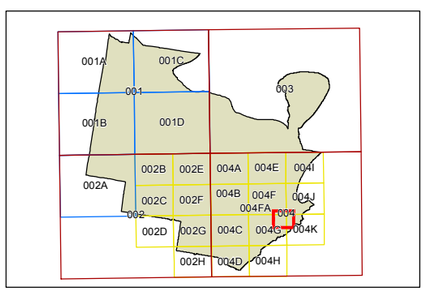
Newcastle Local Environmental Plan 2012

Site Map
Planning Proposal PP2016/0004

Subject Site
Key Sites

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N

Projection: GDA 1994
MGA Zone 56

Scale: 1:5,000 @ A3

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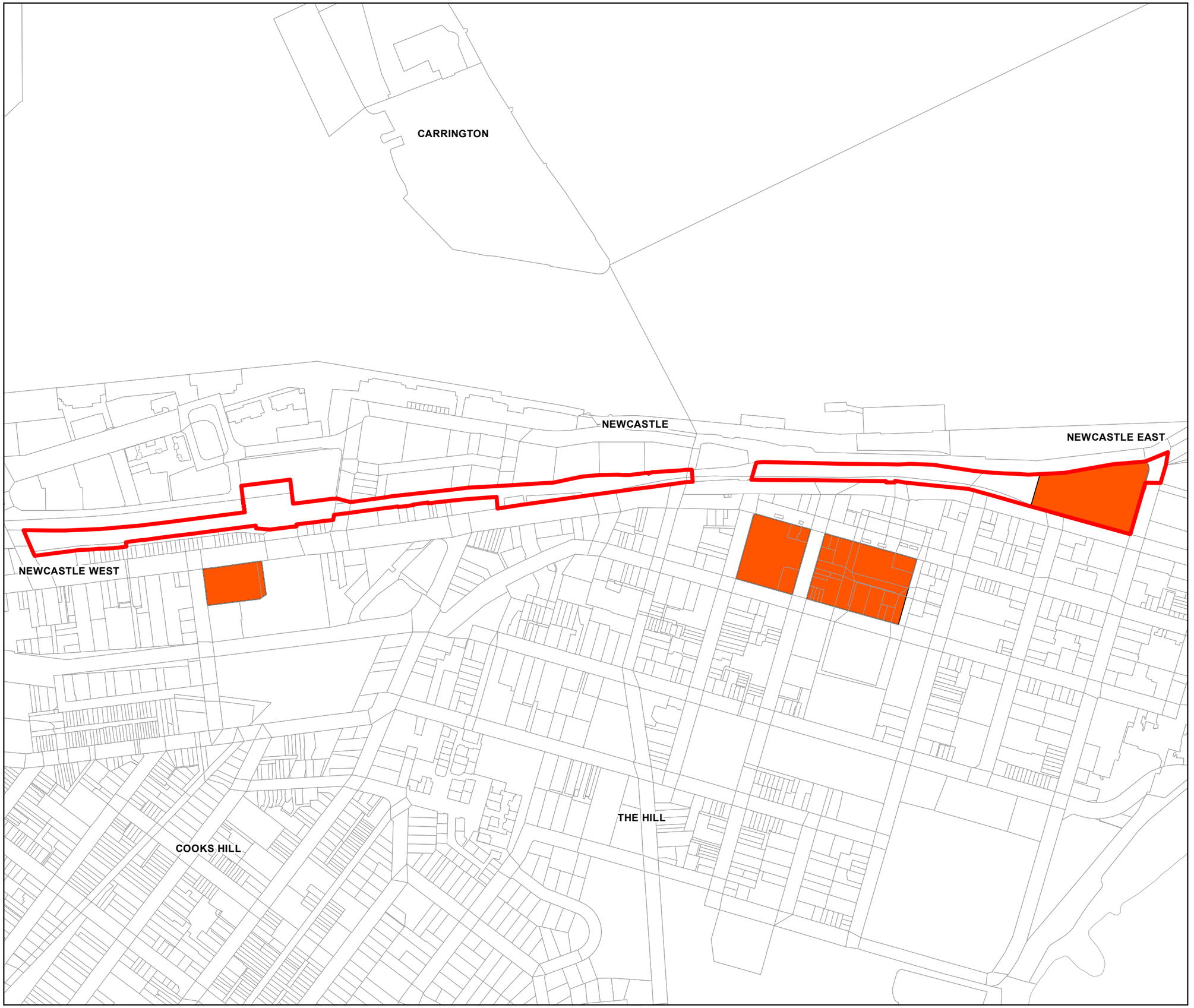
Figure 9

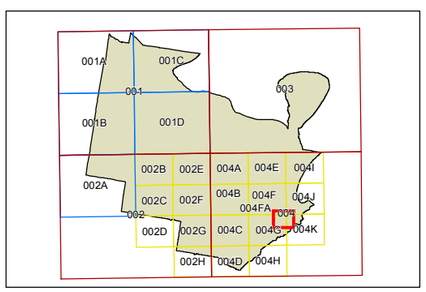
Newcastle Local Environmental Plan 2012

Site Map
Planning Proposal PP2016/0004

Subject Site
Key Sites

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N

Projection: GDA 1994
MGA Zone 56

Scale: 1:5,000 @ A3

Map Identification Number: ECM 4951344, Date: 4/12/2017 8:57:55 AM

Part 5 – Community Consultation

The Gateway Determination issues on the 13 December 2016 required the Planning Proposal be exhibited for 28 days. Council resolved at its meeting held on 22 August 2017 to place the Planning Agreement and DCP guidelines on public exhibition for 40 days. To ensure consistency he Planning Proposal will also be placed on public exhibition for 40 days.

The Planning Proposal, draft Development Control Plan and draft Planning Agreement were exhibited from Monday 11 September until Monday 23 October 2017. During this time Council received 849 submissions via the "Have Your Say" section on Council's website, emailed into "Official Mail" or hand delivered to Council. The Social Pinpoint Survey on Council's website was viewed 942 times with 647 survey responses.

Form Letters - *Support*

Council received 46 form letters (2 types) in support of the proposal, 39 were from community members living within the Newcastle Local Government Area, 1 from Lake Macquarie, 1 from the Central Coast, 4 from Sydney and 1 that did not include and address.

The form letters noted the exhibited plan for the corridor is consistent with the community vision to bring people back to the Newcastle City Centre by enhancing Newcastle as a destination, while supporting the creation of jobs, education and housing opportunities and high quality public domain. The form letters noted the proposal will dramatically improve the connectivity of Newcastle by reuniting the City Centre with our iconic working harbour, improving the experience of being in and moving around the city.

The letters also commended the leadership taken by Council to preserve and enhance the unique heritage and character of the City through the Planning Proposal.

Form Letters - *Objection*

Council received 137 form letters in opposition of the proposal, 62 were from community members living within the Newcastle Local Government Area, 24 were from Lake Macquarie, 1 from Port Stephens, 30 from broader Hunter area, 13 from the Central Coast, 4 from Sydney and 3 didn't include an address.

The form letter stated *'you can do a submission to Council to say NO to development of the corridor and NO to light rail in Hunter and Scott Streets'* and *'that Council could alter the proposal to remove light rail from Hunter Street and build over the rail in the corridor'*. The form letter included the following examples of points to use in the objection/submission to Council:

i) This land should remain zoned SP2 (Infrastructure - Railway).

ii) A railway corridor capable of direct mass transport is vital for the future.

iii) In past submissions over 70% of the people supported rail in the corridor.

iv) Transport experts said to keep the corridor for rail (NCC Public Voice).

v) In 2013 Government Document 71 says light rail in Hunter Street will cost $100M more.

vi) The development lacks sufficient parking for residents.

vii) No provision for healthy and safe cycling and walking access.

viii) The development will create more traffic congestion with increased trip times.

ix) Create a visible barrier to the harbour.

x) Cause overshadowing of Hunter Street properties and loss of solar access.

xi) Cause removal of hundreds of car parking spaces.

xii) Threaten the heritage of the city - Newcastle / Civic Stations, Signal Box, The Store.

xiii) Cause loss of significant views between Newcastle Station and the harbour.

xiv) Cause overdevelopment of the city - 2,000 apartments already underway.

xv) Light rail on Hunter and Scott Streets will cause removal of hundreds of parking spaces and loading zones, more traffic congestion and pollution (3 extra sets of traffic lights), longer travel times than on the corridor, businesses to fold, widening of Scott Street into Market Street Lawn.

The form letters received by Council reinitiated the points above, specifically keeping the current SP2 Infrastructure zone and reinstating the rail line for either heavy or light rail.

Submissions

Support

Council received 226 submissions in support of the planning proposal, draft DCP and draft planning agreement. The submissions supported the proposal in its entirety as well as specific components of the proposal. The submissions expressed excitement about the development of the University precinct, including student housing, open space links and Market Street Lawn. Council received positive comments on the changes happening to the city, since the closure of the heavy rail in 2014.

Of the 226 submissions received, 80 submissions were specifically supporting the submission made by the Property Council. Although the Property Council submission does propose a slightly different outcome to what is proposed in Council's Planning Proposal, the Property Council's submission does support development on the rail corridor, the proposed open space areas and adaptive reuse of the Newcastle Station and therefore these submissions have been included in the support category.

Objection

Council received 394 objections during the exhibition period. Following review of these submissions, 248 suggested retaining the SP2 Infrastructure Zone, to ensure the rail corridor was protected allowing rail to be reinstated in the corridor in the future. The submissions also disagreed with the light rail route and said it should run down the existing corridor rather than on Hunter and Scott Street.

Concerns were also raised with the removal of parking due to the light rail route and an increase in traffic congestion during the construction phase of light rail and into the future.

The objections expressed concern that the new development in the rail corridor would overshadow Hunter Street and result in an over development of the city. 42 of the objections suggested leaving the entire corridor as open space, to create better connections to the harbour and allow for active transport uses such as walking and cycling.

Of the 394 objections, 73 supported the following Notice of Motion dated 22 August 2017:

i) enable rails to be installed on, and light rail vehicles to operate on the Rail Corridor from Worth Place to Newcastle Station, and

ii) require that, where necessary to enable an effective rail service on the Rail Corridor, and any buildings on the rail route from Worth Place to Newcastle Station are to be constructed so that all light rail vehicles can pass underneath those buildings.

The issues outlined above are matters that cannot be addressed as part of the Planning Proposal as they relate to decisions that have previously been made by the NSW Government in relation to terminating of the heavy rail and the light rail currently being constructed in Hunter and Scott Streets. These are not decisions or matters that the Council has authority over.

Unspecified

Council received 44 submissions that did not clearly state whether they supported or objected to the proposal.

Site Specific Submissions

Council received 17 site specific submissions relating to the Planning Proposal and draft DCP; these submissions contained 6 issues. Council also received a submission from Hunter Development Corporation requesting changes to the Planning Proposal and draft DCP. Further details are provided below on how these issues have been addressed.

Subdivision Adjacent to Market Street Lawn

Council sought further clarification from Hunter Development Corporation (HDC) in relation to the boundary adjustment adjacent to Market Street lawn. HDC advised that the boundary adjustment facilitated works associated with the light rail including the relocation of services, road realignment and footpath widening. The realignment of Scott Street has resulted in an encroachment of 475m^2 into the site of the former rail corridor, primarily to the east of the Newcastle Signal Box where the Market Street light rail platform will be located.

Market Street Lawn will provide approximately 1.2 hectares of landscaped public open space; the subdivision has no impact on the zoning of land proposed in the planning proposal.

414 - 426 Hunter Street Newcastle

Council received two submissions from the owners of 414-426 Hunter Street, concerned with the proposed lowering of the building height from 24m to 18m. These properties are outside of the rail corridor and were included into the planning proposal to improve the amenity to the surrounding open space areas, such as Wheeler Place.

Further detailed analysis of the impact of overshadowing of Wheeler Place was undertaken which showed that at a building height of 18m, there was no impact on Wheeler Place and at the existing building height of 24m there was an approximate encroachment of 3-4 metres at 12pm on the 21 June. This encroachment is considered acceptable.

The draft DCP contains a street wall height control for these properties (on Hunter Street) of 16m. The inclusion of this control in the draft DCP will lessen the impact of overshadowing of Wheeler Place and therefore the Planning Proposal has been amended, to maintain the current building height of 24m.

Proposed through site link from Hunter Street to Civic Lane

Council received three submissions regarding the proposed through site link from Hunter Street to Civic Lane included in the draft DCP. The *Network Access Map* in the draft DCP shows a preferred location of the link between 462 - 492 Hunter Street.

The submissions raised concern that Council would compulsorily acquire and demolish the properties outlined in the draft DCP; which would impact significantly on people's homes and business. One of the submissions also noted that the University owns a property within the preferred site link location and this building would be better served to provide a link as it would enable students to safely cross at the Auckland Street intersection and continue through to the proposed Honeysuckle Campus, without displacing any existing residents or businesses.

Following review of these submissions, the *Network Access Map* in the draft DCP has been amended to remove the ‘preferred arcade / through site link’ and the associated performance criteria / acceptable solution has been deleted.

Although increased permeability in this location is desirable (from Hunter Street to Civic Lane), the clause has created some confusion amongst property owners. There is no proposal for compulsory acquisition at this location. It is considered that the design/development controls for arcades and through site links provide appropriate controls, should property owners in this area choose to redevelop and incorporate through site links to capitalise on the redevelopment of the rail corridor.

Hunter Street Parcel - Live Work Units

Council received nine submissions regarding the Hunter Street parcel that is proposed to be developed to house approximately 13 Live-Work Units. These submissions came from the owners of the adjoining residential units located to the north of the former rail corridor (Nautilus Apartments) all of which expressed concern that future development would impact on their views and amenity including overshadowing and therefore the land should be zoned to RE1 Public Recreation.

The Hunter Street parcel is proposed to be rezoned to B4 Mixed Use, with a building height of 14m and a floor space ratio of 1.5:1. The Nautilus Apartments site has a height limit of 20m. As the Nautilus apartments are located to the north of the former railway corridor, they will not be affected by shadowing from any development on the former corridor

The draft DCP already incorporates design controls to address view lines, solar access and other amenity issues. To address the concerns raised during the public exhibition, the draft DCP has been amended to incorporate an additional control for this location which requires the upper level setback on the northern side of the development to achieve the minimum separation distances detailed in the Department of Planning and Environment's Apartment Design Guidelines.

The intended outcome of developments in the Hunter Street parcel is to complete the streetscape on the northern side of Hunter Street and to facilitate activation of the street.

336 Hunter Street Newcastle

Council received a submission from the owners of 336 Hunter Street who are not part of the rail corridor but were included in the planning proposal to address an anomaly of the site not having a maximum building height or maximum floor space ratio.

The planning proposal proposes a maximum building height of 14m and a floor space ratio of 1.5:1, to be consistent with the controls for the Hunter Street parcel. The submission requested either removing the parcel of land from the planning proposal, and therefore not assigning height and floor space ratio controls, or assigning the same controls on the southern side of Hunter Street being a 24m maximum building height and 2.5:1 floor space ratio.

To ensure consistency of the street wall height with the proposed adjoining Live-Work units, and to reinforce the proposed scale of the streetscape in this area the proposed maximum building height and floor space ratio remains at 14m and 1.5:1.

Civic East

Council received one submission requesting the zoning of the Civic East parcel be changed to RE1 Public Recreation (rather than B4 Mixed Use) and allowing developers to purchase the development rights to be used on the adjoining properties. This would allow the additional floor space ratio that would have previously been on the rail corridor to be added to the adjoining sites, increasing the footprint of the building but not the height limit. As the site to the east of the Civic East parcel is proposed to be zoned B4 Mixed Use, the RE1 zone is not appropriate in this location. Council does not support transferable development rights as part of this proposal.

Hunter Development Corporation Submission

Planning Proposal changes

Hunter Development Corporation requested the Planning Proposal be amended to remove an anomaly, created by the existing minimum lot size for RE1 Public Recreation zoned land within the Newcastle Local Environmental Plan.

The Planning Proposal has been updated to reflect this request as this will allow a subdivision to occur to separate the Newcastle Signal Box from the surrounding RE1 Public Recreation land, allowing the land to be dedicated to Council as outlined in the draft planning agreement.

DCP Changes

Hunter Development Corporation also requested two additional DCP amendments, firstly in relation to the Civic Link to clarify the original intent of the design guidelines which is to provide:

i) a 4.5m pedestrian only link on the northern side of the former railway corridor between Civic Link and Merewether Street; and

ii) vehicular access only on the southern side of the former railway corridor between Civic Link and Merewether Street. This access is for vehicular access for the properties 416-426 Hunter Street and the future affordable housing units proposed on this part of the former railway corridor.

The other change relates to *B6 – Sun access to public spaces*, Darby Plaza will retain the RE1 Recreation zoning but has been removed from the list of public spaces as its unlikely to achieve the sun access requirements detailed in this section of the DCP due to its small size (300m^2), the presence of existing development around the site and permissible (subject to this planning proposal being supported) future development of surrounding areas. Darby Plaza is located in the vicinity of Wheeler Place and Civic Link which do / will meet the sun access requirement, therefore this change is considered to be minor. The Plaza itself is not proposed to be removed only the listing as a public space within the DCP.

Both of these amendments have been made to the draft DCP. The blue text in the draft DCP shows the changes that have been made following the exhibition period.

Public Voice

Council resolved on the 26 April 2017, to hold a Public Voice session during the exhibition period of the Planning Agreement, draft DCP and draft Planning Agreement. The Public Voice was held on 18 October 2017 and included 12 speakers (6 for and 6 against).

The speakers against the proposal spoke about the lack and quality of the open space to be provided in the corridor, additional traffic congestion caused by the Planning Proposal and that the corridor should be retained for rail. One speaker spoke of the affect the proposed lowering of building heights at 414-426 Hunter Street would have on her family as well as the impact the light rail construction had on her ability to secure a tenant for her commercial building; the subdivision of land adjacent to Market Street Lawn was also raised as a concern.

The speakers supporting the proposal discussed the positive impact the rezoning will have on Newcastle including stimulation of commercial development in Honeysuckle from the proposed university campus as well as commenting on how Newcastle is changing and providing greater employment, which has allowed people to move back to Newcastle as there is now suitable professional employment opportunities.

Social Pin Point Survey

A Social Pinpoint Map was developed and included on the engagement page of Council's website. The map included for each parcel of land, zoning information, building height, floor space ratio controls, potential dwelling yield and proposed non-residential area. The map also had a brief survey embedded for people to provide comment.

This map and survey serves the purpose of informing the public about the different aspects of the Planning Proposal and provides the opportunity for the community to provide feedback additional to any formal submissions.

The Social Pinpoint Survey on Council's website was viewed 942 times with 647 survey responses. The results are summarised below;

Education (University)	
Proposed Planning Controls Zoning: B4 Mixed Use Height: 30m FSR: 3.1	45% agreed with the building height 31% agreed with the FSR 47% thought the area should contain student housing
Verbatim comments: The comments of the participants who disagreed with the proposal suggested having no development on the site and reinstating the rail corridor, using the site for open space and active transport uses (walking and cycling) and car parking.	
Additional land at the Museum	
Proposed Planning Controls Zoning: RE1 Public Recreation	91% agreed with the proposed zone

Height: n/a FSR: n/a	
Verbatim comments: Survey participants suggested using the area for a playground that could be incorporated into the museum, a space that reflects the history of the area and for a pickup/drop off area to support transport and car parking.	
Civic Link (incorporating Civic Station)	
Proposed Planning Controls Zoning: RE1 Public Recreation Height: n/a FSR: n/a	84% agreed with the proposed zone
Verbatim comments: The comments supported the area being used for open space as well as leaving the area as a transport corridor.	
Civic (proposed affordable housing site)	
Proposed Planning Controls Zoning: B4 Mixed Use Height: 18m FSR: 3.1	40% agreed with the proposed zone 33% agreed with the FSR 43% agreed with the proposed zone
Verbatim comments: The comments disagreed with the proposed use and through the area should remain as open space and be kept for future transport needs. Others suggested leaving this space for a future expansion of the museum and that the building height should be lowered.	
Civic East	
Proposed Planning Controls Zoning: B4 Mixed Use Height: 30m FSR: 2:5.1	47% agreed with the building height 27% agreed with the FSR 48% agreed with the proposed zone
Verbatim comments: The comments were varied with some suggesting the area be kept for the rail corridor and not built on; others suggested a park or a parking station and comments were both for and against the proposed height limit.	
Darby Plaza	
Proposed Planning Controls Zoning: B4 Mixed Use Height: 24m FSR: 4:1	86% agreed with the proposed zone 39% supported location for student housing
Verbatim comments: The comments thought the area should be used for open space or a transport corridor and not built on.	
Darby Park	
Proposed Planning Controls Zoning: RE1 Public Recreation Height: n/a FSR: n/a	86% agreed with the proposed zone
Verbatim comments: The comments supported the proposed use of the area and suggested water stations, seats, shade, lighting and green walls.	
342-336 Hunter Street	
Proposed Planning Controls Zoning: B4 Mixed Use Height: 14m FSR: 1:5.1	51% agreed the building height
Verbatim comments: The comments said development should be kept to 4 storeys and that the area should be retained for a rail corridor.	

Hunter Street	
Proposed Planning Controls Zoning: B4 Mixed Use Height: 14m FSR: 1:5.1	36% agreed with the building height 32% agreed with the FSR 37% agreed with the proposed zone
Verbatim comments: The comments suggested the area should be retained as open space or for the rail corridor and should not be built on.	
Entertainment Precinct (Market Street Lawn)	
Proposed Planning Controls Zoning: RE1 Public Recreation Height: n/a FSR: n/a	84% agreed with the proposed zone
Verbatim comments: The comments supported the recreation use with participants noting they have enjoyed the events being held at Market Street Lawn.	
Newcastle Station	
Proposed Planning Controls Zoning: SP3 Tourist Zone Height: 10m and 20m FSR: 1:5.1	78% agreed with the tourist orientated development
Verbatim comments: Survey participants though the station and surround space could be used for hands on activities and interactive information for tourists, bike hire facilities, historical/café space and cultural hub, vibrant and unique, exercise equipment, a performance venue and that the station be retained.	

Part 6 – Project Timeline

The project is expected to be completed within 12 months from Gateway determination. The following timetable is proposed:

Task	Planning Proposal Timeline												
	Dec 16	Jan 17	Feb 17	Mar 17	Apr 17	May 17	Jun 17	Jul 17	Aug 17	Sep 17	Oct 17	Nov 17	Dec 17
Issue of Gateway determination													
Prepare any outstanding studies, DCP guidelines and Planning Agreement													
Report to Council seeking resolution to exhibit draft DCP guidelines and draft Planning Agreement													
Exhibition of Planning Proposal, technical studies, draft DCP guidelines, draft Planning Agreement													
Review of submissions and preparation of report to Council													
Report to Council following exhibition													
Planning Proposal sent back to Department requesting that the draft LEP be prepared													

Attachments

Attachment A: Urban Design Analysis - by Hassell Architects, dated 24 March 2017

Attachment B: Assessment of Retail Impact - by MacroPlanDimasi, dated March 2017

Attachment C: Geotechnical and Contamination Assessment - by Douglas Partners, dated March 2017

Attachment D: Heritage Impact Assessment - by RPS, dated June 2017

Attachment E Flood Risk Assessment - by BMT WBM, dated March 2017

Attachment F: Flora and Fauna Assessment - by RPS, dated March 2017

Attachment G: Visual Impact Statement - by Moir Landscape Architects, dated 15 March 2017

Attachment H: Shadow Impact Analysis, by Hassel, dated September 2016

Attachment I: Traffic Impact Assessment - by GHD, dated May 2017

Attachment J: Social impact Assessment - by Elton Consulting, dated 8 March 2017

Attachment K: Economic Assessment - by SGS Economics & Planning, dated May 2017

Attachment L: Servicing Investigation - by ADW Johnson, dated March 2017

Attachment M: Noise and Vibration - by SLR dated 22 March 2017

Attachment A - Urban Design Analysis

By Hassell Architects, dated 24 March 2017

Architecture
Interior Design
Landscape Architecture
Planning
Urban Design

Australia
China
Hong Kong
Singapore
United Kingdom

NEWCASTLE URBAN TRANSFORMATION & TRANSPORT PROGRAM

URBAN DESIGN ANALYSIS

24 MARCH, 2017



Prepared for Urban Growth NSW
March 2017

HASSELL

Contact
David Tickle Principal
dtickle@hassellstudio.com

HASSELL
Level 2, Pier 9/9, 23 Hickson Road
Sydney NSW
Australia
T +61 2 91012000
hassellstudio.com
@HASSELL_Studio
HASSELL Limited

Document control

Rev	Date	Approved by	Description
01	16 March 2017	David Tickle	For review
02	21 March 2017	David Tickle	For review
03	24 March 2017	David Tickle	For review

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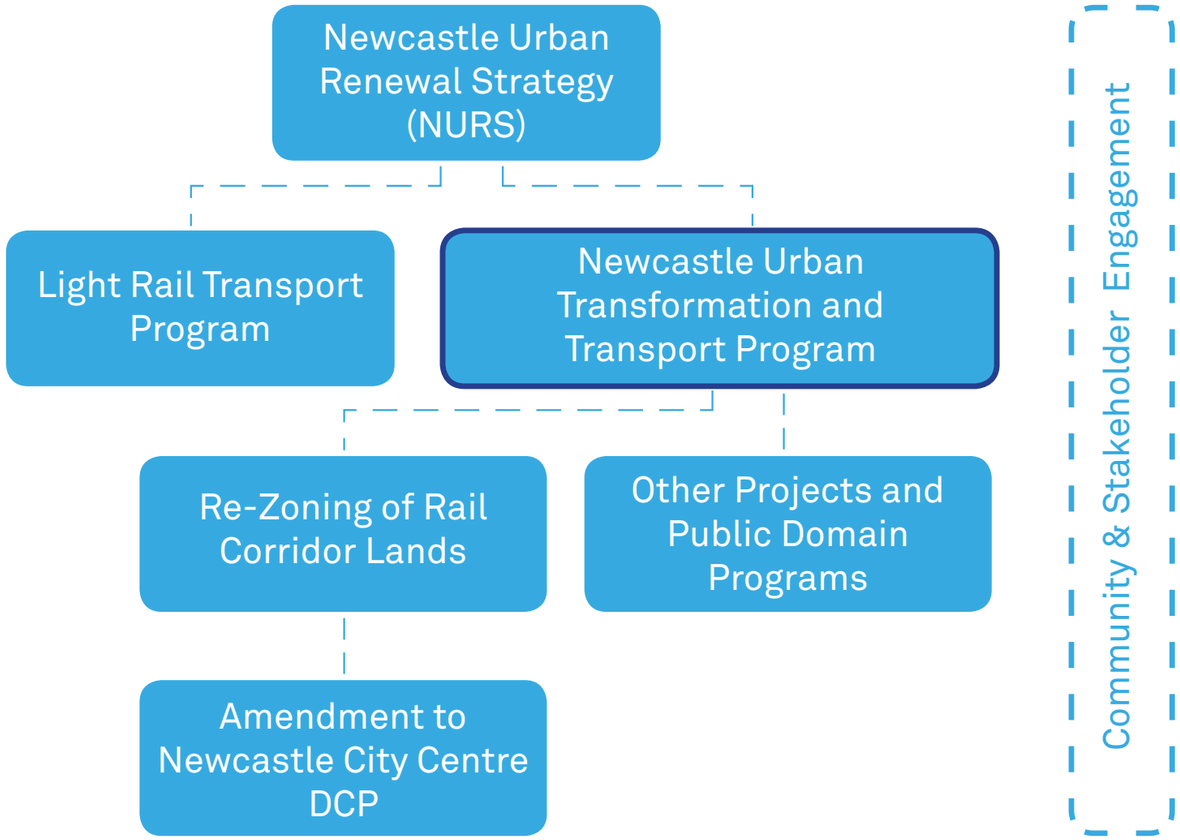
PROJECT OVERVIEW

The Newcastle Urban Transformation and Transport Program (NUTTP) has been established to deliver the NSW Government's more than $500 million commitment to revitalise the city. The Program, being led by UrbanGrowth NSW in collaboration with Newcastle City Council (NCC), Transport for NSW (TfNSW) and the Hunter Development Corporation (HDC), aims to bring people back to the city centre by strengthening connections between the city and the waterfront, creating employment opportunities, providing more public space and amenity, preserving and enhancing heritage, and delivering better transport.

The NSW Government has made a number of announcements relating to the transformation of Newcastle, including:

_ A new multi-modal transport interchange at Wickham
_ Light rail between the Wickham interchange and Pacific Park
_ The activation of Hunter and Scott Streets linked to the delivery of light rail
_ The revitalisation of land in the heavy rail corridor, the delivery of housing, and the delivery of improved public domain, including parks, entertainment precincts and public spaces

This proposal is based on extensive community and stakeholder engagement. Two key events, 'Design Newcastle' 2014 and 'Revitalising Newcastle' 2015 were held to gather people's vision, aspirations, ideas and feedback on potential opportunities for a thriving city centre, the outcomes of which are reflected in this report.



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INTRODUCTION

Newcastle is the second largest city in NSW and is the economic and social heart of the Hunter Region. Regionally significant infrastructure including transport, government, health and education services are located in Newcastle.

Newcastle has a compact city centre located on a scenic peninsula between the Pacific Ocean and the Hunter River. There is a rich collection of historic and significant civic buildings which give the city a distinct character. The topography of the city centre and the gridded street network permit views from the city centre to the harbour, as well as views from the harbour back to the city where the cathedral at the crown of the hill is a recognisable landmark.

The compact nature of the city centre, where beach and the city centre are within easy walking distance, makes Newcastle a very attractive place to live and work. The city offers the employment, educational and commercial opportunities of a big regional city with the commuting convenience and proximity of a small city.



Figure_1.1. Greater Sydney Metropolitan Area - *Source: NURS*

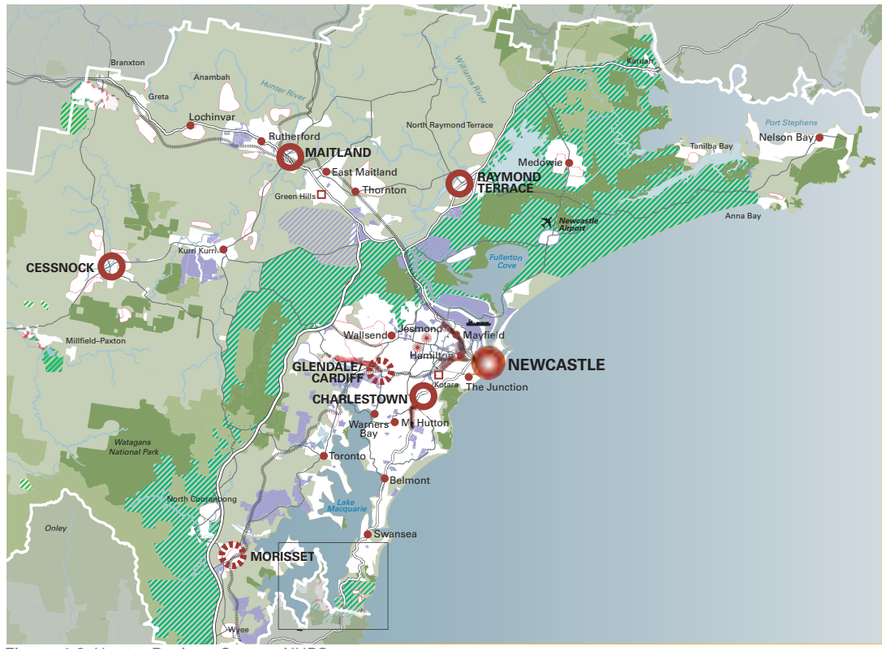


Figure_1.2. Hunter Region - *Source: NURS*

Population
Metro 154,000
Urban 308,000
Density 1100/km2
Forecast growth to 2031 +22.5%









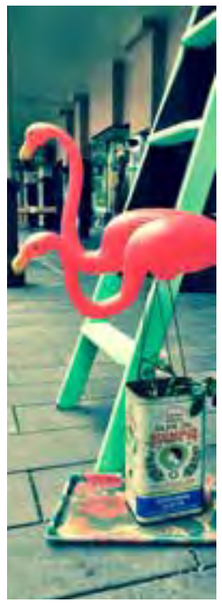












Figure_1.3. Newcastle City - wider study area and re-zoning area

A HISTORY OF RESILIENCE AND TRANSFORMATION

A series of events over the past decades have impacted on the physical, economic and social fabric of the city.

NEWCASTLE'S EVOLUTION



1920s

Traditionally known as the Coal City, Newcastle has been the gateway to the Hunter Region and a centre of industrial activity.



1989

The 1989 earthquake shook the physical and economic structure of the city. Key employment sectors, including retail, health and education, continued to move out of the city centre and into suburban areas.



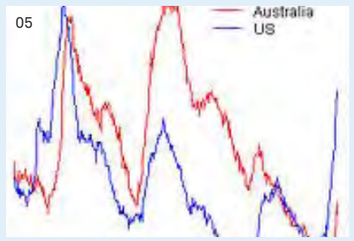
1999

The closure of BHP led to large spikes in unemployment (up to 20%) that has only recently been contained.



1990s

The renewal of Honeysuckle, alongside the city's harbour, created new waterfront public spaces and streets, heritage restoration, residential and commercial activity.



2008-present

The region weathered the Global Financial Crisis due to the strength of the mining sector. However, the number of jobs in the city centre declined by 5% with a key challenge being the attraction of major employers and investment.



looking forward

The NSW government has now committed to $460 million investment in light rail and urban revitalisation, complementing earlier funding for key educational and civic projects, such as NeW Space and the Justice Precinct.

A CITY CENTRE WITH STRONG POTENTIAL

Unique locational advantages and "once in a generation" government intervention supports growth and change.

Over $500 million investment in light rail and urban revitalisation
An attractive waterfront setting
40% of jobs in professional, financial, administration sectors
Globally recognised university growing its city centre presence
The historic heart of the Hunter
Smart City initiatives underway
Renew Newcastle success

HOW HAVE OTHER CITIES BEEN TRANSFORMED?

Around the world, cities like Newcastle are undergoing significant change - transforming from industrial centres to vibrant, creative, globally-focused places.


07

Oslo, Norway

Oslo's strong industrial history has been based around its harbour connections, all of which lie in close proximity to the central urban area of the city. As part of the urban renewal project "Fjord City" which was envisioned in the early 1990's, Oslo has set out to improve the linkage between the city centres and the Fjords by opening up the waterfront areas for recreational, cultural, residential and commercial use. To achieve this, the renewal project placed significant importance upon its public access, public, private transport and sustainable development. Much of the focus has centred around the transformation of roads into public thoroughfares and rezoning of areas for mixed used and recreational activities. Through such modifications, Oslo is now considered to be one of the most 'liveable' cities in the world.


08

Bilbao, Spain

After the collapse of its industrial industries in the 1970's, Bilbao set out an urban renewal scheme that would re-engage public interest into the city and allow it to compete more effectively as a city of global interest. Proposed in 1991, the framework of the renewal scheme focused upon the development of successful public transport and infrastructure as well as creating unique cultural focal points that would allow the city to become a global icon. In 1995, the Bilbao Metro was implemented and closely followed with the Guggenheim museum in 1997, which has become a significant international attractor. In 2000, the airport terminal was completed and in 2012 the port relocated and a major waterfront landscape project was rolled out. Today, Bilbao's cultural industry is thriving and is a prime example of successful urban renewal in regards to a post-industrial city.


09

Rotterdam, The Netherlands

Based around the river Maas, the urban development of Rotterdam was strongly linked to its success as a working port. As part of the urban renewal policies implemented in the 1980's, port activity shifted closer towards the sea, and the riverfront areas were designated for mixed use, commercial, public and recreational spaces. The framework for the scheme was primarily focused on turning the city into a leader in new and emerging architectural and design ideas. Now in 2015, the city, in particular the waterfront, is renowned globally for its architectural and urban design qualities and can be seen to have contributed to the reinvigoration of its art and cultural sectors.


10

Hull, UK

After suffering from economic downturn in the once prosperous industrial city, Hull focused an urban renewal scheme based around its strong cultural and industrial background. This has led to renewed interest into the city, with the city's cultural program being of primary interest, whereby a crowd funding program allowed for the city to host the year-long festival of Hull. In 2013, it was announced that Hull will become the UK's City of Culture and Gateway to Europe from 2017 onwards. This has sparked a further interest into emphasis on the city's strong cultural and industrial roots and has led to increased funding towards its arts and culture programs.


11

Newcastle upon Tyne, UK

With the continued reputation as a 'strong' industrial city, Newcastle (UK) has sought to reinvigorate its arts and cultural sectors. The implementation of a rigorous arts and culture program including commissioning the Angel of the North Sculpture, the Gateshead Music Centre and the BALTIC Centre for Contemporary Art have placed Newcastle Upon Tyne on the map as a major cultural destination generating significant economic benefits for the city. In addition to this, the transformation of the forming shipping premises along the river Tyne into public, recreational and mixed use areas has transformed the once forlorn area into a thriving and bustling precinct.

IMAGE SOURCE
01_hunterwater.com.au
02_flickriver.com. *Photographer: Dr John Turner*
03_abc.net.au
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15_diariodeluzycolor.wordpress.com

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THE EXISTING RENEWAL STRATEGY

NEWCASTLE URBAN RENEWAL STRAEGY - NURS

Developed by the NSW Department of Planning & Infrastructure in consultation with the City of Newcastle, key NSW Government agencies and the community, NURS is a strategy to support the revitalisation of Newcastle over the next 25 years.

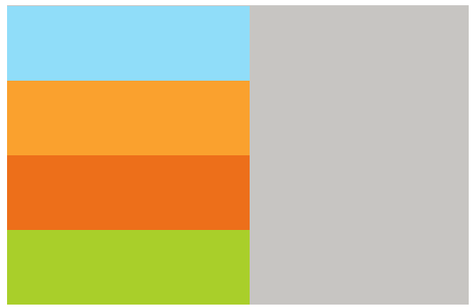
A clear framework including a range of place-based, economic and transport-related initiatives have been developed in the strategy to improve the city's economy, access, connections, liveability, and the quality and attractiveness of the public domain. These initiatives are recognised as being important catalysts for encouraging renewal and investment in the Newcastle city centre into the future.

The 2014 update to the strategy recognises light rail services to replace the existing heavy rail line (instead of previously proposed bus services) and the identification of three character precincts (West End, Civic and East End), within which significant opportunities for built form and public domain changes and improvements exist.

The vision, guiding principles, city wide strategies, and urban renewal and transport initiatives developed within the strategy have strongly influenced the public domain and opportunity site responses developed in this study. Through NUTTP, a number of initiatives identified in NURS can be delivered, including implementing the light rail, connecting the city with its waterfront, revitalising Hunter Street as the "Main Street" and strengthening the role and character of the city precincts.

10,000 additional jobs and 6,000 additional dwellings by 2036

Above: Economic targets outlined in NURS 2012



Newcastle Urban Renewal Strategy 2012



NINE GUIDING PRINCIPLES FROM NURS have been used to guide the strategies and renewal opportunities for Newcastle City

01 **OPPORTUNITIES TO GROW & EXPAND**

02 **ECONOMIC VIABILITY & COMPETITION**

03 **HOUSING MIX & AFFORDABILITY**

04 **BUSY & VIBRANT CENTRE**

05 **INVESTMENT EMPLOYMENT & GROWTH**

06 **PROVIDE FOR FUTURE EMPLOYMENT GROWTH**

07 **TRANSPORT ACCESS & CONNECTIVITY**

08 **RETAIL VARIETY & CHOICE**

09 **INTEGRITY & VIABILITY**

Key Urban Transformation and Transport Initiatives from NURS Update 2014



PROMOTE THE CITY CENTRE AS AN EDUCATIONAL HUB

- Facilitate new University of Newcastle city campus
- Support new research facilities



STRENGTHEN THE CIVIC PRECINCT

- Encourage civic uses such as the new university campus and law courts
- Improve Wheeler Place with additional shade and seating
- Reinforce the 'Cultural Axis' from the Civic Park to the waterfront with improved public domain and signage



RECOGNISE NEWCASTLE'S HERITAGE

- Retain and re-purpose heritage buildings that contribute to the character and history of the city



REVITALISE HUNTER STREET MALL

- De-clutter the Hunter Street Mall and upgrade the public domain and street furniture to provide a pleasant pedestrian experience
- Encourage mixed-use development with more residents to support local businesses
- Support the redevelopment of key sites, laneways and spaces that connect to the mall and the foreshore



LONG TERM GROWTH IN THE WEST END

- Redevelop large consolidated lots and support interim uses, such as showrooms and large-format retail
- Increase public space including a new connection along cottage creek
- Plan for long term city expansion in the West End



CREATE A CONNECTED WALKING AND CYCLING NETWORK

- Implement the City of Newcastle's Cycling Strategy and Cycling Plan
- Promote end-of-trip facilities for cyclists such as bike racks and showering facilities



IMPLEMENT THE LIGHT RAIL

- Deliver a new light rail system that connects key activity areas with frequent services between Wickham and the beach at least every 10 minutes.
- Construct fully accessible interchange at Wickham for rail, light rail and buses, with all services on one level for easy transfer



CONNECT THE CITY WITH ITS WATERFRONT

- Create new road and/or pedestrian crossings re-connecting the city centre to the waterfront
- Improve signage
- Improve the public domain with new landscaping and footpath paving



RE-ESTABLISH HUNTER STREET AS NEWCASTLE'S MAIN STREET

- Concentrate activity in nodes
- Enhance Hunter Street for pedestrians, cyclists and public transport users
- Improve the quality of the public domain by widening footpaths and adding more landscaping



MANAGE DEMAND FOR CAR PARKING

- Undertake an annual review of parking and consider expanding parking controls to inner city areas
- Consider setting limits on the amount of car parking available in the city centre



IMPROVE THE EFFICIENCY OF THE ROAD NETWORK FOR ALL USERS

- Upgrade the road networks and key intersections where there is congestion or safety issues
- Reinforce Hunter Street as a key route for all users



Figure_1.4. Newcastle Urban Renewal Strategy - *source: NURS update 2014*

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ENGAGING WITH THE COMMUNITY

Extensive engagement with the community is a key component of the NSW Government's Newcastle Urban Transformation and Transport Program. Two main events, 'Design Newcastle' 2014 and 'Revitalising Newcastle' 2015 were held to gather a broad range of people's vision, aspirations, ideas and feedback on potential opportunities for a thriving city centre.

DESIGN NEWCASTLE 2014

Process

In June 2014, UrbanGrowth NSW initiated a two month community engagement program, which included consultations in relation to the CBD revitalisation, future uses of the vacant rail corridor land, heritage station buildings, light rail stops and open space. These consultations built on previous engagement undertaken since 2013 to assess potential light rail routes.

As part of a Design Newcastle community consultation process, community groups and 100 randomly selected residents were invited to participate in a two-day summit. The aim of the summit was "to generate community ideas and insight that could be used to inform plans for the revitalisation of Newcastle". A large number of ideas were generated to encourage employment, create improvements in the public domain, activate public spaces, promote sustainability and meet social infrastructure needs.

Outcomes and findings

Key issues identified by UrbanGrowth NSW through this process were:

- Support for urban renewal in the Newcastle city centre
- Support for the concept of three specialised city precincts: city east, city west and civic
- Support for "big ideas" to revitalise the city centre
- Support for a mix of housing types in the city centre
- Strong support for the introduction of new educational facilities in the city centre
- Support for the reuse of public buildings such as Newcastle Railway Station
- Support for development within the rail corridor, where that development brings people into the city centre and aids in the creation of jobs
- Support for temporary or permanent structures in the rail corridor to activate the space and create connectivity between the city and the waterfront
- Interest in ongoing consultation regarding urban renewal and development within the city centre and corridor
- Support for the introduction of light rail and the truncation of heavy rail.

These ideas and responses have been taken into consideration in preparation of the Urban Renewal Concept Plan.











REVITALISING NEWCASTLE 2015

Process

In August 2015, UrbanGrowth NSW initiated another community engagement program in partnership with Newcastle City Council (NCC) over a six week period. The engagement program was part of the NSW Government's wider Newcastle Urban Transformation and Transport Program which also includes Transport for NSW (TfNSW), the Hunter Development Corporation (HDC) and NCC.

The community engagement process attracted high levels of participation from across Newcastle and the Lower Hunter region, including:

- More than 1,400 participants from more than 40 Hunter postcodes participated in 13 face-to-face community events, including community forums, pop-up engagement stalls and door knocking city centre businesses
- More than 2,500 people participated in phone and online surveys
- More than 17,500 people engaging with online forums including the Revitalising Newcastle website, Facebook and Twitter channels
- Receipt of 285 submissions through the website, email and post.

Outcomes and findings

The engagement process resulted in clear findings and direction in relation to the overall project objectives and opportunities.

There was broad support for the Program objectives, including:

- strong support for bringing people back to the city, growing new jobs and connecting the city to its waterfront
- a range of suggestions for place making, public domain and community assets
- the desire for the heritage and character of the city centre to be respected in the revitalisation

There was broad support for maintaining and enhancing the character of the city centre's three precincts:

- West End: the commercial hub for the Hunter region, with relatively higher density commercial and residential development.
- Civic: the city's art, education and cultural heart, supported by some commercial and residential development.
- East End: a thriving urban community with tourism, entertainment, and some, sensitive residential development that respects the heritage nature of the precinct

Four "opportunities" for the future use of the rail corridor were presented and discussed within workshop groups. People favoured the 'Harbour Play City' and 'Harbour Entertainment City' opportunities, both of which combine mixed use development with open space and new community assets. People also suggested ways these opportunities could be enhanced and integrated with broader renewal of the city centre.

Further details of the Program objectives, opportunities and outcomes are included in this report, as well as within the Engagement Outcomes Report released by UrbanGrowth NSW in December 2015.







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PROGRAM VISION AND OBJECTIVES

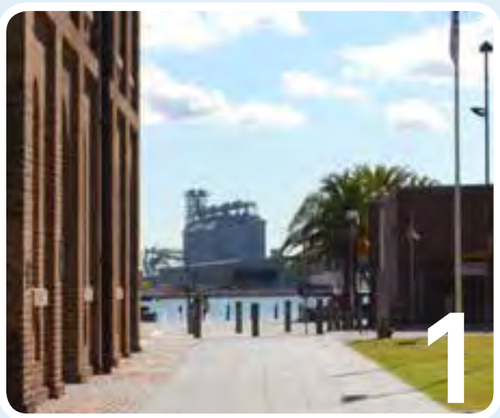
The vision and objectives for the revitalisation of Newcastle city centre builds on the vision and principles developed in the Newcastle Urban Renewal Strategy (NURS) and has been informed by feedback from the community, Newcastle City Council, government agencies and city renewal experts.

THE VISION FOR THE CITY CENTRE

Our vision is an activated city centre and waterfront that attracts people, new enterprises and tourism. Over time, we see great opportunities exist to build on the strengths of the city centre to encourage innovative and enterprising industries to thrive. In the longer term, we see an opportunity to strengthen Newcastle's position on the regional, national and international stage, with a view to stronger ties with the Asia Pacific.

OBJECTIVES OF FUTURE TRANSFORMATION

The outcomes from the Community Engagement period confirmed the importance of the program objectives and recognised the importance of adding Objective 4, 'Preserve and enhance heritage and culture' to the set of objectives.



Connect the city centre to its waterfront

Unite the city centre and the harbour to improve the experience of being in and moving around the city.



Create great places linked to new transport

Integrate urban transformation with new, efficient transport to activate Hunter and Scott Streets and return them to thriving main streets.



Create economically sustainable public domain and community assets

Leave a positive legacy for the people of Newcastle, with new and enhanced public domain and community facilities that can be maintained to a high standard into the future.



Preserve and enhance heritage and culture

Respect, maintain and enhance the unique heritage and character of Newcastle city centre through the revitalisation activities.



Help grow jobs in the city centre

Invest in initiatives that create jobs, with a focus on innovative industries, higher education and initiatives to encourage a range of businesses to the city centre.



Bring people back to the city centre

Re-imagine the city centre as an enhanced destination, supported by new employment, educational and housing opportunities and public domain that will attract people.

IMAGE SOURCE
01_HASSELL
02_<america.pink/bahnhofstrasse_549556.html>
03_HASSELL, photography by Peter Bennetts
04_HASSELL
05_HASSELL, photography by Peter Bennetts
06_HASSELL, photography by Douglas Mark Black

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01_ Connect the city centre to its waterfront

Unite the city centre and the harbour to improve the experience of being in and moving around the city. Strategically located connections will reinforce activation of the public domain.

What we observed

The city centre is severed from the working harbour and is unable to realise community value, access and investment advantage from this unique asset.

Evidence of this challenge

_Rail line severs Hunter Street from the harbour with limited on-grade crossing points. North-south permeability, particularly for the mobility impaired, is significantly reduced. It is difficult for all pedestrians and cyclists to move around the city centre easily.

_Contamination and mine subsidence impact on the viability of renewal

_Significant areas and sites such as Hunter and King Streets and the Christ Church Cathedral are poorly connected to the harbour.

_A regular city grid known as 'Dangar's grid' exists in the east. Following truncation of the existing heavy rail line, the opportunity exists to extend this historic grid through to the waters edge, maximising views and connections between the city and the harbour.

What the community told us

_There is a shared view that Newcastle's harbour and beaches are a unique asset to the city. Creating better connections between these and the city centre was consistently supported by the community.

_The community want to be able to move around the city easily, whether by public transport, private car, bicycle or on foot.

_The community recognise that improving public access between the city centre and its waterfront would benefit not only local residents, workers and visitors, but will also help to attract tourists.

_Crossing points between the city and harbour need to be more accessible, especially for the disabled and elderly.

_An improved network of walking and cycling paths needs to be delivered as part of the light rail.

_New north-south connections should link significant areas and destinations, including shops, cafes, and restaurants in the city to the harbour.

_Any new development is not to block important view corridors to the Cathedral or create a barrier to the foreshore.

How the master plan can respond

The master plan defines a number of new connections between the city centre and the harbour made possible by the truncation of the heavy rail line, including:

_extending existing street alignments as pedestrian connections at Argyle, Perkins, Wolfe, Market, and Newcomen Streets

_creating new areas of public space with increased pedestrian permeability at:

- Civic Link (creating new pedestrian connections between Wheeler Place and the harbour)
- Darby Plaza (creating new pedestrian connections between Darby Street, Argyle Street and the harbour)
- Market Street Lawn (formerly referred to as the Entertainment Precinct - creating new pedestrian connections across open area of parkland linking Scott Street to the harbour)

These connections create visual linkages to the harbour from many vantage points in the city centre, especially along north-south streets and from the hilltop of the city. New buildings are not to be built within these important view corridors.

The extension of green open space between the foreshore and Scott Street in the east will offer great opportunities for uninterrupted views and connections to the harbour.

Several connections (at Civic Link, Argyle Plaza and Market Street Lawn) are located close to new light rail stops, enhancing pedestrian access to these stops. These connections will not only improve access to public transport, but will also improve linkages to important civic and community destinations.

A number of temporary connections already exist as a result of the truncation of the rail line and are well used by pedestrians and cyclists alike.





Existing: **A street system with potential to grow**



Potential: **Multiple connections created between the city centre and harbour**

02_ Create great places linked to new transport

Integrate urban transformation with new, efficient transport to activate Hunter and Scott Streets and return them to thriving main streets.

What we observed

Investment in the re-purposing of surplus government lands is critical to releasing value from transport investments - integration of land use and transport planning is required.

Evidence of this challenge
_Increased density around new light rail stops will improve patronage
_Further investment required to enhance temporary crossings as permanent connections
_The removal of the existing rail corridor and replacement with light rail is a more accessible and pedestrian friendly model, and will provide the opportunity to reinforce Hunter Street as the main street and revitalise it as a vibrant urban boulevard, while maximising north-south connections and spaces between the CBD and the harbour.

What the community told us

_Feedback from the community about this objective was mixed.
_Some people believe that returning heavy rail to the city centre would achieve this objective without the need to introduce light rail.
_Some people are satisfied with the amount of public domain and places in the city centre, however, noted that much of the green space seems to be under-utilitised. They would prefer existing places are enhanced and preserved.
_Others felt that Newcastle needs new destinations and improved public domain for community use with a defined program of activities to really make them 'great places.' Suggestions included arts, food and performance festivals, an outdoor cinema, community meeting spaces, temporary and permanent sculptures and public art.

How the master plan can respond

The introduction of light rail will provide a means for which Hunter Street is enlivened and activated once again as Newcastle's main street. The opportunity for urban transformation, including improved shopfronts, restored heritage frontages, and new commercial and retail premises with residential units above will integrate with the new light rail and contribute to the re-creation of a great urban boulevard.

At each of the new light rail stops, the opportunity exists to integrate with existing bus and ferry services to create a number of new transport connection hubs at key destinations within Newcastle city. Improved north-south connections will allow multiple pedestrian and cyclist crossing points to be achieved, providing better integration between all modes of movement.

The master plan offers opportunities for existing open space to be enhanced and expanded adjacent to the new light rail. A series of connected civic squares defined by existing heritage and new built form will be made possible by the Civic Link connecting the civic heart of the city centre with the Harbour.

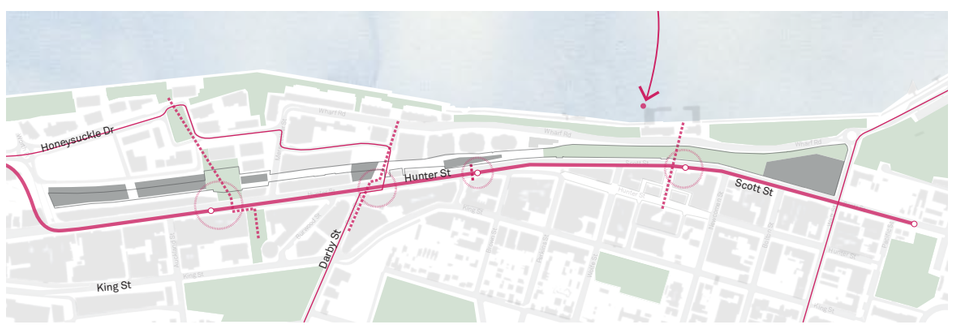
Similarly, the opportunity exists for open space to be expanded and enhanced in the east, creating a new entertainment destination at the Market Street Lawn and Newcastle Station precincts that extends from Scott Street to the Harbour, and connected back to the city via a direct pedestrian link and light rail stop at Market Street. A fresh food market and regional playspace have previously been investigated, although community support for this was limited during the recent consultation period.







Existing: **Transport links needing greater integration**



Potential: **Transport capacity and integration in city centre improved**

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03_ Create economically sustainable public domain and community assets

Leave a positive legacy for the people of Newcastle, with new and enhanced public domain and community facilities that can be maintained to a high standard into the future.

What we observed

Major new social and recreational amenities are needed to support an increase in student, resident and worker populations in order to attract higher skilled knowledge workers.

Evidence of this challenge

_While there are a number of open space types throughout Newcastle city, including a strong garden presence at the east end, large open formal spaces through the civic core, and a popular harbour promenade along Hunter River, public spaces need to accommodate a greater diversity of users and uses.

What the community told us

_Response by the community to this objective was mixed.

_However, there were a range of suggestions for creating economically sustainable public domain and community assets including creating flexible spaces and places that work for a range of audiences, at different times of the day and night and for a breadth of activities.

_Feedback pointed to the need to program activities on a changing schedule so that they generate continued interest and participation. A broad range of activities that attract all people in the community, across ages, interests and abilities should be held.

_Some feedback supported pop-up and temporary structures to enable flexibility in the use of new public domain.

How the master plan can respond

UrbanGrowth NSW is committed to embedding environmental, social and economic sustainability into the public domain to maintain a high level of quality and useability into the future.

The two major new public spaces proposed, Civic Link, and the expanded foreshore park in the East End adjacent to Newcastle Station - Market Street Lawn - will provide valuable open space and community facilities to residents and visitors alike. Each has the potential to develop its own program and social / recreation activities, with a defined use, character and collection of users.

For example, open space in the East End at the Market Street Lawn precinct could become part of a new regional destination, providing generous space for recreation activities directly adjacent to the waterfront. Civic Link could be more formal in nature, defined by existing and proposed buildings with active ground floor uses and temporary pop-up uses, and can provide the missing link in the sequence of civic space, green space and buildings to the water.

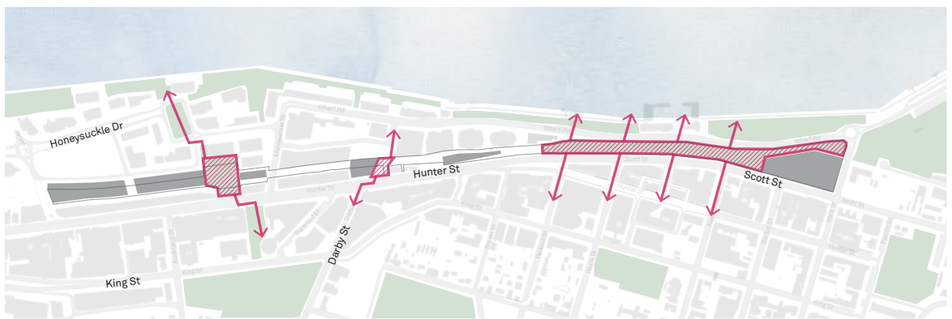
A number of other public spaces are also proposed to enhance the quality of the new north-south connections including Darby Plaza between Argyle and Darby Streets.

Consideration is to be given to operation and maintenance costs including the exploration of water sensitive urban design strategies within the public domain. Community and sustainable revenue-generating activities are to be provided to help supply the necessary funds for public assets to be maintained over time.





Existing: **Diverse but inconsistent public spaces**



Potential: **New public spaces located to reinforce key connections and destinations**

04_ Preserve and enhance heritage and culture

Respect, maintain and enhance the unique heritage and character of Newcastle city centre through the revitalisation activities.

What we observed

Newcastle has a unique history and its collection of heritage buildings make a significant contribution to the character and charm of the place. However, many have been neglected and are under-utilised.

Evidence of this challenge
_Heritage sites are common within the Newcastle city centre, particularly along Hunter Street (the historic main street of Newcastle) and in the Civic and East Precincts.
_Many heritage buildings are not being used, and many are run-down and in need of repair - these require investment to ensure ongoing quality and usability.
_Opportunities exist for the adaptive re-use of a number of these heritage buildings throughout the city centre.
_Some heritage buildings are ideally located with the potential to become significant community assets.

What the community told us

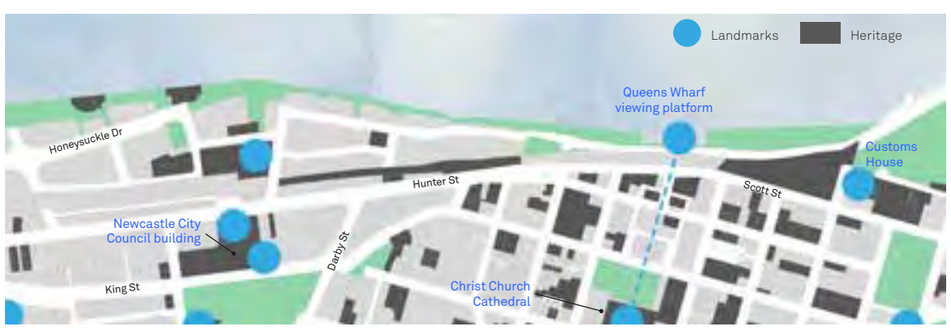
_This objective was added following 'Revitalising Newcastle' as there was a consistently held view among the community that the city's heritage and character should be respected as part of the revitalisation of Newcastle.
_Other common comments around heritage included:
_People want to enhance and preserve the city centre's unique history, heritage and way of life.
_Business owners and operators pointed to the unique heritage character of the city as an attractor for boutique-style businesses.
_There is a desire for building heights and densities to respect the heritage nature and character of the city.
_The community want the important architectural and cultural heritage of Newcastle Station to be celebrated and conserved.

How the master plan can respond

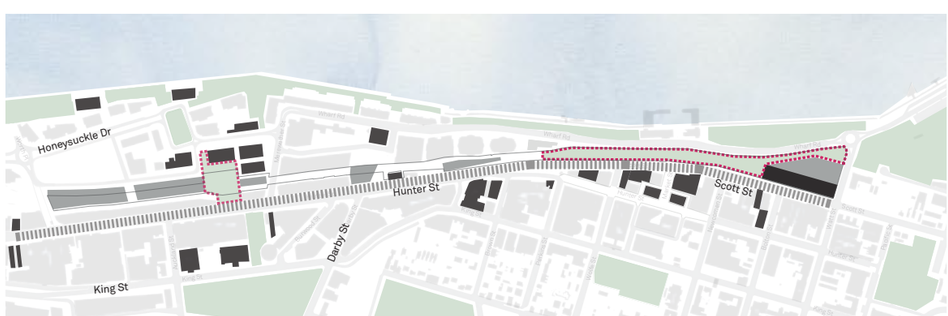
_A number of opportunities existing in the master plan for the enhancement and preservation of heritage in the Newcastle city centre, while contributing to the activation of the Civic and City East precincts.
_For example, the revitalisation and re-activation of Hunter Street will look at opportunities to restore and celebrate existing heritage facades, encouraging a mix of small businesses and creative industries to move in.
_Significant opportunities exist for Newcastle Station and the railway signal box to be adaptively re-used into new iconic community destinations.
_Creation of the new Civic Link offers the chance to better reveal and celebrate the heritage values of Newcastle Museum from the main street.







Existing: **Historic buildings in need of rejuvenation**



Potential: **Re-activation of key precincts, buildings and spaces**

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05_ Help grow jobs in the city centre

Invest in initiatives that create jobs, with a focus on innovative industries, higher education and initiatives to encourage a range of businesses to the city centre

What we observed

Structural changes in the regional economy mean that finding opportunities to create new and more diverse jobs is more important than ever.

Evidence of this challenge
_Mining sector expected to contract.
_City centre jobs expected to fall by 5%.
_Suburban shopping centres have impacted city centre. A number of shopfronts, particularly along Newcastle's main street are vacant. However, Hunter Street Mall is proposed to be revitalised.
_New infrastructure is needed to support growth and attract investment.
_Despite recent decline, Newcastle city centre remains the most attractive commercial location. New and interesting businesses are moving in, and the shift of the NeW SPACE University Campus to the city centre will support urban transformation.
_A number of recent initiatives, such as 'Renew Newcastle' and 'Hit the Bricks' have been successful in beginning to transform Newcastle into a city filled with increased levels of activity, art and culture, leveraging off its industrial character to create unique, eclectic and creative city spaces.

What the community told us

_There is a shared view that the creation of new jobs in Newcastle is an important guiding objective for the Program.
_Revitalisation activities should proactively support the growth of jobs across a range of industries and job types, while building on the existing strengths of the city and region in education, health, agriculture, arts and culture.
_Young people, in particular, expressed a strong desire to be able to build a career in Newcastle.
_People with a disability and people from culturally and linguistically diverse (CALD) backgrounds, particularly newly arrived migrants and refugees, highlighted the need for a range of job opportunities and support programs to assist them to enter and progress in the job market.
_Jobs growth is to be supported by efficient and effective transport between the Hunter region and the city centre.
_Suggestions ranged from supporting existing and new businesses by upgrading streetscapes and public domain; revitalising Hunter Street, including the mall, encouraging larger businesses to relocate to the city centre; and locating more state and federal government jobs in the city centre.

How the master plan can respond

_Proposed mixed use infill development at appropriate locations along the corridor will introduce new ground floor retail and commercial uses to build upon established areas of activity, and introduce new life into those areas requiring greater activation. Residential uses above will also increase the level of safety and activity in these areas, by increasing the number of people that live in the city centre.
_A revitalised main street, restored local heritage, an efficient, reliable mode of public transport, and a greater number of people, will help attract small businesses back to under-utilised areas of the city centre.
_New ground floor uses and residential uses above will create lively frontages to Hunter Street and help to better define existing and proposed public open space.
_The opportunity exists to strengthen the civic precinct as the cultural and educational heart of the city, linking the NeW Space campus, new law courts, Newcastle Museum and Civic Theatre. New uses should build upon this character. Student housing has been investigated as an option to support the NeW Space in the Civic Precinct.
_It is proposed that new uses in both the Newcastle Station and Market Street Lawn Precincts be focused on community or tourist uses. An adaptive re-use of Newcastle Station linked to generous open space on the harbour front provides a real opportunity for a significant, new destination with job-generating uses.





Existing: **An evolving, eclectic, creative local economy**



Potential: **Ground floor uses that support local businesses, build character and activate the city centre**

06_ Bring people back to the city centre

Re-imagine the city centre as an enhanced destination, supported by new employment, educational and housing opportunities and public domain that will attract people

What we observed

The city centre has insufficient critical mass of people and activity to thrive as a regional capital. NURS envisages significant population and employment growth to address this issue.

Evidence of this challenge
_2.5 kilometre long city centre
_8000 residents compared with 18000 jobs
_Competition from suburban centres - no major retail anchors such as a supermarket. A number of shopfronts are under-utilised or vacant. Hunter Street Mall re-development will begin to attract shoppers back to Newcastle city centre.
_The lack of people contributes to low levels of activity both during the day and particularly at night, impacting on the sense of safety, and viability of commercial premises.
_Limited housing options exist in the city centre.
_Tourism primarily caters for business, family and friends. A unique event or destination is needed to attract a wider range of visitors.
_New mixed use developments, such as at Honeysuckle, are beginning to encourage a larger number of people living and working in the city centre.

What the community told us

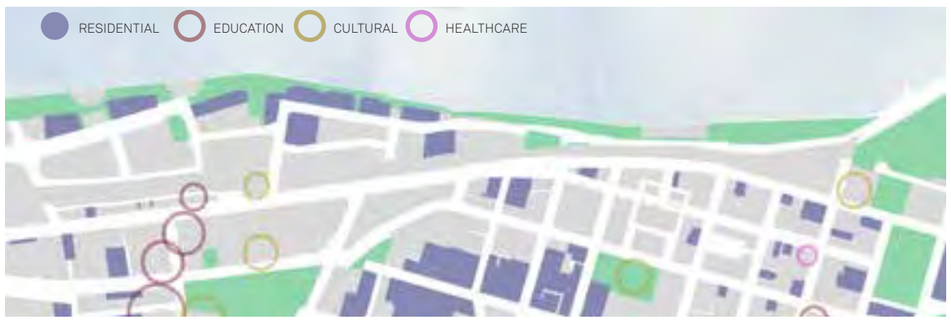
_There was a consistently held view that the city was once a thriving and attractive place and that it would benefit from attracting more people to live, work, study and undertake leisure activities.
_Some feedback suggested that people struggled to find places to take visiting friends and family beyond the beach and existing cultural institutions.
_A consistent theme was that new housing should provide a mix of options to contribute to a diverse range of people living and working in the city.
_They also wanted the city centre to be a safe, attractive and active place to visit both day and night.
_A consistent preference was for higher density buildings to be located in the West End and to a lesser degree, Civic. The East End was seen as being more suited to lower density buildings, open space, public domain and entertainment activities.
_To cater for an increased student, worker and resident population, improvements to public transport, parking, walking, cycle paths, open space, signage and wayfinding is needed.

How the master plan can respond

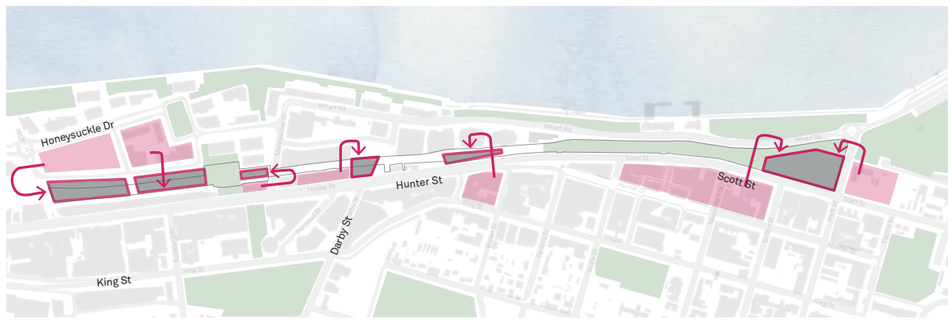
_New residential development is required to increase the city resident population.
_Mixed use development will encourage increased levels of activity throughout the day allowing people to live and work in the city centre.
_The master plan can support new mixed use development including ground floor retail and commercial uses at appropriate locations with residential above.
_While higher resident densities should be focused around the city centre and transportation hubs, proposed built form including building height is to remain sympathetic in form and scale to adjacent planning controls.
_Important view corridors between buildings are also to be maintained to reduce visual impact and increase north-south permeability from the city centre to the water.
_Potential affordable housing and student housing in the Civic Precinct is being investigated to increase the mix of people living in the city.
_Public domain improvements will enhance the attractiveness and sense of place associated with these new developments, while increasing pedestrian and cycle connectivity between.
_Effective public transport providing an efficient east-west connection through the city centre from Wickham Transport Interchange to the beach will increase the number of people visiting from the Hunter Region and beyond.
_A new public destination in the East End involving an enhancement and adaptive re-use of Newcastle Station could also act to attract not just local residents but a wider range of tourists and visitors to Newcastle city.







Existing: **Limited numbers of people living in the city centre**



Potential: **New and diverse housing, employment, and/or education choices well integrated into the existing fabric of the city centre**

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KEY SPATIAL STRATEGIES

Based on the analysis undertaken and ideas from the community and previous studies, a number of strategies have been developed. These provide the spatial framework for the master plan.

The master plan seeks to reinforce three distinct precincts within Newcastle CBD, *City West, Civic and City East*, linked together by three major east-west connectors, *Hunter Street, King Street and the Harbour Promenade*. These precincts and connectors each have their own character and function.

NUTTP builds on the opportunities identified in NURS to re-introduce and strengthen their roles while improving connections to the harbourfront in multiple locations.

While future aspirations have been explored for the West Precinct, the focus of the NUTTP and the subsequent re-zoning application is within the Civic and East Precincts, east of Worth Place.



Enhanced quality of east-west connections



Strategies to enhance the quality and character of the existing east-west connections

New north-south connections



Investigating the potential for new north-south connections between the city and the harbour

IMAGE SOURCE
01_zimbio.com
02_HASSELL
03_spottedbylocals.com. *Photographer: Jessica Spengler*
04_HASSELL
05_newcastle.edu.au
06_HASSELL
07_HASSELL
08_icaboston.org
09_opusarchitecture.com.au
10_HASSELL
11_germany.travel
12_HASSELL

EAST *key aspirations*

BRINGING PEOPLE BACK TO THE CITY: A THRIVING URBAN COMMUNITY



Connections and views to the harbour strengthened along existing grid



Leisure activities for all ages and abilities under the pine trees along the harbourfront



Fun, active lifestyles



Uses that supports a residential population



New spaces for activity and play

CIVIC *key aspirations*

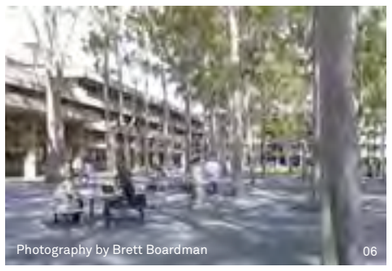
SPECIALISED PRODUCTIVE ECONOMY: THE ESTABLISHED CIVIC, CULTURAL AND EDUCATIONAL HEART OF THE CITY



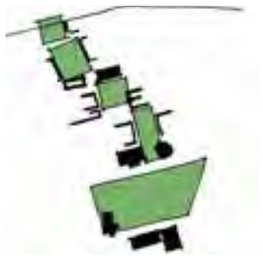
Growth of tertiary education



Preservation of existing civic and cultural monuments. Formal civic character of the squares, parks, streets and connections associated with these monuments will be enhanced



Urban forest providing shade and areas for social gathering



A civic link with a central civic garden that connects the civic core to the harbourfront with a series of formal public squares



Laneway activation and diversification of city culture



Connections to the water terminated by iconic harbour destinations or markers

WEST *key aspirations*

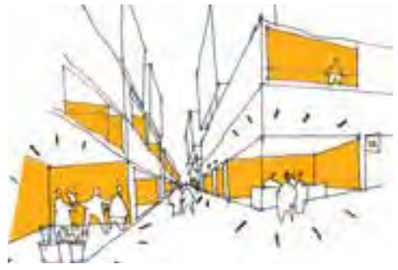
CONNECTING ASIA PACIFIC: A NEW COMMERCIAL HUB FOR THE HUNTER REGION



An iconic cultural destination on the harbourfront



Gateway to the city with a new transport interchange at Wickham Station



Pedestrian connections and street edge activation at lower levels of commercial podia



Clear vistas orientating city to the harbour



A rejuvenated harbour landscape that makes reference to the historic, industrial nature of the site



Generous street blocks for commercial floor plate re-development with podiums and higher commercial and residential towers above

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KEY SPATIAL STRATEGIES

The master plan identifies the key structuring ideas across Newcastle city. Key catalyst sites for urban renewal and public domain upgrades have been identified, some of which may be delivered under NUTTP.

- Foreshore Connection
- Hunter Street Boulevard
- King Street
- Proposed light rail and stops
- Shop front improvements
- Flank wall opportunities eg mural / "Hit the Bricks" site
- Defined built form edge
- Public domain improvements
- Potential development site opportunity
- Significant civic / community building
- Axes and potential harbour markers
- Proposed street trees or banner poles
- Existing station building
- Future substation location

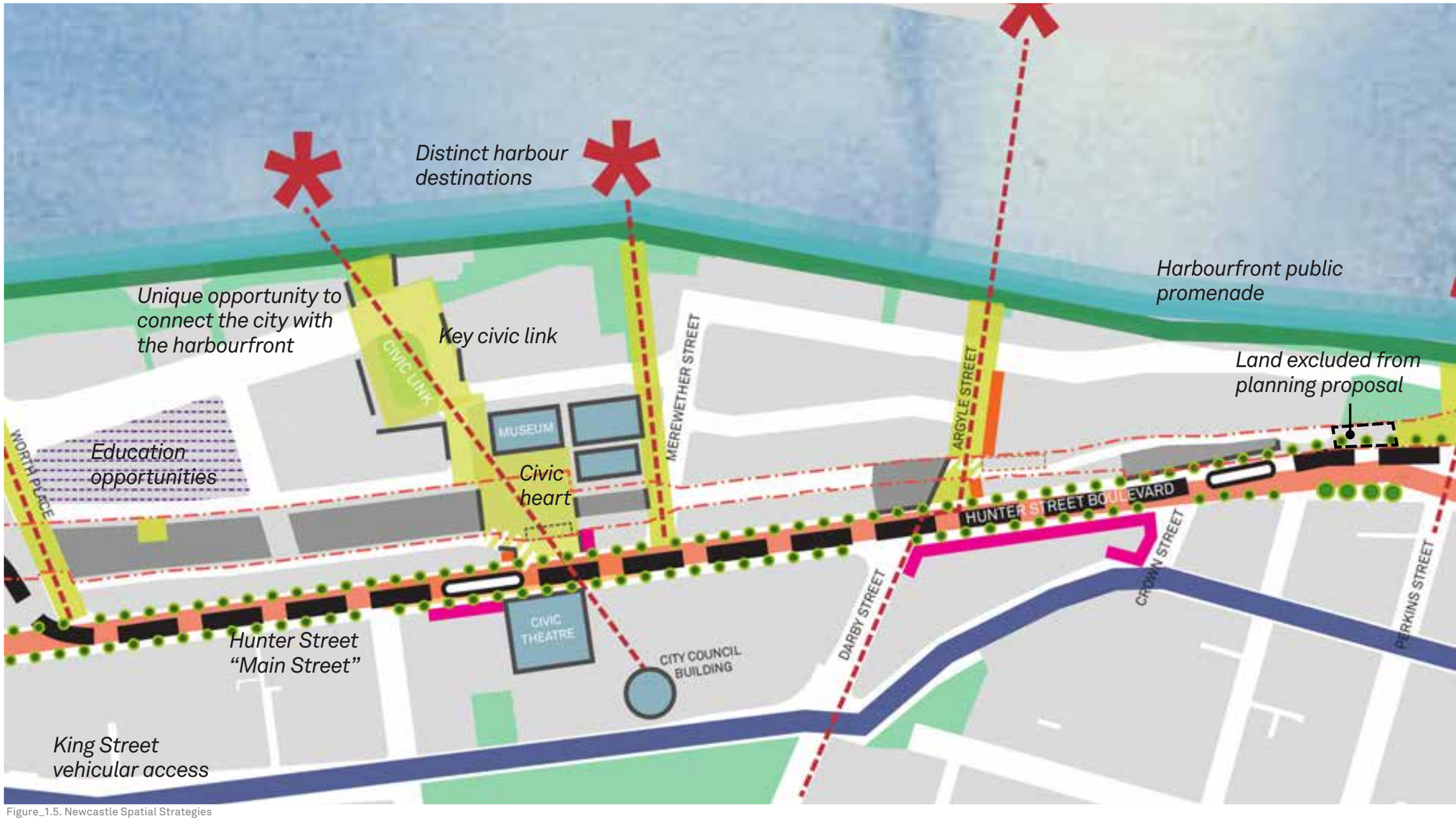
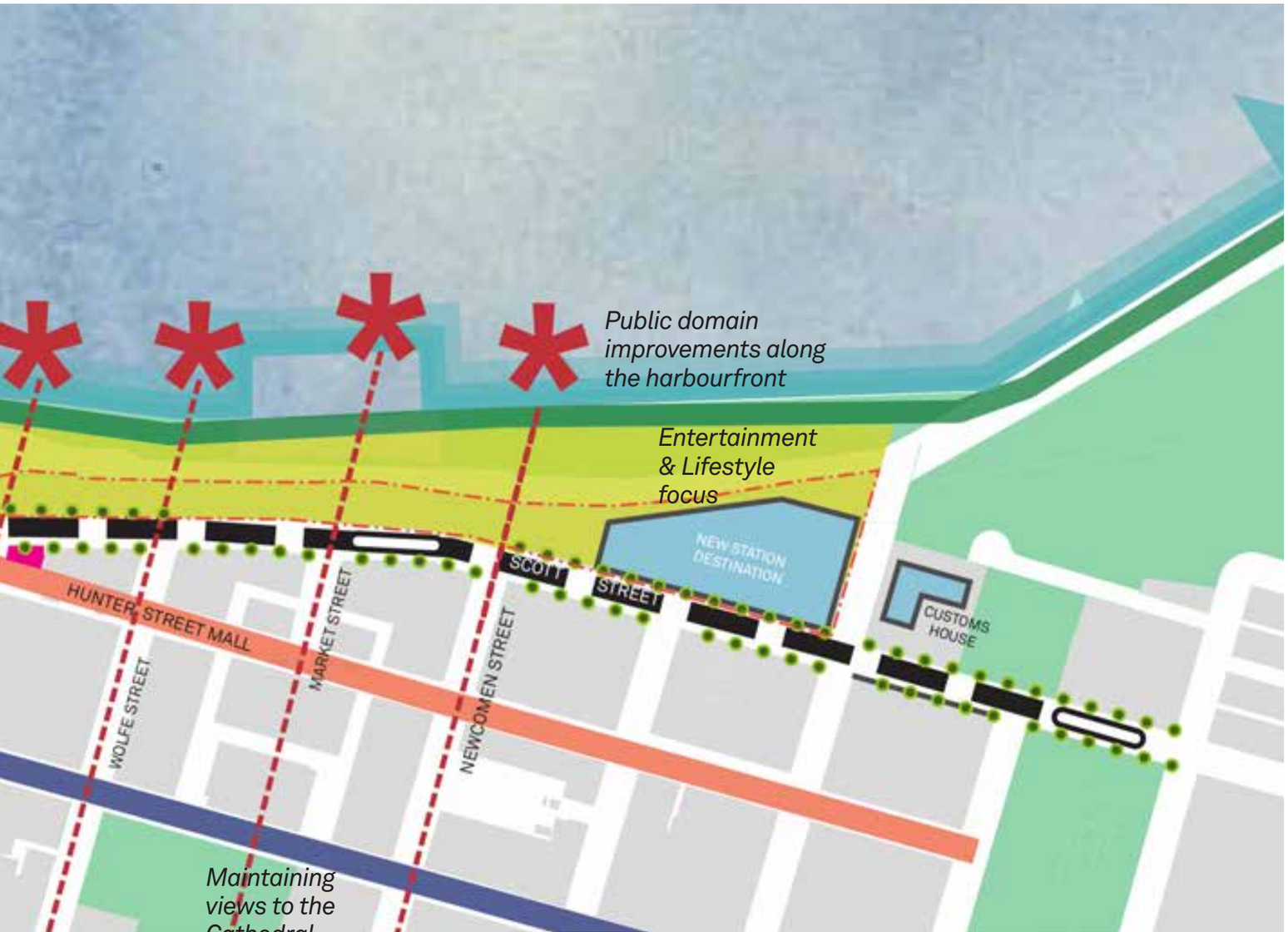


Figure_1.5. Newcastle Spatial Strategies



BUILDING ON KEY PROGRAM OBJECTIVES

01_CONNECT THE CITY CENTRE TO ITS WATERFRONT

_Remove existing heavy rail line and increase on-grade connectivity between the city and the harbour.
_Establish a civic link with gardens that celebrates and reveals existing public buildings and monuments and provides a connection between the civic heart of the city and waterfront.
_Allow for future safe cycle friendly routes providing linkages between the city centre and the harbour promenade.
_New built form to preserve existing view corridors to the waterfront.

02_CREATE GREAT PLACES LINKED TO NEW TRANSPORT

_Reinstate Hunter Street as the thriving "Main Street" with new, efficient transport and reinvigorated shopfronts while maintaining the historic street wall height and alignment.
_New hubs at Civic and East End to be serviced by new public transport stops.

03_CREATE ECONOMICALLY SUSTAINABLE PUBLIC DOMAIN AND COMMUNITY ASSETS

_Environmental, social and economic sustainability to be considered in the creation and management of the public domain and associated community assets.
_Generous areas of public open space to offer a range of recreation activities for all ages and abilities.

04_PRESERVE AND ENHANCE HERITAGE AND CULTURE

_Heritage buildings and surrounds to be celebrated and enhanced to make positive contributions to the public domain and create active new community uses.
_Explore removal of the existing Civic Station building to reveal heritage facades and create attractive edges to new public space.
_Encourage adaptive re-use of appropriate heritage buildings including re-use of Newcastle Station and the railway signal box to transform into a new cultural destination accessible to all.
_Encourage restoration of heritage facades along Hunter Street and re-purpose with active small business, dining, art or retail uses.

05_HELP GROW JOBS IN THE CITY CENTRE

_Provide a range of retail and commercial options along Newcastle's main street, key connections and Hunter Street Mall to cater to a diverse range of consumers, including local residents and visitors.
_Increase the number of mixed use developments in the city centre to support jobs and services and enhance day and night activity.

06_BRING PEOPLE BACK TO THE CITY CENTRE

_Strengthen the role of precincts to establish active retail, commercial, recreation, entertainment, civic and education cores that have a strong sense of community and place.
_Provide new mixed use development to accommodate future housing and job demand in the city centre.
_Establish an active educational hub in Civic Precinct combined with potential student housing.
_Revitalise Hunter Street Mall as the main retail precinct supported by a range of social and entertainment activities.
_Create a dedicated entertainment hub in the East End centred around Newcastle Station and the foreshore including temporary pop-up and permanent community uses, and open spaces to play, relax and reconnect with the Harbour.

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ILLUSTRATIVE MASTER PLAN

The illustrative master plan identifies key projects within Newcastle City Centre that have the potential to generate new or reinvigorated public spaces, which may be delivered under the NUTTP.

01 CIVIC LINK



Figure_1.7. Connecting light rail on Hunter Street to the city and the waterfront

02 DARBY PLAZA



Figure_1.8. A new urban plaza at the junction of Darby and Argyle Streets

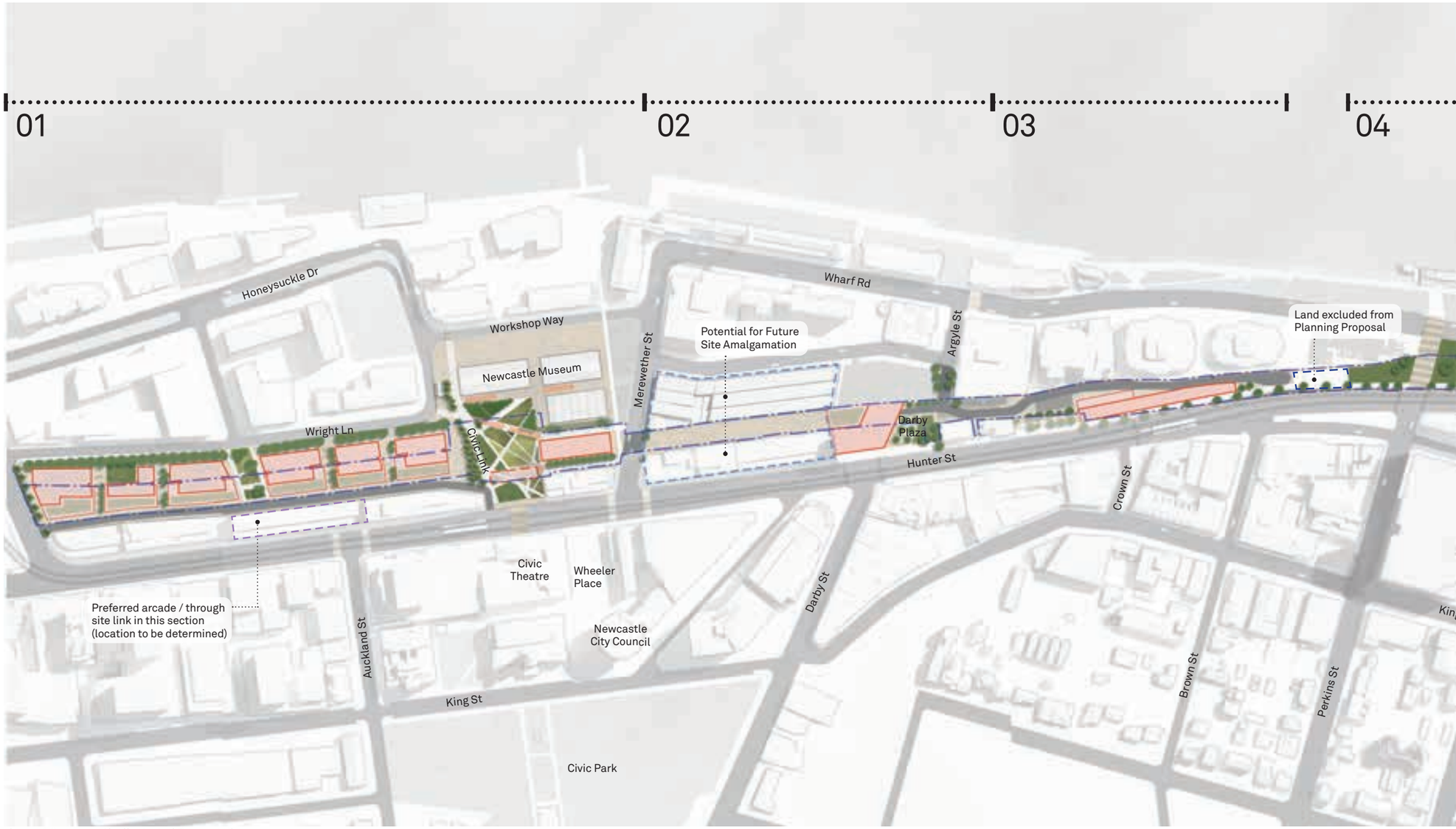


Figure_1.6. Newcastle Illustrated Concept Plan

03 HUNTER STREET REVITALISATION



Figure_1.9. Enhancing and enlivening the city's historic main street

04 MARKET STREET LAWN

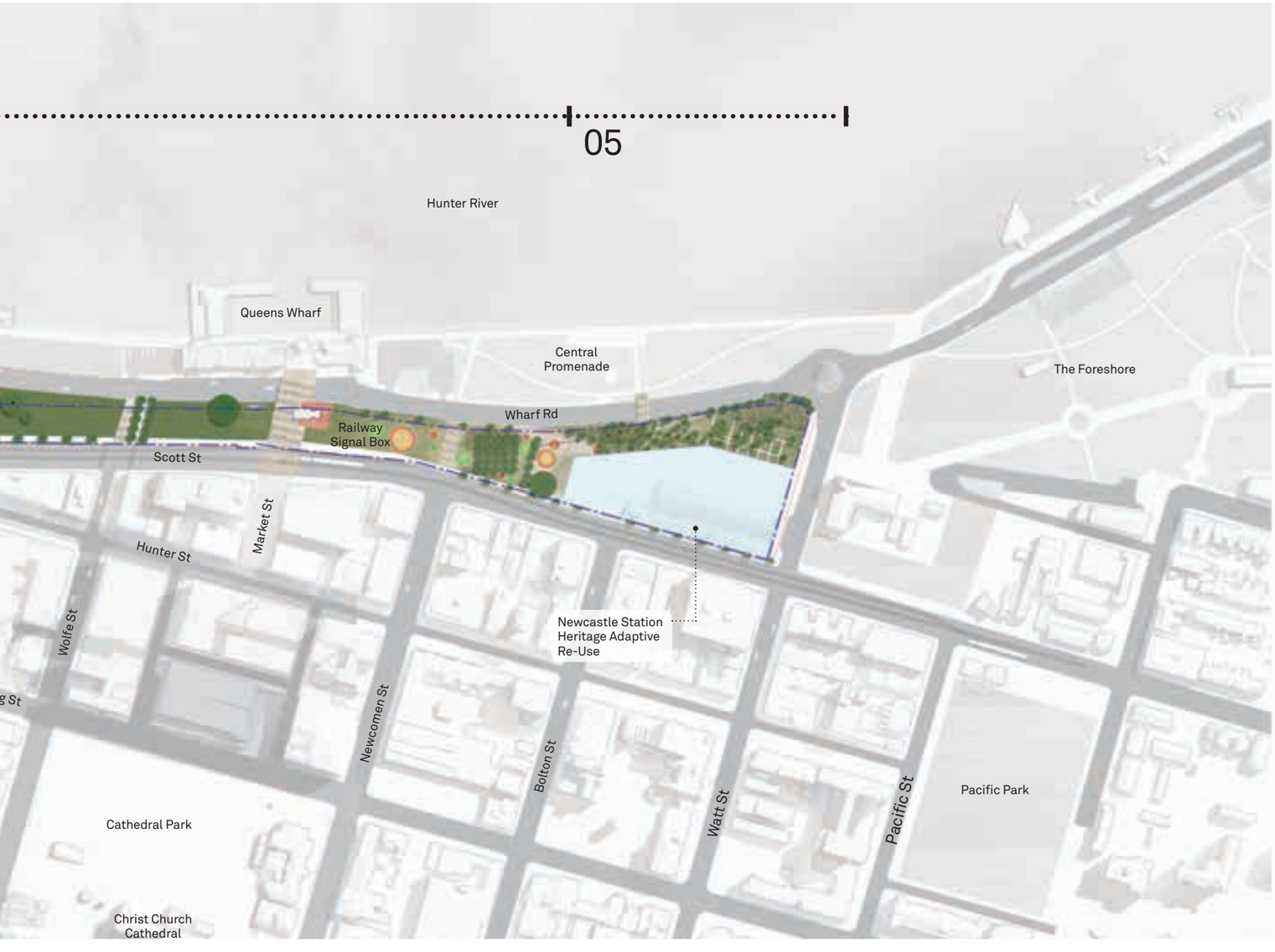


Figure_1.10. A large open space for community activities and events

05 NEWCASTLE STATION



Figure_1.11. Newcastle Station re-imagined as the focus of a new entertainment destination



01_CIVIC LINK

_Create a civic space that is framed and encourages a mix of public uses as well as having the capacity to generate public movement from Wheeler Place, through Honeysuckle to the harbour's edge.
_Create new open space and walking and cycle connections that link Newcastle's civic buildings to the waterfront.
_Open up views to the harbour from the civic area.
_Create an enhanced civic, cultural and educational hub, linked to the new light rail, NeW Space Campus, Newcastle Museum, Law Courts and Civic Theatre.
_Adjacent mixed use development to provide active ground floor uses and passive surveillance from floors above to generate activity and safety.

02_DARBY PLAZA

_Create an urban plaza integrated with a new north-south connection at the intersection of Darby and Argyle Streets.
_Improve the connection and views from the Darby Street eat-street right through to the harbour.
_Adjacent mixed use development to provide active ground floor uses and passive surveillance from floors above to generate activity and safety at all hours of the day.

03_HUNTER STREET REVITALISATION

_Reinstate Hunter Street as Newcastle's 'main street' with light rail, shop front improvements and upgrades.
_Maintain and celebrate heritage buildings along Hunter Street.
_Create linkages from Hunter Street to the harbour.
_Attract new investment and create jobs with a lively main street.
_Accentuate north-south corridors and fill in 'missing teeth'

04_MARKET STREET LAWN (ENTERTAINMENT PRECINCT)

_Create spaces to play, relax and reconnect with the Harbour, with recreation activities for all ages and abilities.
_Extend the original Dangar Grid in the form of new pedestrian connections to improve connections between Hunter Street Mall and the harbour.
_Expand green open space between Scott Street and the foreshore to offer great opportunities for uninterrupted views and increased areas of public space along the waterfront.
_Celebrate Newcastle Station's heritage through adaptive restoration such that it restores it to its former glory.
_Adaptively re-use the existing railway station signal box to create additional activation activities for the public to enjoy.

05_NEWCASTLE STATION

_Adaptively reuse Newcastle Station as the centrepiece of a new entertainment destination, to ensure its heritage values are maintained and accommodate enterprises and activities to attract visitors and stimulate the economy.
_Create an enhanced offering within the public domain to complement Newcastle Station's re-purposed use.
_Include a mix of community and commercial (revenue generating) uses

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01_CIVIC LINK

Newcastle will gain a civic heart from which regeneration will grow

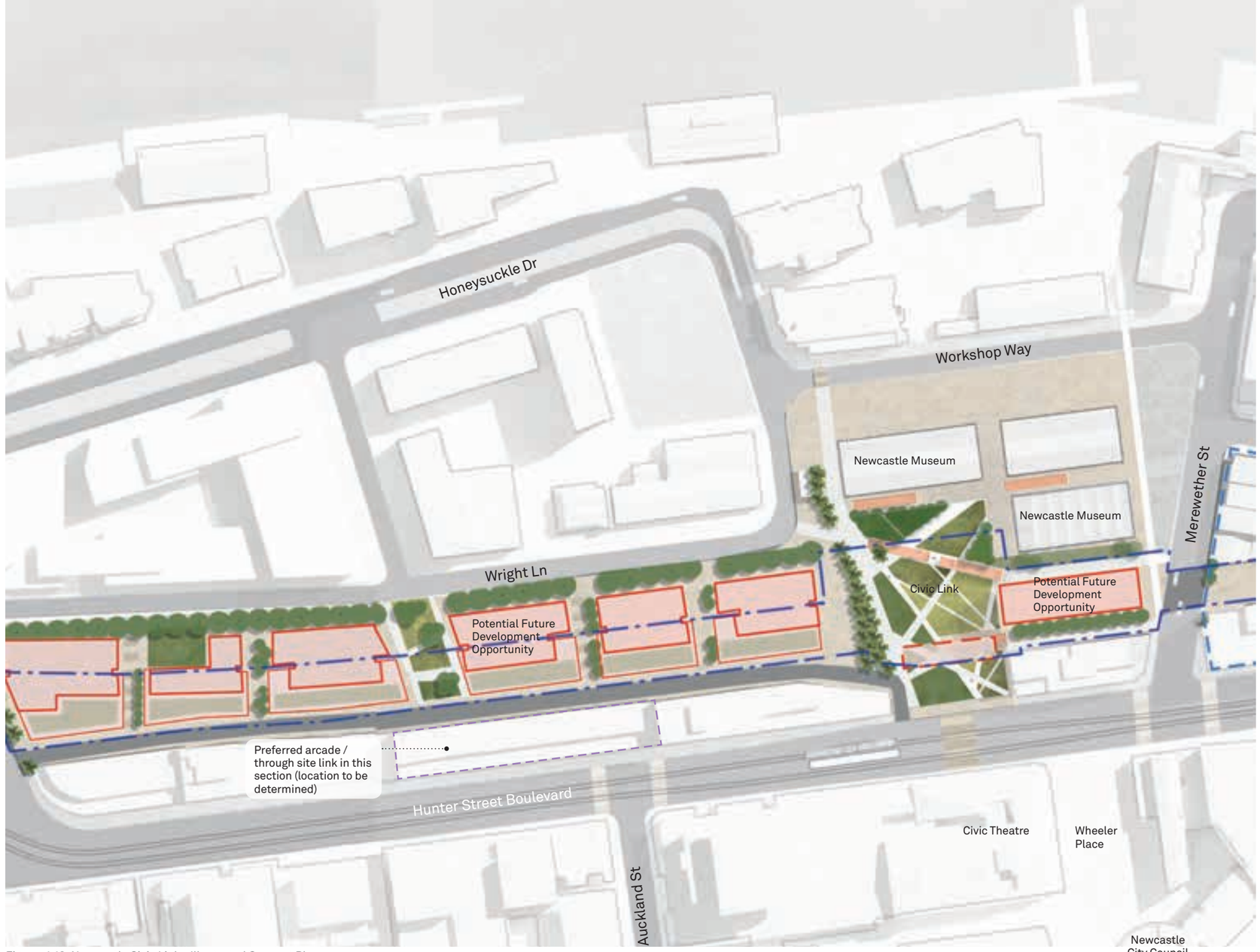
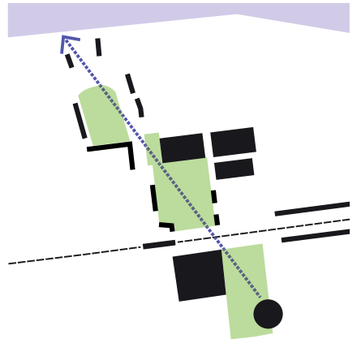


Figure_1.12. Newcastle Civic Link - Illustrated Concept Plan



Clvic Link

This area is the civic heart of Newcastle. It includes Civic Park, City Hall, Civic Theatre and Newcastle Museum. New investment in the area includes the $94 million law courts and $95 million University of Newcastle NeW Space Campus.

The creation of a central Civic garden between existing civic spaces will create a connected network of open space complete with walking and cycle connections that extends Newcastle's civic buildings to the waterfront. Viewed in the context of a larger chain of public domain interventions including Wheeler Place and a pedestrian friendly crossing across Hunter Street, Newcastle will gain a civic heart from which regeneration will grow.

The Civic Link will be a moment of calm and elegance in the city centre. Areas of lawn are criss-crossed by formal paths following key desire lines. Dense stands of tree planting offer opportunities for gathering and eating lunch.

Mixed use infill development and existing heritage facades will define edges, and help to activate and provide passive surveillance of the space both day and night.

To enable the above outcomes to be met, it is proposed that the land within the corridor at the location of the proposed Civic Link be re-zoned from SP2 Infrastructure to RE1 Public Recreation, and the land either side of the Civic Link within the corridor be re-zoned to B4 Mixed Use.

Feedback from the community during the consultation process largely supported the Civic Link. Reasons for support centred on the vibrancy that would be added to the city through this opportunity.



Figure_1.13. Artist's Impression - Connecting light rail on Hunter Street to the city and the waterfront







Figure_1.14. Artist's Impression - Completing a sequence of public spaces from Civic Park to the waterfront

(SUBJECT TO STATUTORY APPROVAL)

01_
Direct link to the harbour

02_
Temporary food and entertainment pop-up activities

03_
Active transit corridor

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02_DARBY PLAZA

Improving the Darby Street /Argyle Street connection to the harbour centred at a new urban plaza

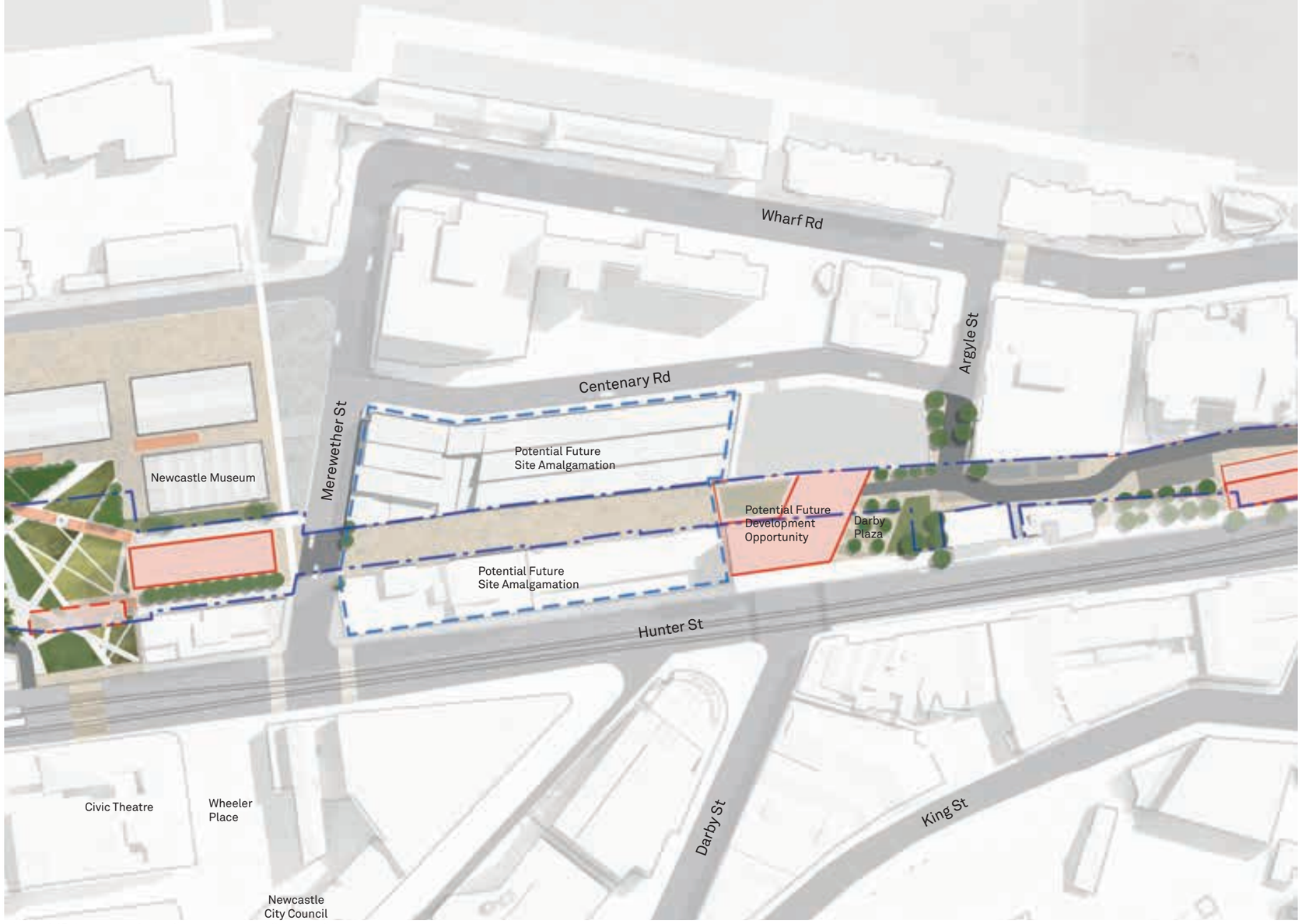
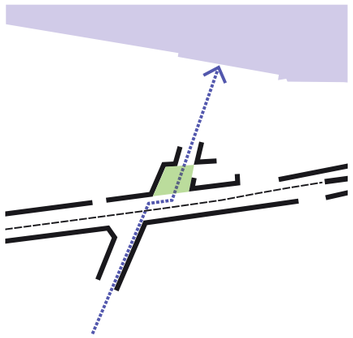


Figure_1.15. Newcastle Darby Plaza - Illustrated Concept Plan



Darby Plaza

The plaza will facilitate pedestrian and cycle movements between Hunter Street and the harbour.

The creation of a new urban plaza where Darby Street meets Hunter Street will encourage the cultural heart of the city centre to be extended northward, towards the harbour.

The plaza has the potential to be a largely hard-paved urban space and possibly programmed for various events and activities and pop-up retail.

New mixed use development proposed to the west of the plaza along Hunter Street is to provide active ground floor uses and passive surveillance from floors above to generate activity and safety, as well as creating an attractive edge to the plaza.

To enable the above outcomes to be met, it is proposed that the land within the corridor at the location of the new plaza be rezoned from SP2 Infrastructure to B4 Mixed Use.



Figure_1.16. Artist's Impression - A new urban plaza at the junction of Darby and Argyle Streets

(SUBJECT TO STATUTORY APPROVAL)



01_
An improved Darby St / Argyle Street connection between the city and harbour

02_
Active urban plaza

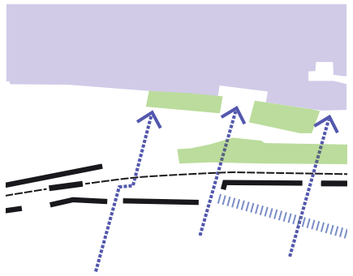
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03_HUNTER STREET REVITALISATION

Enhancing and enlivening the city's historic main street



Figure_1.17. Newcastle Hunter Street Revitalisation - Illustrated Concept Plan



Hunter/ Scott Street Activation

Hunter Street features some of Newcastle's best heritage buildings and offers a mix of shops, cafes, restaurants and other local businesses. Once Newcastle's main street, Hunter Street has experienced a decline in recent years.

The existing rail line runs directly adjacent to the northern edge of Hunter/ Scott Streets between Crown and Newcomen Streets creating a poor and inactive interface.

Potential mixed use development along the rail corridor between Crown and Wolfe Streets will help to improve the pedestrian interface and reinstate Hunter Street/ Scott Street as Newcastle's 'main street.'

New built form along the Hunter Street edge is to consist of a mix of ground floor active retail frontages and/or home office units and residential above which will introduce new activity, vibrancy, surveillance, and investment into a revitalised main street.

Built form between Argyle and Brown Streets is to adopt the lowest of adjacent planned heights, reducing potential impacts.

There was strong support by the community on the revitalisation of Hunter Street to return it to a thriving main street.

To enable the above outcomes to be met, it is proposed that the land within the corridor between Argyle and Brown Streets be re-zoned from SP2 - Infrastructure to B4 - Mixed Use.

The site immediately to the east (between Brown Street and Perkins Streets) has been removed from the current Planning Proposal in accordance with the Gateway determination as issued by the NSW Department of Planning and Environment.



Figure_1.18. Artist's Impression - Enhancing and enlivening the city's historic main street

(SUBJECT TO STATUTORY APPROVAL)



01_
Built form defines street edges

02_
Passive surveillance from balconies

03_
Home office and small retail uses along ground floor

04_
Active transit corridor

05_
Celebration of existing heritage

06_
Activation of ground floor frontages

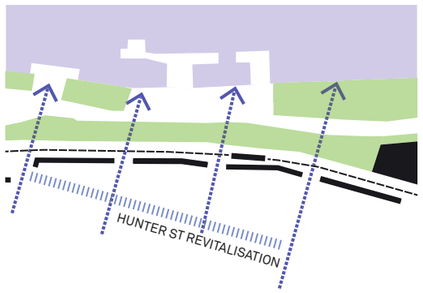
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04_MARKET STREET LAWN

Open space for recreation, social and community events with a water side setting



Figure_1.19. Newcastle Market Street Lawn Precinct - Illustrated Concept Plan



Market Street Lawn

The harbour lawns within the Market Street Lawn precinct (previously referred to as the Entertainment precinct) sees the adaptation and widening of the existing parkland space to the harbour to provide a more engaging and useable parkland along the harbour. The open space offers the chance for small programmable events, perfect for outdoor cinema, arts and music events.

Parts of the space could be heavily planted with additional palms to create a continuous dappled canopy of shade and shelter to the space and subtle mounding of the ground plane can provide a series of rooms within the park for other events and community gatherings.

Improved circulation to and through the park will be created by the extension of the original Dangar Grid into the park in the form of new north-south pedestrian connections. However, the expansive open space created provides the opportunity for uninterrupted views and connections in multiple directions.

An at-grade crossing at Market Street will replace the elevated crossing, providing a more accessible pedestrian and cycle connection between the Market Street Lawn and Hunter Street Mall.

Adaptive re-use of the existing railway signal box will provide additional activation activities for the public to enjoy within an open space context.

To enable the above outcomes to be met, it is proposed that the land within the corridor from approximately Perkins Street to approximately Newcomen Street be re-zoned from SP2 Infrastructure to RE1 Public Recreation.



Figure_1.20. Artist's Impression - A large open space for community activities and events

(SUBJECT TO STATUTORY APPROVAL)

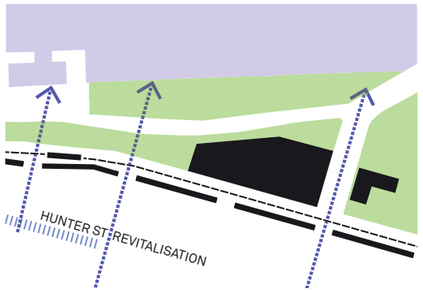
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05_NEWCASTLE STATION

A re-imagined Newcastle Station as the focus of a new entertainment destination



Figure_1.21. Newcastle Station - Illustrated Concept Plan



Newcastle Station

The heritage-listed Newcastle Station is a valued part of the city centre and is ideally located near the waterfront and Market Street Lawn. The building and its surrounds could be adaptively re-used for community or commercial use and together with an enhanced offering could become a significant destination for visitors and locals alike.

A significant community destination in this location will benefit from its proximity to the proposed renewal of Hunter Street Mall and has the potential to become the centrepiece to a lively and active city precinct.

To enable the above outcomes to be met, it is proposed that the land within the corridor shown in the adjacent plan be re-zoned from SP2 Infrastructure to SP3 - Tourist.

Feedback from the engagement process informed us that there was little support for a regional playspace and fresh produce hub in this location.



Figure_1.22. Artist's Impression - Newcastle Station re-imagined as the focus of a new entertainment destination

POTENTIAL FUTURE

(SUBJECT TO STATUTORY APPROVAL)



01_
Adaptive re-use of existing Station building

02_
Entry to new active community hub

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NEW HOUSING AND EMPLOYMENT IN THE CITY CENTRE

Rezoning Concept Plan

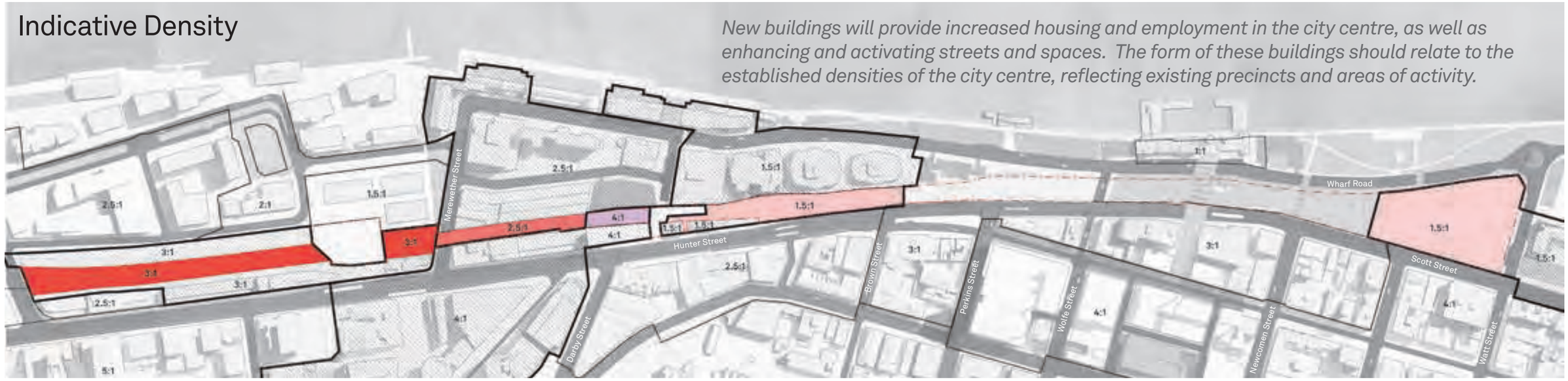
Amendments to the NLEP are required to deliver part of the concept plan. The proposed amendments are on surplus rail corridor land only.

Necessary amendments to the NLEP 2012 include:
- Amend the Land Use Zoning Map to introduce new B4 Mixed Use, SP3 Tourism and RE1 Public Recreation zones
- Amend the Height of Building and Floor Space Ratio maps to facilitate development on select parcels of land
- Reclassification of part of the rail surplus rail corridor to Community by amending Part 3 of Schedule 4 of the NLEP to rezone land for public open space
- Amendment to the Land Reservation Acquisition Map to enable the proposed RE1 public open space land to be acquired by Newcastle Council.
- Amend the key maps (as referred to in Clause 7.5 of the NLEP) to include Newcastle Railway Station Heritage building.

In general, the proposed rezoning will provide a mix of uses with between 400-500 dwellings which will comprise a variety of styles and types, and around 5,000m2 of commercial, restaurant and other entertainment uses.

Indicative Density

New buildings will provide increased housing and employment in the city centre, as well as enhancing and activating streets and spaces. The form of these buildings should relate to the established densities of the city centre, reflecting existing precincts and areas of activity.



3.0 | 2.5 | 4.0 | 1.5 | 1.5

Current planning controls around the Civic precinct allow for a higher density of development, up to an FSR of 5.0:1 - supporting the delivery of a mix of uses and activities in a significant part of the city centre.

As the sites adjacent to the corridor have an FSR of 3.0:1, it is proposed that this density is extended across the corridor land also, providing consistency and facilitating potential amalgamation of sites

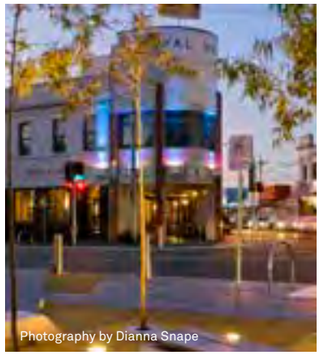
Further east, between Merewether and Brown Streets, there is a greater range of density controls, from 1.5:1 to 4.0:1, reflecting a transition in scale from the city centre to the harbour edge.

Within this zone, it is proposed that a density of 2.5:1 be applied to the corridor land between the Darby Street site and Merewether Street providing consistency and facilitating potential amalgamation with the site to the north, and 1.5:1 to the corridor land between Argyle and Brown Streets, also providing consistency with the site to the north (with the exception of the prominent site opposite Darby Street. A density of 4.0:1 is proposed at this site. This facilitates potential amalgamation of sites and ensures that sites along Hunter Street, at an FSR of 4.0:1, reinforce the importance of this major street connector).

The Newcastle Station site is situated north of the city centre (with an FSR of 4.0:1) and west of Customs House (with an FSR of 1.5:1). Considering the heritage character, scale and potential usage of the station, an FSR of 1.5:1 is proposed for this site.









Indicative Height

The heights of new buildings should respond to established or future built form, viewlines between the city and harbour, and lower scale heritage buildings.



30m

West of Civic Station, existing controls allow for taller building forms along Hunter Street and in the Honeysuckle area, generally 24-30 metres in height. An extension of the 30 metre height limit across the corridor is proposed (with the exception of the site to the east directly adjacent Civic Link - this is proposed to be 24m to relate to the lower built form scale at this end, minimise overshadowing and contribute to the creation of a comfortable scaled pedestrian environment). It is expected that this will not result in significant amenity or view impact, as new buildings will be located between buildings of a similar scale.

24m 18m

On the corridor site west of Merewether Street, a height limit of 18 metres is proposed to provide a transition between the taller buildings along Hunter Street (24 metres) and the low scale heritage buildings to the north (10 metres).

24-30m

Between Merewether and Argyle streets, surrounding sites have a height limit of 24-30 metres. The extension of the 30 metre height limit across the corridor is proposed (with the exception of the site opposite Darby Street which will extend to 24m). It is expected that this will not result in significant amenity or view impact, as new buildings will be located between buildings of a similar scale.

14m

Between Argyle and Brown streets, a range of height limits currently exist and this is reflected in a diversity of building forms. For the corridor sites in this area, a height limit of 14 metres is proposed which adopts the lowest of adjacent height limits. This is an appropriate height due to the narrow width of the lot and also reduces potential impact while allowing for new built form along Hunter Street.

10-15m

The majority of the Newcastle Station site is proposed to have a height limit of 10m, consistent with the adjoining Customs House. The site of the existing station building is proposed to be 15m to prevent future extensions above the existing building height.

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SHADOW IMPACT ANALYSIS

A shadow impact analysis was conducted to assess the overshadowing impact of the proposed indicative building envelopes to publicly accessible open space at key locations along the corridor including Civic Link and Darby Plaza. The analysis looks at 3 control times (9am, 12pm, and 3pm) for the equinox, summer and winter solstices.

Civic Link

Throughout the year, especially during midday, little overshadowing occurs within Civic Link, creating an open space with high amenity and comfort during winter. Up to only 13% of the space proposed to be rezoned RE1 Public Recreation is additionally overshadowed in winter at 9am and 11% at 3pm by the proposed built form envelopes. Shading strategies are advised to mitigate solar impact in summer. The analysis also demonstrates that no additional overshadowing of Wheeler Place occurs as a result of the proposed building envelopes and heights.



Indicative building envelope

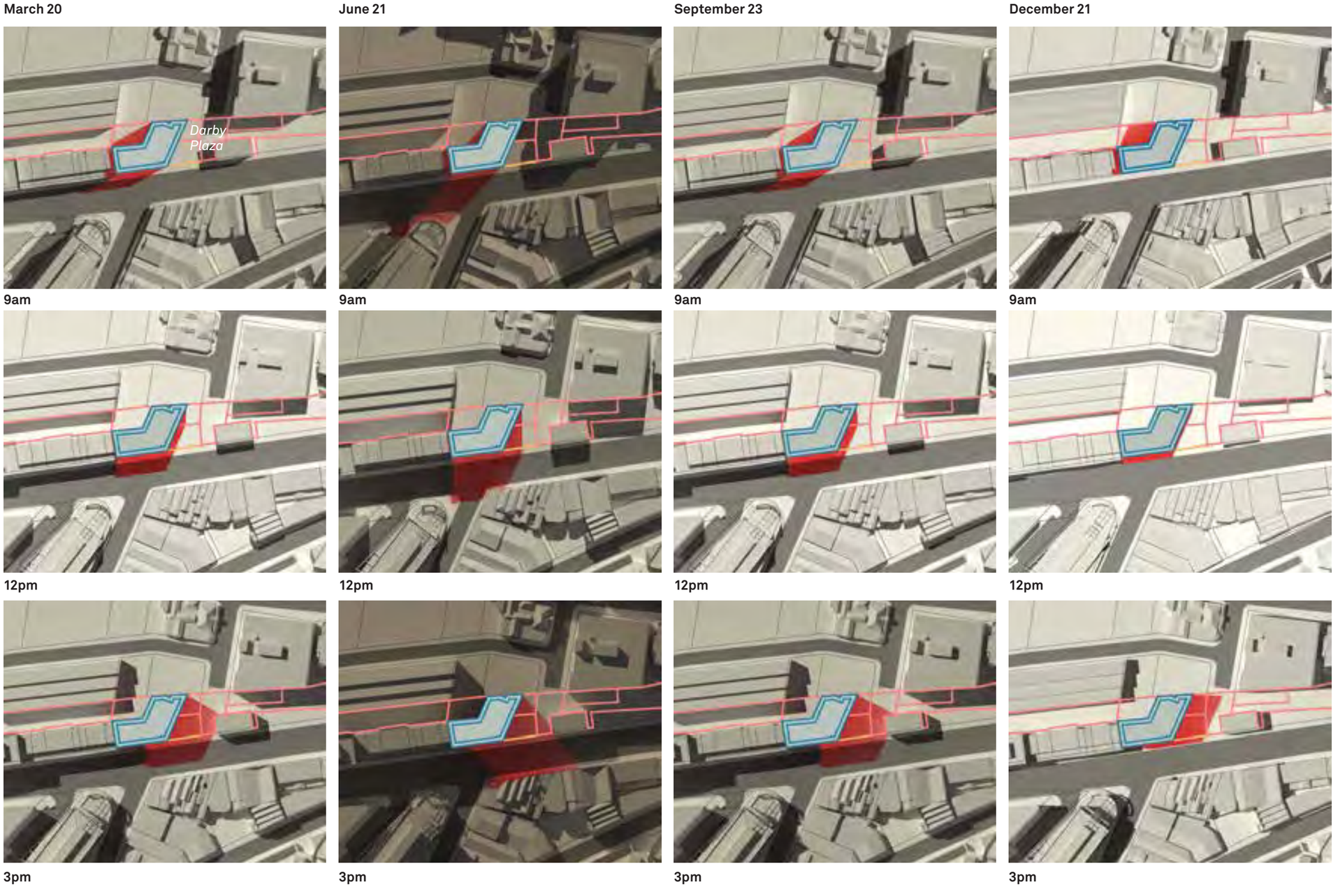
Additional overshadowing from indicative building envelope

The shadow studies contained within this report are accurate to the implied limits of the supplied base information. HASSELL does not accept responsibility for the accuracy of information prepared by other parties.

Please note, proposed building envelopes used for this shadow analysis are indicative only and require further testing, analysis and approval. The envelopes have been modelled to the indicative heights specified on page 39 and are within the maximum FSR controls specified on page 38 of this report.

Darby Plaza

Darby Plaza receives good solar access in winter at midday, however, by 3pm approximately 30% of the land proposed to be rezoned RE1 Public Recreation at Darby Plaza is overshadowed by the proposed built form envelope. A similar outcome occurs at March 20 and September 23, although the overshadowing at 3pm is up to 50%. In summer, the plaza is largely in full sun from the morning to midday, with approximately 40% overshadowing occuring in the afternoon at 3pm (within the land proposed to be rezoned RE1 Public Recreation). Shading strategies are advised to mitigate solar impact in the morning to midday during summer.



Indicative building envelope

Additional overshadowing from indicative building envelope

The shadow studies contained within this report are accurate to the implied limits of the supplied base information. HASSELL does not accept responsibility for the accuracy of information prepared by other parties.

Please note, proposed building envelopes used for this shadow analysis are indicative only and require further testing, analysis and approval. The envelopes have been modelled to the indicative heights specified on page 39 and are within the maximum FSR controls specified on page 38 of this report.

Australia

Adelaide
HASSELL
Level 1
82 Waymouth Street
Adelaide SA
Australia 5000
T +61 8 8220 5000
E adelaide@hassellstudio.com

Brisbane
HASSELL
36 Warry Street
Fortitude Valley QLD
Australia 4006
T +61 7 3914 4000
E brisbane@hassellstudio.com

Melbourne
HASSELL
61 Little Collins Street
Melbourne VIC
Australia 3000
T +61 3 8102 3000
E melbourne@hassellstudio.com

Perth
HASSELL
Level 1
Commonwealth Bank Building
242 Murray Street
Perth WA
Australia 6000
T +61 8 6477 6000
E perth@hassellstudio.com

Sydney
HASSELL
Level 2
Pier 8/9, 23 Hickson Road
Sydney NSW
Australia 2000
T +61 2 9101 2000
E sydney@hassellstudio.com

China

Beijing
HASSELL
Suite 308-B011 Building A
Beijing Fortune Centre
7 Middle Dong San Huan Road
Chaoyang District
Beijing 100026 China
T +8610 5126 6908
E beijing@hassellstudio.com

Hong Kong
HASSELL
22F, 169 Electric Road
North Point Hong Kong
T +852 2552 9098
E hongkong@hassellstudio.com

Shanghai
HASSELL
12F base 45 Caoxi North Road
Xuhui District
Shanghai 200030 China
T +8621 5467 9333
E shanghai@hassellstudio.com

South East Asia

Singapore
HASSELL
33 Tras Street #02-01
078973 Singapore
T +65 6224 4688
E singapore@hassellstudio.com

United Kingdom

Cardiff
HASSELL
Level 4 James William House
9 Museum Place
Cardiff CF10 3BD United Kingdom
T +44 29 2072 9071
E cardiff@hassellstudio.com

London
HASSELL
Level 2 Morelands
17 – 21 Old Street
Clerkenwell
London EC1V 9HL United Kingdom
T +44 20 7490 7669
E london@hassellstudio.com

Attachment B - Assessment of Retail Impact

By MacroPlanDimasi, dated March 2017

Newcastle Urban Transformation and Transport Program: Rezoning of Surplus Rail Corridor Lands

Assessment of need and impacts on centres hierarchy of proposed retail and commercial floorspace

March 2017



MacroPlanDimasi

MacroPlan Dimasi

MELBOURNE
Level 16
330 Collins Street
Melbourne VIC 3000
(03) 9600 0500

SYDNEY
Level 6
39 Martin Place
Sydney NSW 2000
(02) 9221 5211

BRISBANE
Level 15
111 Eagle Street
Brisbane QLD 4000
(07) 3221 8166

GOLD COAST
Level 2
89 -91 Surf Parade
Broadbeach QLD 4218
(07) 3221 8166

ADELAIDE
Ground Floor
89 King William Street
Adelaide SA 5000
(08) 8221 6332

PERTH
Level 1
89 St Georges Terrace
Perth WA 6000
(08) 9225 7200

Prepared for: Urban Growth NSW

MacroPlan Dimasi staff responsible for this report:

James Turnbull, Senior Manager – Retail

Adelaide Timbrell, Analyst – Retail

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Executive summary

This report presents an independent assessment of the demand for additional retail and commercial floorspace along the Surplus Rail Corridor Lands, and the resultant economic impacts on the Newcastle Central Business District (CBD) and other relevant activity centres throughout the surrounding region.

This report forms part of a broader planning proposal that seeks an amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor lands ('rail corridor land') between Worth Place and Watt Street in the Newcastle City Centre.

The following key points summarise our analysis:

Proposed development potential

- There are 15 sites forming the Surplus Rail Corridor Lands. The indicative development mix associated with the proposed corridor rezoning that has been developed by Hassell and UrbanGrowth NSW indicates that the corridor land could yield up to 400 – 500 residential dwellings and around 5,000 sq.m of retail and commercial floorspace.

- There are also 5 "adjacent sites" to the Surplus Rail Corridor Lands, which could yield additional residential development (around 200 - 250 dwellings) and some minor ground/lower level retail and commercial floorspace.

Customer segments

Future retail/commercial development within the Surplus Rail Corridor Lands could serve a range of customer segments, including inner city residents; inner city workers; residents from across the broader Lower Hunter region; tourists to the Newcastle LGA – both domestic and international; and nearby students.

Inner-city resident trade area

- The inner city resident trade area population is estimated to be approximately 13,410 as at June 2015, and is estimated to grow by around 47% to reach 19,700 by 2031, reflecting average annual growth of 2.4%.

- The trade area population is characterised by high per capita income, an above average proportion of single and couple households, low home ownership levels, and a high proportion of 20 – 29 year olds. This is typical of an inner city location with a high proportion of young professionals and low proportion of children (i.e. non-workers).

- The inner city resident trade area generates around 36,800 sq.m of retail floorspace demand as at 2015, which is expected to increase by around 1,400 sq.m per annum, to reach about 58,600 sq.m by 2031. To put this in context, the total proposed retail/commercial floorspace of around 5,000 sq.m, would be equivalent to just 3 - 3.5 years' worth of retail demand growth generated by the inner city resident main trade area population.

Newcastle CBD worker customer segment

- The Newcastle CBD worker trade area contains an estimated 21,800 workers as at 2015, which we expect to grow to around 28,800 workers by 2031, an increase of 32% in this timeframe. This growth is expected to be driven by the Hunter Street Mall redevelopment, new development within the rail corridor lands, and the continued development/gentrification of the Honeysuckle precinct north of the corridor lands.

- The Newcastle CBD worker trade area population generates an estimated 16,400 sq.m of retail floorspace demand, which is expected to increase by 40%-45% by 2031, to reach 23,400 sq.m, an increase of 7,000 sq.m.

Tourist customer segment

- Almost 3.5 million tourists visit the Newcastle LGA per annum, including around 3.4 million domestic day-trip and domestic overnight visitors. In combination, when all of these visitors are considered collectively, this equates to an equivalent year-round population of around 10,000 – 15,000 persons across the Newcastle LGA.

- Of particular note, of the domestic tourists visiting the Hunter region around 40%-50% visit or pass through the Newcastle LGA, while of the international tourists to the Hunter region around 70%-80% visit the Newcastle LGA.

- The tourist customer segment generates retail expenditure of around $380 million per annum, which is equivalent to around 61,300 sq.m across the whole Newcastle LGA. This demand is expected to increase by around 20%, or 10,500 sq.m to reach 71,800 sq.m by 2031.

Competitive environment

- The Newcastle CBD contains around 55,000 – 60,000 sq.m of retail floorspace, of which around 26,000 sq.m consists of the Marketown shopping centre. The existing Hunter Street Mall is run-down, awaiting redevelopment and currently supports many incubator businesses which occupy low-rent space as part of the Renew Newcastle program. The emerging Honeysuckle precinct contains an estimated 2,500 sq.m of retail floorspace, and is expected to benefit from the truncation of the rail line, leading to enhanced connectivity with the rest of CBD.

- The Hunter Street Mall redevelopment by could potentially yield around 4,900 sq.m of retail floorspace on the ground levels, which is likely to include a metro-style supermarket, convenience related retail, (e.g. newsagent, pharmacy, hairdressers) as well as non-food discretionary retailers including mini-major tenants, boutique fashion, homewares, surf shops etc). A further 2,700 sq.m of commercial space is also planned.

- The redevelopment of the rail corridor lands, in conjunction with the Hunter Mall redevelopment will revitalise and rejuvenate the Newcastle CBD retail offer, making it more attractive in general, strengthening its position against surrounding centres in the retail hierarchy.

- Charlestown Square and Westfield Kotara both recently underwent minor redevelopments, with the latter planned to expand further, to include more mini-majors and specialty retail. Because of the relatively minor scale of these expansions and the higher order role and function of these centres, such redevelopments are not expected

to have a noticeable impact on the development potential of the rail corridor lands, which will rely on different customer segments.

Estimated trading impacts on retail hierarchy

- The retail component of the corridor lands is expected to be around 2,413 sq.m. This is a very small provision of retail in the context of the broader offer within the Newcastle CBD, and would be widely dispersed across the rail lands corridor (i.e. not one consolidated offer with an anchor tenant). Even in combination with the Hunter Mall redevelopment (4,900 sq.m), the total additional provision of retail floorspace planned in the Newcastle CBD is not significant in the context of the existing offer (which is more than 66,000 sq.m) and surrounding major centres such as Charlestown Square and Westfield Kotara.

- Generally, retail trading impacts between 10% and 15% are considered by the industry to be significant but acceptable, with impacts less than 10% considered relatively moderate, and impacts less than 5% generally considered minor/negligible. However, other factors such as the current trading performance; expansions of centres; potential loss of services to the community; expected growth in the region; and overall net community benefit should be considered.

- We estimate the impacts attributable to the corridor lands retail component to be minor/negligible, with all impacts estimated to be less than 4% on any individual centre.

- Estimated impacts on the proposed Hunter Street Mall redevelopment are expected to be around 3.3% and across the rest of the Newcastle CBD retail offer, we estimate impacts in the order of 2.9%.

- The cumulative impacts of both the corridor lands and Hunter Mall redevelopment are estimated to be less than 10% on any individual centre, which is considered to be a moderate level of impact (i.e. within an acceptable range). Allowing for future growth in the surrounding trade areas for the various centres, we estimate that all surrounding retail centres would achieve sales levels in 2019/20 above current trading levels – even with both the surplus corridor lands development and the Hunter Mall redevelopment.

- Impacts on the Marketown sub-regional shopping centre are expected to be around 9% – 10%, primarily due to the Hunter Mall development. We expect a supermarket at Hunter Mall to drive the majority of this impact, with impacts mainly absorbed by supermarket retailers at this centre.

- We estimate impacts on nearby centres/precincts at Hamilton, Junction Fair and Cooks Hill to be moderate to negligible, at less than 7%.

- We expect that retailers in the CBD will, to some extent, benefit from the proposed rezoning of the corridor lands and the Hunter Mall redevelopment because it will result in additional residential population and workers along the corridor. Furthermore, the proposed rezoning would help to boost the overall profile of the CBD as a retail and entertainment destination. Potentially, there will improvements to retail/commercial vacancy levels in the CBD.

- In summary, the proposed rezoning of the rail corridor lands to enable the potential development of around 5,000 sq.m of retail/commercial floorspace is considered appropriate, and would represent only a small addition to the retail network. Even in combination with the proposed redevelopment of the Hunter Mall precinct, cumulative impacts across the retail hierarchy are expected to be moderate.

- Impacts of the order estimated are highly unlikely to result in any detrimental impacts on the surrounding retail/centres hierarchy across the region, nor other retail precincts within the Newcastle CBD. Additional retail/commercial development within the Newcastle CBD is likely to boost the overall profile and attractiveness of the CBD as a retail, entertainment and commercial destination.

Introduction

This report presents an independent assessment of the demand for additional retail and commercial floorspace along the Surplus Rail Corridor Lands, and the resultant economic impacts on the Newcastle Central Business District (CBD) and other relevant activity centres throughout the surrounding region.

This report forms part of a broader planning proposal that seeks an amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor lands ('rail corridor land') between Worth Place and Watt Street in the Newcastle City Centre.

The report has been prepared in accordance with a project brief from UrbanGrowth NSW and Elton Consulting (the lead consultants), and is structured as follows:

- **Section 1** reviews the local and regional context surrounding the corridor and provides an overview of the indicative development that could be facilitated through the rezoning of the land.
- **Section 2** examines the potential customer segments that could be served by potential retail/commercial floorspace along the corridor. The section provides estimates of current and future population levels for each identified customer segment; analyses the socio-demographic profile of the customer segments; and assesses the current and future estimated retail expenditure volumes generated by each customer segment.
- **Section 3** reviews the competitive context within which retail/commercial development in the corridor will operate, including all proposed competitive facilities.
- **Section 4** provides an assessment of the retail/commercial floorspace demand generated by the various customer segments identified and the growth in this demand.

- **Section 5** presents our estimates of likely trading impacts on the Newcastle CBD and the surrounding retail/commercial centres hierarchy, and then discusses the implications of these impacts.

Section 1: Site context and proposed development

1.1 Regional and local context

The Newcastle Central Business District (CBD) is located 160 km north of the Sydney CBD, and forms the economic, commercial and civic heart of metropolitan Newcastle, which is NSW's second largest city (Refer Map 1.1).

The Newcastle Urban Transformation and Transport Program ("Program") has been established to deliver on NSW Government's more than $500 million commitment to revitalise the city centre through: the truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange; the provision of a new light rail line from Wickham to the Beach; and the delivery of a package of urban transformation initiatives.

The truncation of heavy rail services at Wickham and the building of a new interchange are the first steps in delivering an urban renewal and transport solution for Newcastle.

Transport for NSW has been working closely with UrbanGrowth NSW, Newcastle City Council and Roads and Maritime Services in planning for light rail. Light rail will help improve public transport and access, reunite the city centre with its waterfront and improve the attractiveness of public spaces. The light rail route will travel east from the new transport interchange at Wickham along the existing rail corridor to Worth Place, before moving south to connect with Hunter Street and Scott Street before reaching Pacific Park, near the beach.

The Surplus Rail Corridor Lands ("corridor lands") incorporates narrow corridor of land surrounding the truncated rail line between Watt Street (i.e. Newcastle Station) and Worth Place (Refer Map 1.2).

As a result of the truncation of the heavy rail line at Wickham, to be replaced by the proposed light rail development along Scott Street, the corridor lands now presents an excellent opportunity in the heart of Newcastle CBD for new mixed use development and community open space that will help to revitalise the CBD.

The transformation element of the Program aims to bring people back to the city centre by strengthening connections between the city and the waterfront, creating employment opportunities, providing more public space and amenity, and delivering better transport.

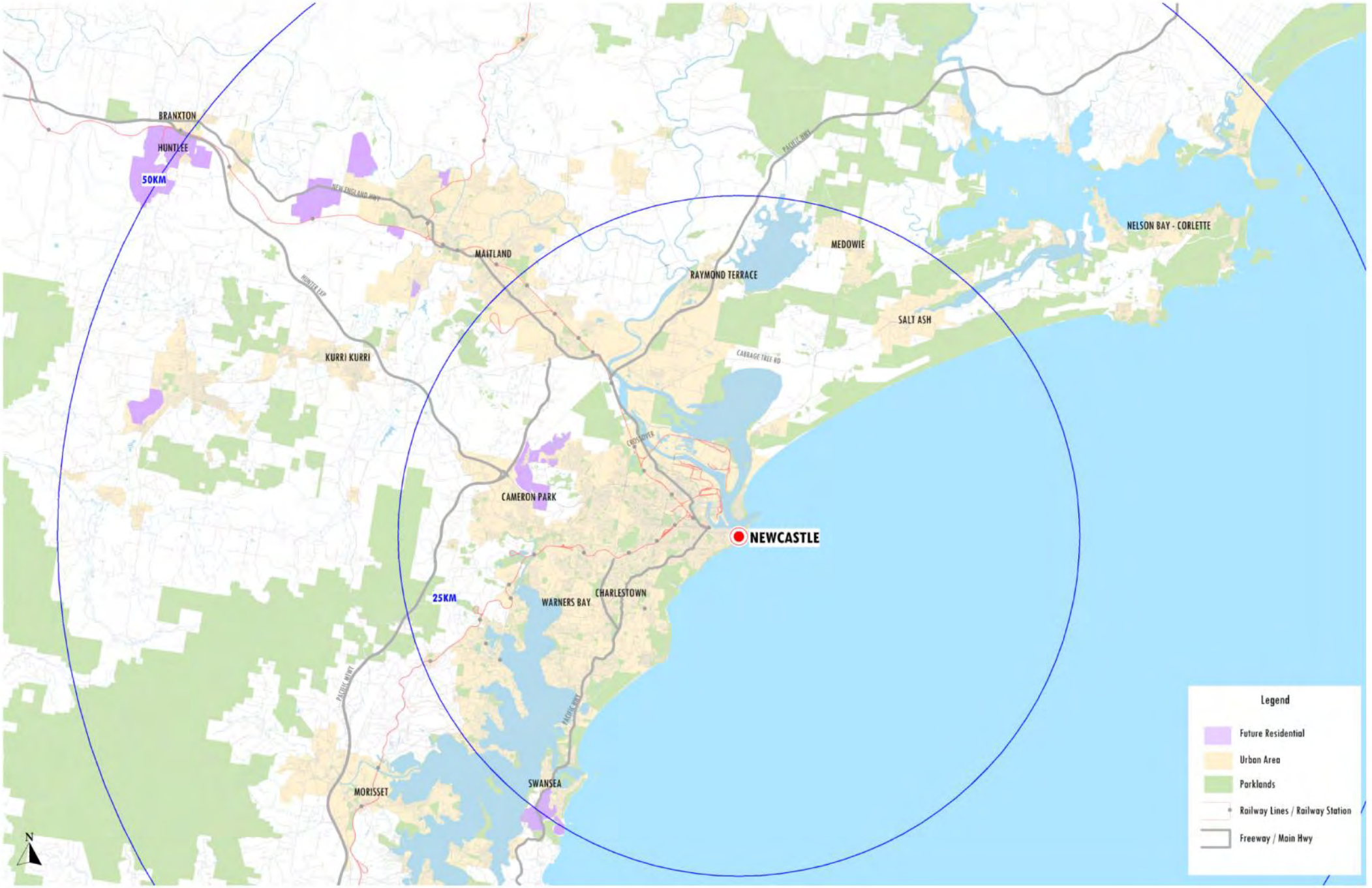
The proposed zoning amendments applying to the rail corridor land will form part of the delivery of urban transformation, comprising a package of transport, built form and public domain improvements in and around the rail corridor lands.

The Newcastle Urban Renewal Strategy (NURS) 2012 outlines a clear strategy to support the revitalisation of the Newcastle CBD. It proposes a framework for the growth of the city and identifies key initiatives to improve the economy, access, connections and the quality and attractiveness of the public domain.

The NURS identifies three character precincts in Newcastle City Centre (West End, Civic and East End), within which significant housing and employment opportunities, together with built form and public domain changes and improvements exist.

The East End sector includes part of the corridor lands as well as the major redevelopment and revitalisation of the Hunter Street Mall and immediate surrounding areas, identified on Map 1.2. This Hunter Mall development has DA Masterplan approval for up to 500 dwellings, as well as 4,900 sq.m of retail floorspace and around 2,700 sq.m of commercial floorspace, with the site recently sold to Iris Capital in 2016 (from GPT and UrbanGrowth NSW).

Other major projects in the Newcastle CBD include the University of Newcastle education precinct development – which is under construction, and the continued gentrification of the Honeysuckle waterfront as the truncation of the rail improves the accessibility of this area.



Map 1.1: Newcastle

Regional context

MacroPlanDimasi



Map 1.2: Surplus Rail Corridor Lands

Site location

1.2 Planning proposal

Table 1.1 and Figure 1.1 summarises the land parcels within the Surplus Rail Corridor Lands, including the intended zone for each parcel and size of each parcel (based on the latest plans from February 2017). There are 15 parcels forming the Surplus Rail Corridor Lands, 7 of which are ear-marked to potentially accommodate retail and commercial floorspace and residential dwellings (i.e. B4 zoned), totalling:

- Around 400 - 500 residential dwellings; and
- Around 5,000 sq.m of retail and commercial floorspace, which we have assumed would be allocated 50% to retail uses and 50% for commercial uses.

There are also 5 "adjacent sites" to the Surplus Rail Corridor Lands (i.e. sites 16 – 20). These sites do not form part of the planning proposal but have been considered in our assessment given they directly related to the rezoning of the Surplus Rail Corridor Lands. These sites could potentially yield:

- Around 200 - 250 residential dwellings; and
- Around 2,000 sq.m of retail and commercial floorspace.

In total, the corridor and its immediate surrounds could accommodate 700 - 800 new dwellings, and around 7,000 sq.m of retail and commercial floorspace. The other sites in the corridor are generally planned to serve a tourist (Parcel 15) or recreational purpose (5, 10, 14), while Parcels 11 and 13 are planned to be retained as SP2 Infrastructure zone.

This report has been based upon the proposed zoning under the Planning Proposal as submitted for Gateway determination, with the inclusion of Parcel 13. It is noted that this parcel has been removed from the current Planning Proposal in accordance with the Gateway determination as issued by the NSW DPE. Nevertheless, for completeness, this report has considered the potential for some development occurring within this parcel in the

future (subject to outcomes of a separate Planning Proposal). The recommendations of this report discuss whether there are any specific implications arising from this additional parcel.

Table 1.1
Surplus Rail Corridor Lands - Land parcels and indicative development yield

Parcel no.	Area (sq.m)	Zoning	Purpose
1	3,370	B4	Mixed use dev
2	408	B4	Mixed use dev
3	1,869	B4	Mixed use dev
4	900	B4	Mixed use dev
5	2,839	RE1	Public recreation
6	1,604	B4	Mixed use dev
7	295	B4	Mixed use dev (road)
8	2,040	B4	Mixed use dev
9	988	B4	Mixed use dev
10	467	RE1	Public recreation
11	386	SP2	Infrastructure
12	4,542	B4	Mixed use dev
13	659	SP2	Infrastructure
14	11,151	RE1	Public recreation
15	10,698	SP3	Tourist
Total Corridor Land	**42,216**		

Source: Hassell; UrbanGrowth NSW



Figure 1.1 – Corridor parcels

Section 2: Customer segments

This section examines the potential customer segments that could be served by potential retail/commercial floorspace along the corridor. The section provides estimates of current and anticipated population levels within the identified customer segments; analyses the socio-demographic profile of the customer segments; and assesses the current and future estimated retail expenditure volumes generated by each customer segment.

Future retail/commercial development within the Surplus Rail Corridor Lands could serve a range of customer segments, including:

- **Inner city residents** – which will include inner city residents who could be frequent customers of the proposed facilities;
- **Surrounding workers** – which will include those who work within a comfortable walking distance of the corridor;
- **Residents from the broader Newcastle/Lower Hunter Region** – who would be drawn by the broader regional scale retail, cultural and entertainment facilities in the Newcastle CBD. These customers are likely to use the facilities less frequently, but potentially spend more time and money when visiting;
- **Tourists** – which would include domestic day trippers; domestic overnight visitors and international tourists to the Newcastle LGA;
- **Nearby students** – which would include students from the nearby University of Newcastle CBD Campus. Although this customer segment is relatively small compared with the other customer segments.

2.1 Inner city resident trade area

2.1.1 Trade area definition

The extent of the trade area or catchment that is served by any shopping centre or retail facility/precinct is shaped by the interplay of a number of critical factors. These factors include:

- The relative attraction of the retail facility, in comparison with alternative competitive retail facilities. The factors that determine the strength and attraction of any particular centre are primarily its scale and composition; its layout and ambience; and carparking, including access and ease of use.
- The proximity and attractiveness of competitive retail facilities. The locations, compositions, quality and scale of competitive retail facilities all serve to define the extent of the trade area which a retail facility is effectively able to serve.
- The available road network and public transport infrastructure, which determine the ease (or difficulty) with which customers are able to access a retail facility.
- Significant physical barriers which are difficult to negotiate, and can act as delineating boundaries to the trade area served by a retail facility.

Map 2.1 illustrates the potential inner city resident trade area that could be served by the proposed retail/commercial developments along the Surplus Rail Corridor Lands.

The trade area has been defined to include the inner city of Newcastle, consisting of the suburbs of Newcastle, Newcastle East, The Hill, Cooks Hill, Newcastle West, and parts of Hamilton East and Bar Beach.

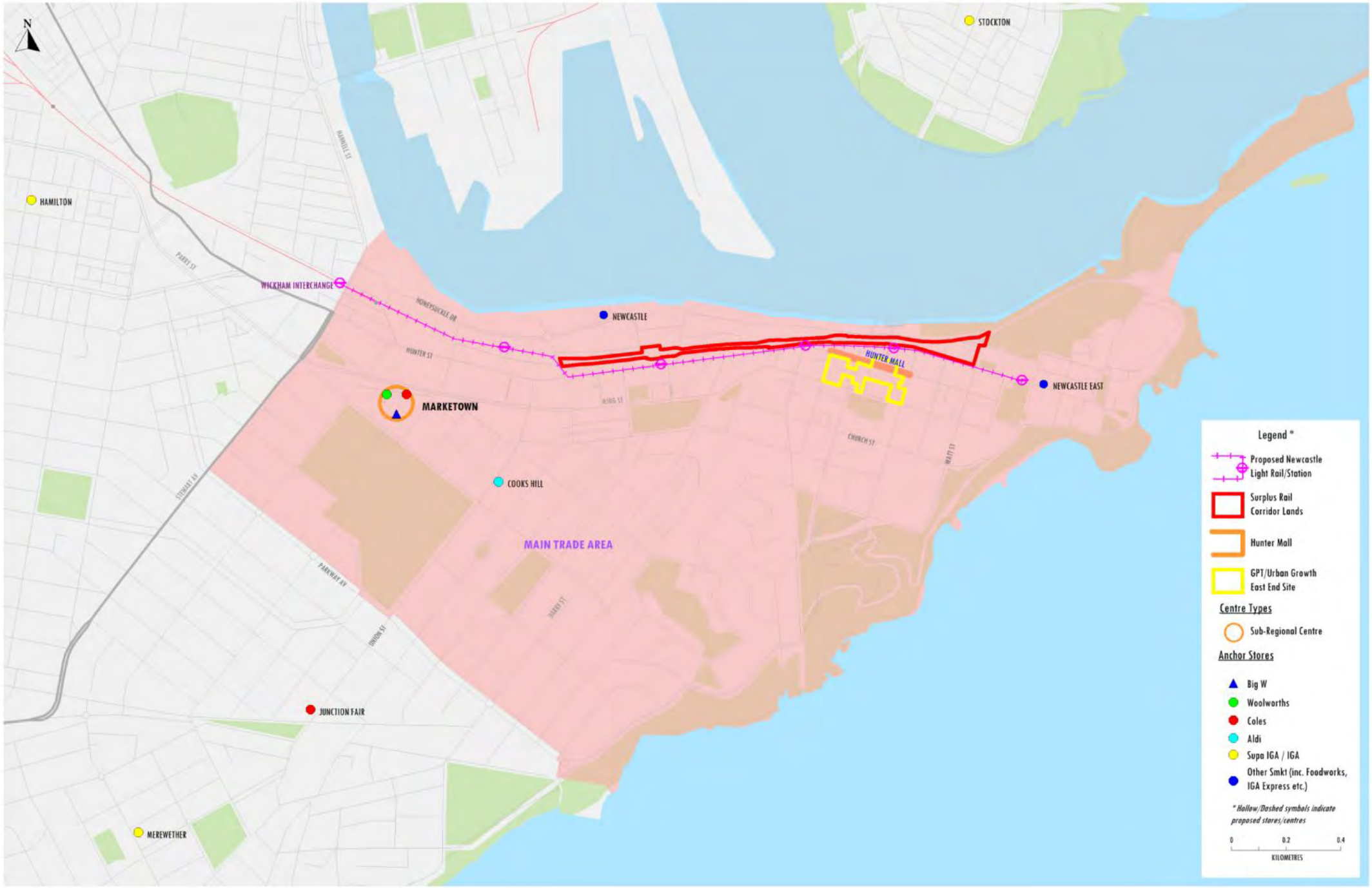
The inner city resident trade area is generally bounded by the coastline to the north and east, Parkway Avenue to the south-west and Stewart Avenue to the north-west.

2.1.2 Consistency with SGS Planning and Economics Report

We have defined the inner city resident trade area based on the practical area that we consider residents could readily access the proposed retail/commercial facilities along the corridor. This area differs slightly from the defined study area in the SGS Planning and Economics report which has been defined in accordance with the Newcastle City Council's definition of its City Centre.

The boundary of the defined City Centre generally includes the commercial/employment areas in the City Centre and does not reflect the likely trade area served by inner-city retail facilities that might be developed along the corridor. For example the City Centre does not include residents living in Cooks Hill/The Hill (a few hundred metres away) yet includes residents in Hamilton West (i.e. west of Stuart Avenue).

In our analysis of the potential worker trade area served by the proposed retail/commercial development in the corridor, we have used the City Centre definition, as per the SGS report.



Map 2.1: Newcastle Rail Corridor Land

Trade area and competition (Inner city resident)

MacroPlanDimasi

2.1.3 Trade area population

Table 2.1 details the current and projected population levels within the inner city resident trade area. Throughout this report, population estimates and projections have been based on a range of sources, including the following:

- Australian Bureau of Statistics Census of Population and Housing (2006 and 2011);
- Australian Bureau of Statistics Dwelling Approvals Data (2010–15);
- Australian Bureau of Statistics Estimated Residential Population Data (ERP) (2011-14);
- NSW Department of Planning and Environment (DPE) – population and household projections (2014) and NSW Bureau of Transport Statistics (BTS) – population projections at transport zone level (2014);
- Newcastle City Council Urban Renewal Strategy (2012);
- Newcastle City Council Population Projections (Forecast ID) (2013); and
- Other investigations of future residential development, undertaken by this office, including consideration of the potential dwelling yield within the corridor lands.

Table 2.1
Surplus Rail Corridor Lands trade area population, 2011-2031*

	Estimated population			Forecast population		
Trade area sector	2011	2015	2018	2021	2026	2031
Main trade area	12,768	13,409	14,459	15,659	17,659	19,659
			Average annual growth (no.)			
Trade area sector		2011-15	2015-18	2018-21	2021-26	2026-31
Main trade area		160	350	400	400	400
			Average annual growth (%)			
Trade area sector		2011-15	2015-18	2018-21	2021-26	2026-31
Main trade area		1.2%	2.5%	2.7%	2.4%	2.2%

**As at June*
Source: ABS Census 2011; NSW BTS; Newcastle City Council; MacroPlan Dimasi

The inner city resident trade area population is estimated to be approximately 13,410 as at June 2015. Some of the larger inner city residential developments, which are expected to drive population growth in the future, are summarised as follows:

- **Surplus Rail Corridor Lands (Urban Growth NSW)**: The corridor lands could potentially accommodate in the order of 400 - 500 dwellings and adjacent sites could accommodate around 200 - 250 additional dwellings. The inner city of Newcastle is undergoing strong growth as part of a broader gentrification of this area.

- **Hunter Street Mall (IRIS Capital)**: mixed use development site that could support around 500 dwellings for which a concept development application was lodged with Council in 2015. If approved, the development is expected to commence in 2016/17.

- **Icon Central**: a 17 storey 265 unit development at the western end of the Newcastle CBD. More than 70% of the units have been sold off the plan and project is expected to be completed early 2017.

- **Arena:** a 16 storey 161 unit development. Stage 1 is nearly sold and out and the final release is currently underway. The project is expected to be completed in early 2017.

Having regard to the above developments, which are not necessarily accounted for in official population projections, the inner city resident trade area population is estimated to grow by around 47% to reach 19,700 by 2031, reflecting average annual growth of 2.4%.

2.1.4 Socio-demographic profile

Table 2.2 presents the socio-demographic profile of inner city resident population trade area and compares it to the metropolitan Newcastle, Sydney and Australian averages, based on information sourced from the 2011 ABS Census of Population and Housing.

- The average per capita income of the trade area population is 52.1% above the Newcastle average, and also significantly higher than the metropolitan Sydney average, reflecting high levels of affluence typical of an inner city population but also reflects the smaller average household size of this population. Nonetheless, the average household income of the trade area population is also significantly above the Newcastle average, and on par with metropolitan Sydney.

- The average age of the trade area population, at 38.5 years, is below the Newcastle average of 39.7 years. This is due to the very high proportion of 20-29 year olds in the trade area, compared to the Newcastle average (27.6% vs 13.4%). This proportion may increase further as the Newcastle CBD improves its position as an employment destination for white collar professionals and the University site is developed.

- The home ownership level of the trade area population (45.0%) is significantly below the Newcastle average (70.6%). This is typical of inner city locations that include a high proportion of young professionals and students.

- Australian born residents account for 83.8% of the trade area population, which is lower than the Newcastle average of 88.7%, but much higher than the Australian average of 74.0%.

- Couples without children are the most prevalent household type in the trade area, accounting for 31.6% of households, which is much higher than the Newcastle average of 24.3%. Lone person households account for 24% of all households, which is more than double the Newcastle average.

The trade area population is characterised by high per capita income, an above average proportion of single and couple households, low home ownership levels, and a high

proportion of 20 – 29 year olds. This is typical of an inner city location with a high proportion of young professionals and low proportion of children (i.e. non-workers).

Table 2.2
Newcastle Rail Corridor Lands inner city resident main trade area - socio-demographic profile, 2011

Census item	Main TA	Newcastle avg.	Syd Metro avg.	Aust. avg.
Per capita income	$51,137	$33,619	$37,441	$34,467
Var. from Newcastle benchmark	*52.1%*			
Avg. household income	$102,142	$82,641	$101,090	$88,205
Var. from Newcastle benchmark	*23.6%*			
Avg. household size	2.0	2.5	2.7	2.6
Age distribution (% of population)				
Aged 0-14	10.2%	18.0%	19.2%	19.3%
Aged 15-19	4.2%	6.5%	6.3%	6.5%
Aged 20-29	27.6%	13.4%	14.8%	13.8%
Aged 30-39	15.0%	12.4%	15.3%	13.8%
Aged 40-49	11.4%	13.4%	14.3%	14.2%
Aged 50-59	13.6%	13.2%	12.2%	12.8%
Aged 60+	18.0%	23.1%	18.0%	19.6%
Average age	38.5	39.7	37.1	37.9
Housing status (% of households)				
Owner (total)	45.0%	70.6%	66.8%	68.7%
• Owner (outright)	23.6%	36.0%	31.1%	32.9%
• Owner (with mortgage)	21.4%	34.6%	35.7%	35.8%
Renter	54.4%	28.6%	32.4%	30.4%
Other	0.5%	0.8%	0.8%	0.9%
Birthplace (% of population)				
Australian born	83.8%	88.7%	63.6%	74.0%
Overseas born	16.2%	11.3%	36.4%	26.0%
• Asia	3.2%	2.2%	15.5%	8.6%
• Europe	6.8%	6.2%	10.6%	10.5%
• Other	6.2%	2.9%	10.3%	7.0%
Family type (% of households)				
Couple with dep't children	29.0%	40.8%	48.2%	45.3%
Couple with non-dep't child.	3.9%	8.0%	9.1%	7.7%
Couple without children	31.6%	24.3%	20.1%	23.0%
One parent with dep't child.	7.0%	10.0%	8.5%	9.2%
One parent w non-dep't child.	2.5%	4.2%	3.9%	3.5%
Other family	1.9%	1.0%	1.2%	1.1%
Lone person	24.0%	11.6%	9.0%	10.2%

Source: ABS Census of Population & Housing, 2011; MacroPlan Dimasi

2.1.5 Retail expenditure capacity

MacroPlan Dimasi estimates retail expenditure capacity generated by the main trade area residents based on information sourced from Market Data Systems (MDS), which utilises a detailed micro simulation model of household expenditure behaviour for all residents of Australia. The model takes into account information from a wide variety of sources including the regular ABS Household Expenditure Surveys, national accounts data, Census data and other information. We consider MarketInfo data to be an accurate measure of available retail expenditure and it is widely relied on in the retail industry. Total retail expenditure is detailed in a number of categories, as follows:

- Take-home food and groceries – goods typically sold in supermarkets and specialty fresh food stores.
- Packaged liquor – packaged beer, wine and spirits such as those purchased at bottle-shops and liquor outlets.
- Food catering – cafes, take-away outlets and restaurants, including liquor consumed on such premises.
- Apparel – clothing, footwear, fashion and accessories.
- Household Goods – giftware, electrical, computers, furniture, homewares, and hardware goods.
- Leisure – sporting goods, music, DVDs, games, books, newsagents and film processing/photography.
- General Retail – pharmaceutical goods, cosmetics, toys, florists, mobile phones.
- Retail Services – retail services such as key cutting, shoe repairs, hair and beauty.

Chart 2.1 shows the retail expenditure capacity per person for residents of the identified main trade area for the year 2014/15, inclusive of GST, and compares these estimates with the averages for Newcastle and Australia. The following points are noted:

- Retail expenditure per capita is estimated to be around 23% above the Newcastle average.

- Per capita expenditure on fresh food is around 9% greater than the Newcastle average, while other food and groceries report per capita expenditure at around 2% above average. These categories are both of particular relevance to supermarkets, as they represent 90% - 95% of items for sale at supermarkets. Per capita expenditure on food catering is around 60% above average – which is typical of a young, affluent inner-city population.

- Per capita expenditure on discretionary retail categories is around 26 – 27% above the Newcastle average. Expenditure per capita on retail services, leisure and apparel categories is particularly high, ranging between 40 and 45% above the Newcastle average.

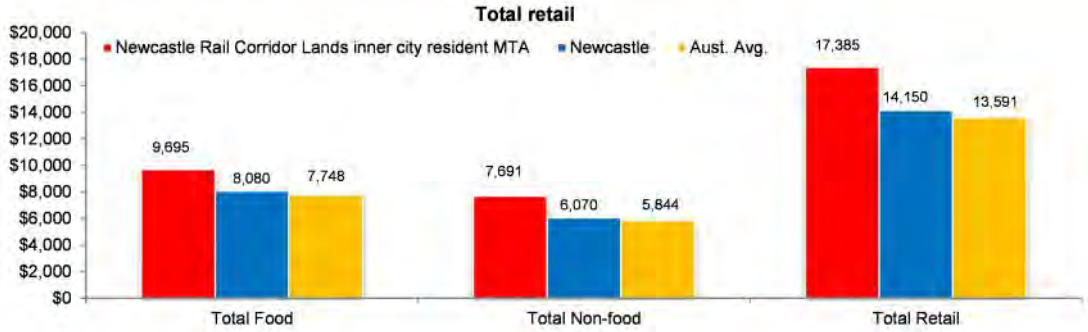
Table 2.3 presents estimates of total retail expenditure generated by the main trade area population, by retail category, over the period from 2015 to 2031. Spending forecasts are presented inclusive of GST and in constant 2014/15 dollars (i.e. excluding inflation).

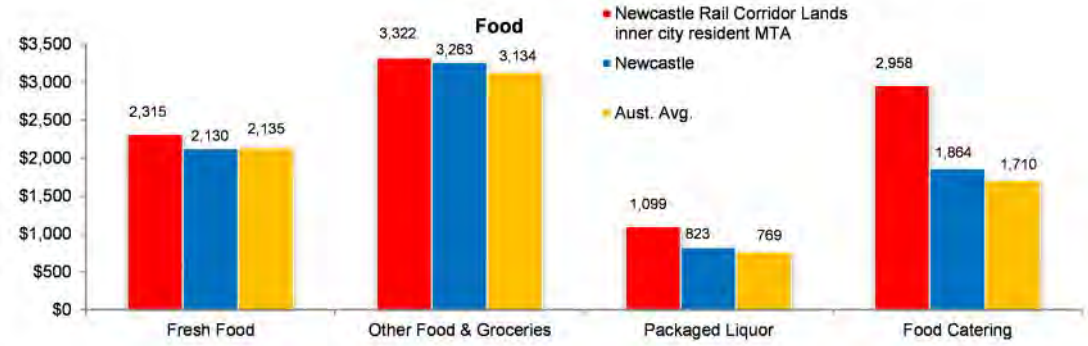
The retail expenditure market is estimated to grow from about $231.7 million in 2015 to $401.3 million by 2031, at an average annual growth rate of 3.5%. The average annual growth rate of 3.5% comprises two components, being residential population growth, which is expected to average 2.4% per annum; and real growth in per capita retail expenditure, which is expected to average 1.0% – 1.1% per annum over the forecast period.

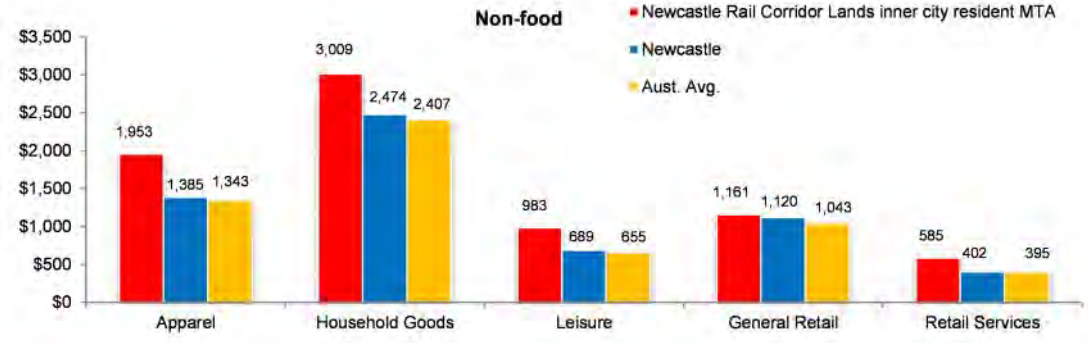
FLG expenditure (take-home food and groceries including packaged liquor) is estimated at $89.8 million in 2015, and accounts for 39% of all retail expenditure in the trade area. FLG expenditure by trade area residents is forecast to increase to $157.2 million by 2031, reflecting average annual growth of 3.6%. The fastest growing category is expected to be food catering, which could grow at an average annual rate of 4.1%.

Chart 2.1

Newcastle Rail Corridor Lands inner city resident trade area - retail expenditure per person, 2014/15*







*Including GST
Source: MarketInfo; MacroPlan Dimasi

Table 2.3
NRCL inner city resident main trade area - retail expenditure by category ($M), 2015-2031*

Year ending June	FLG	Food catering	Apparel	Household goods	Leisure	General retail	Retail services	**Total retail**
2015	89.8	39.4	26.0	40.1	13.1	15.5	7.8	231.7
2016	92.6	40.8	26.7	41.2	13.4	15.9	8.0	238.7
2017	96.2	42.6	27.6	42.7	13.9	16.4	8.4	247.8
2018	100.0	44.5	28.6	44.3	14.4	17.0	8.7	257.4
2019	104.0	46.6	29.6	46.0	14.9	17.6	9.0	267.6
2020	108.3	48.7	30.6	47.8	15.4	18.2	9.4	278.4
2021	112.8	51.0	31.7	49.6	16.0	18.9	9.8	289.8
2022	117.4	53.3	32.9	51.5	16.5	19.5	10.2	301.4
2023	122.0	55.7	34.0	53.4	17.1	20.2	10.6	312.9
2024	126.7	58.2	35.1	55.3	17.7	20.9	11.0	324.9
2025	131.7	60.7	36.3	57.4	18.3	21.6	11.4	337.4
2026	136.8	63.4	37.6	59.5	18.9	22.3	11.9	350.4
2027	141.8	66.0	38.7	61.5	19.5	23.0	12.3	362.8
2028	146.5	68.6	39.8	63.3	20.0	23.7	12.7	374.7
2029	151.4	71.2	40.9	65.3	20.6	24.3	13.1	386.9
2030	156.4	73.9	42.1	67.3	21.2	25.0	13.6	399.5
2031	161.6	76.8	43.3	69.4	21.8	25.7	14.0	412.6
Average annual growth ($M)								
2015-2031	4.5	2.3	1.1	1.8	0.5	0.6	0.4	11.3
Average annual growth (%)								
2015-2031	3.7%	4.3%	3.2%	3.5%	3.2%	3.2%	3.7%	3.7%

**Constant 2014/15 dollars & including GST*
Source: MarketInfo; MacroPlan Dimasi

Retail expenditure category definitions:

- FLG: take-home food and groceries, as well as packaged liquor.
- Food catering: expenditure at cafes, take-away food outlets and restaurants.
- Apparel: clothing, footwear, fashion accessories and jewellery.
- Household goods: giftware, electrical, computers, furniture, homewares and hardware goods.
- Leisure: sporting goods, music, DVDs, computer games, books, newspapers & magazines, stationery and photography equipment.
- General retail: pharmaceutical goods, cosmetics, toys, florists, mobile phones and pets.
- Retail services: hair & beauty, optical goods, dry cleaning, key cutting and shoe repairs.

2.2 Newcastle CBD workers

The Newcastle CBD worker trade area has been defined to include four transport destination zones (TDZ) in accordance with the definition of the Newcastle City Council definition of the CBD boundary (i.e. as per the SGS report), and is illustrated on Map 2.2.

There is some overlap in this customer segment, with the inner-city residential market, as approximately 15 – 20% of CBD workers live and work in the CBD. This market will be particularly important in driving demand during the working week for retail/commercial businesses along the corridor lands, and elsewhere within the CBD.

Table 2.4 presents estimations the population of the CBD worker trade area, based on data from the NSW BTS. As at 2015, we estimate there to be around 21,800 workers within the defined worker trade area which we expect to grow to around 28,800 workers by 2031, at an average annual rate of 1.8%, equivalent to an increase of around 32%.

Table 2.4
SCRL worker trade area population, 2011-2031*

	Estimated population		Forecast population			
Trade area	2011	2015	2018	2021	2026	2031
Worker trade area	19,470	21,790	23,730	25,740	27,720	28,810
	Average annual growth (no.)					
Trade area		2011-15	2015-18	2018-21	2021-26	2026-31
Worker trade area		580	647	670	396	218
	Average annual growth (%)					
Trade area		2011-15	2015-18	2018-21	2021-26	2026-31
Worker trade area		2.9%	2.9%	2.7%	1.5%	0.8%

**As at June*
Source: ABS Census; NSW BTS



Map 2.2: Surplus Rail Corridor Lands

Worker trade area and competition

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Future growth in the worker trade area population is expected to be driven by the transformation and redevelopment of the Newcastle CBD, in particular, the Hunter Street Mall development, which could potentially include around 7,600 sq.m of retail and commercial floorspace.

Other major projects include the University of Newcastle education precinct development, and additional development/businesses are expected to be accommodated around the Honeysuckle waterfront as the truncation of the rail improves the accessibility of this area.

The CBD contains a higher than average proportion of professionals, managers and clerical/service workers than the metropolitan NSW average. The higher than average proportion of white collar workers means that average salaries for CBD workers are about 15% - 20% above the metropolitan Newcastle average.

Table 2.5 presents the estimated retail expenditure generated by the worker trade area population over the period 2015 – 2031. Generally, retail expenditure near one's place of work is mainly on food and groceries, food catering, retail services and other convenience related categories.

Typically, workers spend between 20% - 40% of their annual retail expenditure near their place of work, depending on the retail offer provided. For example, workers near a regional shopping centre like Charlestown Square or workers in the Sydney CBD would likely spend a higher proportion of their annual retail expenditure near their place of work compared with workers in an industrial estate, such near the Port of Newcastle, with limited retail amenity.

Table 2.4
SCRL worker trade area - retail expenditure by category ($M), 2015-2031*

Year ending June	FLG	Food catering	Apparel	Household goods	Leisure	General retail	Retail services	**Total retail**
2015	46.7	14.0	10.4	18.6	5.2	8.4	3.0	106.4
2016	48.6	14.6	10.8	19.3	5.4	8.7	3.1	110.5
2017	50.5	15.3	11.1	20.0	5.5	9.0	3.3	114.7
2018	52.4	16.0	11.5	20.7	5.7	9.3	3.4	119.1
2019	54.5	16.7	11.9	21.5	5.9	9.6	3.5	123.5
2020	56.5	17.4	12.3	22.2	6.1	9.9	3.7	128.1
2021	58.6	18.1	12.7	23.0	6.3	10.3	3.8	132.8
2022	60.5	18.8	13.0	23.7	6.5	10.5	3.9	136.8
2023	62.0	19.3	13.3	24.2	6.6	10.7	4.0	140.2
2024	63.6	19.9	13.5	24.7	6.7	10.9	4.1	143.6
2025	65.2	20.5	13.8	25.3	6.9	11.2	4.2	147.0
2026	66.8	21.1	14.1	25.9	7.0	11.4	4.3	150.6
2027	68.2	21.7	14.3	26.4	7.1	11.6	4.4	153.7
2028	69.4	22.2	14.5	26.8	7.2	11.7	4.5	156.3
2029	70.7	22.7	14.7	27.2	7.3	11.9	4.6	159.0
2030	71.9	23.2	14.9	27.6	7.4	12.0	4.7	161.7
2031	73.2	23.8	15.1	28.0	7.5	12.2	4.7	164.5
Average annual growth ($M)								
2015-2031	1.7	0.6	0.3	0.6	0.1	0.2	0.1	3.6
Average annual growth (%)								
2015-2031	2.8%	3.4%	2.3%	2.6%	2.3%	2.3%	2.8%	2.8%

**Constant 2014/15 dollars & including GST*
Source: MarketInfo; MacroPlan Dimasi

2.3 Lower Hunter regional trade area

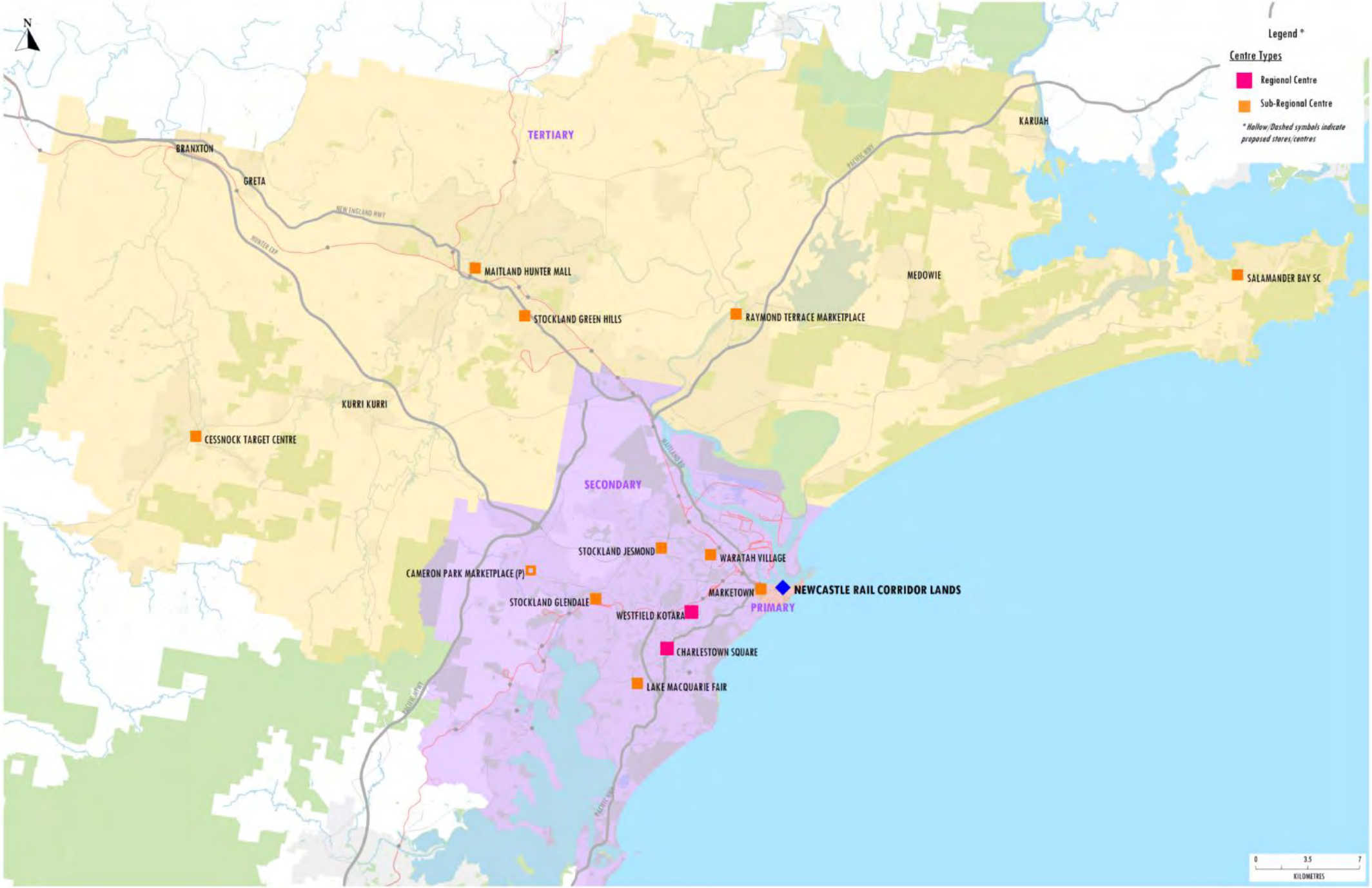
The Newcastle CBD contains a mix of destinational retail, entertainment, civic, leisure and cultural facilities, and is the principal CBD for the surrounding Lower Hunter regional area. As such, the collective critical mass within the CBD would serve an extensive trade area, in particular as the CBD undergoes its transformation.

Map 2.3 illustrates the Lower Hunter regional trade area, while Table 2.6 summarises its estimated population over the period 2011 and 2031.

The primary sector of the Lower Hunter Region trade area is the inner city resident trade area defined earlier on Map 2.1. The secondary and tertiary sectors of the Lower Hunter trade area consists of potential shoppers who may visit less frequently than inner Newcastle residents but are likely to dwell longer when visiting and spend greater amounts per visit.

There are an estimated 544,000 persons living in the Lower Hunter regional trade area defined on Map 2.3, as at 2015, which is comparable to the Gold Coast LGA (est. 550,000). More than 340,000 persons reside within the Newcastle LGA and the northern Lake Macquarie area. We estimate population growth in the total trade area to be in the order of 0.8% per annum over the period to 2031, with the population expected to reach around 617,700 by this time, an increase of around 73,350.

The size of this potential market is significant, and only minor market shares of available expenditure would need to be attracted from this market in order to provide a significant contribution to total annual potential turnover generated by retail/commercial businesses in the Newcastle CBD, and indeed, the Surplus Rail Corridor Lands.



Map 2.3: Surplus Rail Corridor Lands

Lower Hunter regional trade area and competition

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Table 2.6
Lower Hunter Region trade area population, 2011-2031*

	Estimated population			Forecast population		
Trade area sector	2011	2015	2018	2021	2026	2031
Primary	12,768	13,409	14,459	15,659	17,659	19,659
Total secondary	317,490	329,090	336,890	344,690	358,190	371,690
Main trade area	**330,258**	**342,499**	**351,349**	**360,349**	**375,849**	**391,349**
Total tertiary	188,240	201,840	207,240	212,340	219,340	226,340
Total trade area	**518,498**	**544,339**	**558,589**	**572,689**	**595,189**	**617,689**

	Average annual growth (no.)				
Trade area sector	2011-15	2015-18	2018-21	2021-26	2026-31
Primary	160	350	400	400	400
Total secondary	2,900	2,600	2,600	2,700	2,700
Main trade area	**3,060**	**2,950**	**3,000**	**3,100**	**3,100**
Total tertiary	3,400	1,800	1,700	1,400	1,400
Total trade area	**6,460**	**4,750**	**4,700**	**4,500**	**4,500**

	Average annual growth (%)				
Trade area sector	2011-15	2015-18	2018-21	2021-26	2026-31
Primary	1.2%	2.5%	2.7%	2.4%	2.2%
Total secondary	0.9%	0.8%	0.8%	0.8%	0.7%
Main trade area	**0.9%**	**0.9%**	**0.8%**	**0.8%**	**0.8%**
Total tertiary	1.8%	0.9%	0.8%	0.7%	0.6%
Total trade area	**1.2%**	**0.9%**	**0.8%**	**0.8%**	**0.7%**

**As at June*
Source: ABS Census 2011; NSW Department of Planning and Environment 2014; MacroPlan Dimasi

2.4 Tourist customer segment

Tourism is a key economic driver for the Hunter region, driven strongly by the destinational allure of the Hunter Valley wine region, which accommodates significant domestic visitation, and to a lesser extent international visitation.

Table 2.7 presents data from Tourism Research Australia on visitation levels to the Newcastle LGA and broader Hunter Tourism region, as well as the estimated retail expenditure generated by these visitors. The following key highlights are noted:

- On average over the past four years, around 2.4 million domestic day-trippers visited Newcastle LGA per annum.
- Approximately 1.0 million domestic overnight visitors visited per annum – contributing around 2.6 million visitor nights.
- Approximately 76,000 international visitors stayed for around 1.7 million visitor nights in the Newcastle LGA.
- In combination, when all of these visitors are considered collectively, this equates to an equivalent year-round population of around 10,000 – 15,000 across the Newcastle LGA.

Of particular note, of the domestic tourists visiting the Hunter region around 40-50% visit or pass through the Newcastle LGA, while of the international tourists to the Hunter region around 70-80% visit the Newcastle LGA.

The tourist market is considered to be a key market opportunity that is generally under serviced by the retail offer within the Newcastle CBD. In total, domestic and international tourists visiting the Newcastle LGA generate a potential $380 million in retail expenditure per annum.

Table 2.7
SRCL - Estimated annual tourism visitation and expenditure

		Est. visitation		Est. Retail Expenditure		Est. Total Expenditure	
	Visitor Type	Visitors ('000s)	Nights ('000s)	$/person	Total ($M)	$/person	Total ($M)
Newcastle LGA (2011-14)*	Domestic day tripper	2,408	n.a.	44.2	106.4	105.5	254.0
	Domestic overnight visitors	1,010	2,574	254.4	256.9	437.6	442.0
	International visitors	76	1,665	459.6	34.9	1,201.0	91.3
	Total	**3,494**	**4,239**	**114.0**	**398.3**	**152.6**	**533.3**
Hunter Region (2015)**	Domestic day tripper	5,762	n.a.	46.0	265.2	109.9	633.0
	Domestic overnight visitors	3,075	8,767	281.7	866.2	484.6	1,490.0
	International visitors	164	2,532	413.1	67.7	1,079.3	177.0
	Total	**9,001**	**11,299**	**133.2**	**1,199.1**	**255.5**	**2,300.0**
Newcastle LGA as a share of Hunter Region (%)	Domestic day tripper	41.8%	n.a.		40.1%		40.1%
	Domestic overnight visitors	32.8%	29.4%		29.7%		29.7%
	International visitors	46.3%	65.8%		51.6%		51.6%
	Total	**38.8%**	**37.5%**		**33.2%**		**23.2%**

**Four year average to year ended September 2014*
***Year ended June 2015*
Source: Tourism Research Auastralia - International Visitor Survey & National Visitor Survey; MacroPlan Dimasi

Section 3: Competition

This section of the report reviews the competitive context within which retail/commercial development in the corridor lands will operate, including all proposed competitive facilities.

3.1 Existing competition

Newcastle CBD

The Newcastle CBD currently contains an estimated 55,000 – 60,000 sq.m of occupied retail floorspace, dominated by the 26,000 sq.m Marketown sub-regional shopping centre which includes a Big W and Coles and Woolworths supermarkets. There is estimated 30,000 sq.m of street based retail generally oriented around Hunter Street/King Street, which generally consists of a mix of cafes, restaurants, take-away shops, some convenience retailers and lower quality/discount retailers. The Newcastle CBD west of Marketown is generally undersupplied in terms of convenient fresh food retailing. Indeed there are limited supermarket facilities in the CBD east of Marketown.

There is an estimated 2,500 sq.m of retail floorspace in the Honeysuckle precinct north of the corridor lands, generally consisting of ground floor cafes, restaurants, and some small scale convenience retail.

Currently, there are some parts of the Newcastle CBD that are suffering from high vacancy levels. We expect that the new development in the CBD, including the Hunter Mall redevelopment and the proposed mixed used development of the surplus corridor lands will help to revitalise the CBD. Additional residential and worker population will drive additional demand and the proposed light rail will improve the accessibility of the CBD to the broader surrounding population.

Major centres

There are two Major Centres supporting the Newcastle CBD, namely Kotara Major Centre and Charlestown Major Centre.

- **Kotara Major Centre:** contains the Westfield Kotara regional shopping centre and Kotara Homemaker Centre. Westfield Kotara includes 67,000 sq.m of retail floorspace, anchored by a David Jones department store, Kmart and Target discount department stores (DDS) and Coles and Woolworths supermarkets. The centre contains mini-majors such as Toys 'R' Us and First Choice Liquor, as well as around 200 specialty retail stores and a new cinema complex/dining precinct.

- Kotara Homemaker Centre is one of the largest bulky goods precincts in NSW, and contains of around 58,000 sq.m of retail floorspace, including major tenants such as Bunnings Warehouse, Domayne, Freedom Furniture, Trade Secret and The Good Guys, as well as around 35 – 40 other retailers including an Aldi supermarket.

- **Charlestown Major Centre**: contains the 80,000 sq.m Charlestown Square regional shopping centre, as well as several streets of ground floor retail and commercial floorspace. Charlestown Square is anchored by a Myer department store, Target and Big W DDS, and Coles and Woolworths supermarkets. The centre contains several mini-major tenants of the likes of H&M (recent addition), Dan Murphy's, Rebel Sport, JB Hi-Fi and City Beach, as well as around 250 specialty retailers.

There are four sub-regional centres across the surrounding region including Waratah Village, Stockland Jesmond, Stockland Wallsend and Stockland Glendale, the latter three which are located a significant distance from the Newcastle CBD, generally serving different markets to the proposed retail development expected to characterise the corridor lands.

Aside from Marketown, which is located within the Newcastle CBD as discussed earlier, the closest sub-regional shopping centre is Waratah Village, which is located around 6 km to the west of the corridor lands. **Waratah Village** contains a full-scale Coles supermarket (of around 3,500 sq.m), a larger Kmart store (which trades 24 hours a day), as well as around 20 specialty stores including pad-sites like Kmart Tyre and Auto and Red Rooster.

The higher order centres defined above are supported by a network of local and neighbourhood centres.

Some of the closer ones include:

- A standalone Aldi supermarket at **Cooks Hill** (in the inner-city residential trade area);
- **Junction Fair**, a 6,000 sq.m neighbourhood centre, which includes a full line Coles supermarket and about a dozen specialty stores;
- **Hamilton**, a small retail precinct including 5,000 sq.m of strip retail, including an Aldi supermarket and an IGA supermarket oriented around
- **Broadmeadow**, which contains around 3,600 sq.m of retail floorspace including an 1,800 sq.m Supa IGA and around 10 specialty retailers;
- **New Lambton**, which includes around 9,000 sq.m of street based retail, anchored by a Supa IGA; and
- **Mayfield**, which is a street/strip precinct generally oriented around Maitland Drive/Pacific Highway, including approximately 15,000 sq.m of retail floorspace, as well as a range of business/commercial floorspace and medical centres. This precinct includes a large Woolworths supermarket of around 4,900 sq.m and an Aldi supermarket.

Table 3.1
SRCL - schedule of competing retail facilities

Centre	Retail GLA (sq.m)	Major traders	Dist. by road from SRCL (km)
Inner city Newcastle	*58,500*		*n.a.*
Marketown	26,000	Big W, Woolworths, Coles	
Other CBD	30,000	Foodworks	
Honeysuckle	2,500	IGA	
Major/regional centres			
Westfield Kotara	*67,000*		*8.0*
• Existing	67,000	David Jones, Kmart, Target, Coles	
• Approved exp.	1,600	Mini-major	
• Proposed exp.	5,900	Mini-majors, spec.	
Charlestown Square	*80,000*		*9.6*
• Existing	80,000	Myer, Target, Big W, Coles, Woolworths	
Sub-regional town centres			
Waratah Village	12,000	Kmart, Coles	6.3
Stockland Jesmond	20,600	Big W, Woolworths, Aldi	9.0
Stockland Wallsend	10,900	Coles, Aldi	11.0
Stockland Glendale	*39,500*		*15.5*
• Existing	39,500	Kmart, Target, Coles, Woolworths, Aldi	
• Proposed	7,700	Coles (exp)	
Local/Neighbourhood centres			
Cooks Hill	3,500	Aldi	1.2
Junction Fair	6,000	Coles	2.3
Hamilton	5,000	Aldi, IGA	3.1
Broadmeadow	3,600	IGA	4.6
Mayfield	15,000	Woolworths, Aldi	5.6
New Lambton	9,000	Supa IGA	6.2
Proposed retail facilities			
Hunter Street Mall	4,900	n.a.	n.a.
Mayfield SC	6,000		*5.6*
• Level 1 (p)	4,580	Coles (p)	
• Ground (p)	1,420		

Source: Property Council of Australia; MacroPlan Dimasi

3.2 Proposed retail facilities

We have summarised the proposed new retail developments across the surrounding region that may be of relevance to the proposed development of retail/commercial floorspace in the corridor lands. These are summarised below:

- **The Hunter Street Mall project:** is a broad redevelopment of the area around the Hunter Street Mall consisting of a mix of uses, including retail, leisure, entertainment and residential uses. We understand the precinct could potentially yield around 4,900 sq.m of retail floorspace on the ground levels, which could include a metro-style supermarket, convenience related retail, (e.g. newsagent, pharmacy, hairdressers) as well as non-food discretionary retailers including mini-major tenants, boutique fashion, homewares, surf shops etc). A further 2,700 sq.m of commercial space is planned.

- A new Coles supermarket is about to be developed at **Mayfield,** at the intersection of Maitland Road and Havelock Street. The 4,380 sq.m Coles supermarket plus 200 sq.m Liquorland outlet will be located on the upper/first floor. There is preliminary approval for a further 1,500 sq.m or so of specialty floorspace on the ground/lower level, with tenancies subject to specific development applications.

Both major regional shopping centres recently underwent expansions, with Westfield Kotara also planned to undergo further expansion, discussed as follows:

- The expansion of **Westfield Kotara** entailed an entertainment & leisure precinct with dining & lifestyle components on the top level, including an 8 cinema complex. An approval exists for further expansion, with a net additional retail area of 1,600 sq.m. A more recent development application was submitted for an additional 5,800 – 5,900 sq.m of retail floorspace including new mini-majors, specialties and a reconfiguration of the Kmart tenancy.

- The expansion of **Charlestown Square** resulted in a net addition of 4,100 sq.m of retail floorspace, to accommodate two new mini majors (including H&M) and extra specialty retailers.

These expansions to the higher order regional centres of Westfield Kotara and Charlestown Square would have little influence on the potential development of street based/integrated mixed used retail and ancillary commercial development in the Newcastle rail lands corridor.

The redevelopment of the Hunter Street Mall precinct is expected to be an important catalyst for the transformation of the Newcastle CBD and is expected to provide a traditional retail offer including key anchor tenants like a supermarket and other important convenience oriented retail that is lacking in the heart of the Newcastle CBD.

Section 4: Retail and commercial floorspace demand

This section of the report provides an assessment of the retail/commercial floorspace demand generated by the various customer segments identified and the growth in this demand.

4.1 Retail floorspace demand

To assess the retail floorspace demand associated with the inner-city resident trade area, we have applied typical retail turnover benchmarks to the available retail expenditure market, by retail category, to translate expenditure estimates into floorspace estimates. These turnover benchmarks, or retail turnover densities (RTD), have been grown forward at a real growth rate of 0.5% per annum.

Due to the long term planning horizon being considered, and the diverse range/mix of retail, and the varying performance levels of certain retail categories and centre types, these estimates should be considered as indicative in nature.

Table 4.1 summarises the estimated retail floorspace demand generated by the inner-city resident trade area over the period 2015 to 2031. As shown, the population of the inner city resident trade area generates demand for around 36,800 sq.m of retail floorspace in 2015, and is expected to increase by around 1,400 sq.m per annum to reach approximately 58,600 sq.m by 2031.

To put this in context, even if all of the proposed retail/commercial floorspace in the rail corridor is allocated for retail uses, i.e. around 5,000 sq.m, this would be equivalent to just 3 – 3.5 years' worth of retail demand growth generated by the inner city resident main trade area population.

Table 4.1
SRCL main trade area - floorspace demand by category ($M), 2015-2031*

Year ending June	FLG	Food catering	Apparel	Household goods	Leisure	General retail	Retail services	**Total retail**
2015	9,976	6,570	4,338	10,023	2,184	2,578	1,114	36,783
2016	10,215	6,760	4,420	10,238	2,225	2,627	1,141	37,625
2017	10,527	7,001	4,533	10,525	2,282	2,693	1,175	38,736
2018	10,848	7,251	4,648	10,819	2,340	2,762	1,211	39,879
2019	11,193	7,519	4,772	11,136	2,402	2,836	1,250	41,108
2020	11,563	7,806	4,905	11,476	2,469	2,915	1,291	42,426
2021	11,952	8,108	5,045	11,832	2,540	2,998	1,335	43,808
2022	12,343	8,415	5,185	12,189	2,610	3,081	1,378	45,201
2023	12,732	8,722	5,321	12,542	2,679	3,162	1,422	46,580
2024	13,132	9,041	5,462	12,904	2,749	3,246	1,466	48,001
2025	13,546	9,372	5,606	13,277	2,822	3,331	1,513	49,466
2026	13,972	9,714	5,753	13,661	2,896	3,419	1,560	50,977
2027	14,393	10,057	5,898	14,038	2,969	3,505	1,607	52,466
2028	14,808	10,397	6,038	14,407	3,039	3,588	1,654	53,930
2029	15,234	10,750	6,181	14,785	3,111	3,673	1,701	55,436
2030	15,673	11,114	6,327	15,174	3,185	3,760	1,750	56,984
2031	16,124	11,491	6,477	15,572	3,261	3,849	1,801	58,576
Average annual growth (sq.m)								
2015-2031	384	308	134	347	67	79	43	1,362
Average annual growth (%)								
2015-2031	3.0%	3.6%	2.5%	2.8%	2.5%	2.5%	3.0%	3.0%

**Constant 2014/15 dollars & including GST*
Source: MarketInfo; MacroPlan Dimasi

Table 4.2 summarises the retail floorspace demand generated by the worker and tourist customer segments.

As shown, the surrounding CBD workers generate an estimated 16,400 sq.m of retail floorspace demand, which is expected to increase by around 40 - 45% by 2031, to reach 23,400 sq.m an increase of 7,000 sq.m.

The Newcastle LGA tourist customer segment generates retail demand equivalent to around 61,300 sq.m (spent across the entire LGA), and this is expected to increase by around 20%, or 10,500 sq.m to reach 71,800 sq.m by 2031.

Table 4.2
SCRL - worker & tourist customer segments - demand for retail floorspace, 2015-2031*"

Heading	Year 2015	2018	2021	2026	2031
Populations					
Newcastle CBD Worker population	21,790	23,730	25,740	27,720	28,810
Newcastle LGA daily tourist population**	14,912	15,364	15,830	16,637	17,486
Total non-residential TA populations	**36,702**	**39,094**	**41,570**	**44,357**	**46,296**
CBD Worker expenditure					
Total retail expenditure ($M)***	304	340	379	430	470
Near place of work (%)	35%	35%	35%	35%	35%
Total retail expenditure near place of work ($M)	**106**	**119**	**133**	**151**	**164**
Available expenditure per worker per year ($)	*4,883*	*5,017*	*5,159*	*5,433*	*5,708*
Estimated retail floorspace demand					
Estimated RTD ($/sq.m)	6,500	6,500	6,500	6,500	6,500
Newcastle CBD Worker population (sq.m)	16,370	18,044	19,828	21,934	23,361
Tourist expenditure - Newcastle LGA					
Total retail expenditure ($M)* **	**398**	**416**	**436**	**469**	**505**
Available expenditure per tourist per day ($)	*73*	*74*	*75*	*77*	*79*
Estimated retail floorspace demand					
Estimated RTD ($/sq.m)	6,500	6,598	6,697	6,867	7,040
Newcastle LGA daily tourist population (sq.m)	61,278	63,125	65,028	68,329	71,796

**Year ended June, all expenditure figures expressed inclusive of GST and in constant $2014/15*
*** Calculated by taking total visitor nights, adding day trippers (each worth half a visitor night), then dividing annual visitation by 365*
****Total retail expenditure across whole Newcastle LGA*
Source: Tourism Research Australia; MarketInfo; MacroPlan Dimasi

4.2 Commercial floorspace demand

Whereas the demand for retail floorspace is intrinsically linked to population and population growth, demand for office floorspace in a particular sub-market like the Newcastle CBD is affected by a multitude of factors including broad economic conditions, local economic conditions, other competitive office markets as well as population and employment growth – in particular, white collar employment growth.

Table 4.3 presents a high level indicative assessment of the potential demand for commercial office floorspace in the Newcastle CBD over the period 2015 to 2031, by applying a methodology that uses the current rate of provision of office floorspace as a proportion of the existing residential population across the Lower Hunter region (i.e. 255,000 sq.m divided by 544,300 persons = 0.47 sq.m per person).

Assuming that this ratio stays roughly the same in the future, which is a reasonable assumption, given the transformation plans for the Newcastle CBD, we estimate demand for commercial/office space in the Newcastle CBD to grow by around 2,200 sq.m per annum, or around 34,000 – 35,000 sq.m over the next 16 years to 2031. Only a small proportion of this demand will be accommodated in the surplus rail corridor.

Table 4.3
SRCL - demand for commercial floorspace, 2015-2031*

	Year				
Heading	2015	2018	2021	2026	2031
Population					
Primary sector (i.e. inner city Newcastle)	13,409	14,459	15,659	17,659	19,659
Secondary and tertiary sectors	530,930	544,130	557,030	577,530	598,030
Total trade area	**544,339**	**558,589**	**572,689**	**595,189**	**617,689**
Est. CBD office demand (sq.m)					
CBD office floorspace per person**	0.47	0.47	0.47	0.47	0.47
Newcastle CBD office floorspace (sq.m)	**255,166**	**261,846**	**268,455**	**279,003**	**289,550**
Change (2015 - 31) (sq.m)					**34,384**

**Year ended June*
***Based on ratio of office floorspace in Newcastle CBD to Lower Hunter Region resident population, as at 2015.*
Source: Property Council of Australia; MacroPlan Dimasi

Section 5: Economic impacts

This section of the report presents our estimates of likely trading impacts on the Newcastle CBD and the surrounding retail/commercial centres hierarchy, and then discusses the implications of these impacts.

5.1 Purpose of assessing trading impacts

The purpose of an impact assessment is to provide guidance as to whether or not there is likely to be a net community benefit or disbenefit from any proposed development. In particular, if there is a real possibility of some existing facilities potentially being impacted to such a degree that they may be lost to the community and if the service or services provided by those facilities are not at the very least replaced by the proposed new facilities, then a community disbenefit could result. In order to understand whether any particular centre may be impacted to the extent that its continued viability may be in question, we have estimated specific retail impacts that we expect across the surrounding competitive network if the proposed supermarket based development at the subject site were to proceed as planned.

This analysis also explores if a net community benefit would be realised from new retail/commercial development in the corridor which might positively impact on surrounding retailers/businesses and the surrounding community (e.g. rejuvenation of an underperforming/underinvested CBD).

These estimates provide indications as to whether the scale of the proposed retail development is reasonable and whether any surrounding centres are likely to be at risk to the extent that the community would suffer a net disbenefit, attributable to the proposed retail development.

In considering likely trading impacts on any individual centre or individual retailer, it must first be acknowledged that such estimation can only realistically expect to provide a broad indication of likely outcomes, since there are many factors which can change in response to any new retail development, and which will have a bearing on the consequent outcomes. The competitive response of each relevant centre or trader is one such factor, as are further redevelopments/improvements which one or more of the competitive network of centres might implement.

5.2 Impacts methodology

The following factors are typically considered when assessing the potential impacts of retail development on each existing facility or centre:

- The distance of the (impacted) centre, or retail precinct, by road, from the proposed development.
- The size of the centre or precinct, in terms of total retail floorspace.
- The amount of supermarket floorspace, and brands of these supermarkets.
- The role and function of the centre or precinct.
- Relative accessibility and relative convenience compared with the proposed retail development.
- The estimated performance of the centre/precinct (in current sales) and future performance (in the impact year), accounting for any future developments in the region that may also impact on the future sales of existing centres.
- The share of available expenditure which the centre/precinct attracts from the identified main trade area of the proposed development. A centre may not be situated in the identified trade area of the proposed development but its main trade area may extend to include parts, or all, of the trade area. For example, the trade area for large regional shopping centre typically includes several hundred thousand persons. Such a trade area

is likely to include (partially or completely) trade areas for smaller convenience based centres, sub-regional centres, retail strips and stand-alone supermarkets.

The following key principles are then relied on when assessing the dollar (and percentage) impacts that are likely to be absorbed by existing facilities/centres:

- The greatest impacts are typically absorbed by the closest comparable retail developments. For example, a new Woolworths supermarket is generally likely to impact the closest nearby Woolworths supermarket to the greatest extent, followed by impacts on other comparable large supermarkets (e.g. Coles), and at the lower end of the spectrum, by smaller scale supermarkets/food stores, which serve much more limited roles.

- Impacts on small scale, local supermarkets/food stores, tend to be relatively smaller in scale, as these stores normally attract a small market share of available main trade area expenditure and perform a different role and function in the hierarchy, often serving the local walkable catchments surrounding them, and/or serving more specialised/discerning needs (e.g. specialty food stores).

Table 5.1 sets out an assessment of the likely order of trading impact on identified centre/retail precinct showing:

- The estimated floorspace (GLA) and sales volume for each centre/precinct as at 2014/15.

- The estimated sales volume for each centre/precinct at 2019/20 assuming no development at the subject site.

- The estimated sales volume for each centre/precinct at 2019/20 after allowing for the proposed development at the subject site at 2019/20.

- The consequent estimated trading impact, measured both as a sales volume and a percentage impact, on each centre.

- The estimated post-impact sales performance at 2019/20 as compared with current (2014/15) sales for each centre/precinct.

We have indicated earlier that we have broadly assumed that the developable retail/commercial area associated with the planning proposal could be indicatively allocated around 50% to retail uses and around 50% to commercial type uses (e.g. banks, consulting firms, insurance, accountants, lawyers, gyms, medical etc).

In order to estimate the absolute worst case scenario of impacts on the surrounding retail network, we have modelled the cumulative impacts from both the proposed retail component of the corridor lands indicative development scheme and the Hunter Mall/East End redevelopment.

We have estimated that when the entire corridor lands development is completed by the year 2019/20, that estimated sales of the ground floor retail component (i.e. about 2,500 sq.m) could potentially be in order of $16 – 16.5 million ($2014/15) based on an average retail turnover density of $6,500 per sq.m.

Table 5.1
SCRL - Estimated impacts on retail hierarchy (2019/20)*

		Est. Sales (2019/20)			Est. Impacts (2019/20)								
					SRLC			Hunter Mall			Combined		
Centre	GLA (sq.m)	Est. sales (2014/15) $M	Without dev. $M	With dev.** $M	Dist. Of impacts (%)	Est. Impacts $M	%	Dist. Of impacts (%)	Est. Impacts $M	%	Est. Impacts $M	%	% diff. from 2014/15
Newcastle CBD	63,400	387.7	487.3	447.3	65.0%	-10.6	-2.2%	60.5%	-29.4	-6.0%	-40.0	-8.2%	15.4%
Marketown	26,000	200.0	226.3	204.0	17.5%	-2.8	-1.3%	40.0%	-19.4	-8.6%	-22.3	-9.9%	2.0%
Hunter Street Mall***	4,900	n.a.	48.6	47.0	10.0%	-1.6	-3.3%	n.a	n.a.	n.a.	-1.6	-3.3%	n.a.
Newcastle CBD (inc. Honeysuckle)***	32,500	187.7	212.4	196.3	37.5%	-6.1	-2.9%	20.5%	-10.0	-4.7%	-16.1	-7.6%	4.6%
Nearby centres/precincts													
Cooks Hill	3,500	25.4	28.0	26.2	2.5%	-0.4	-1.4%	3.0%	-1.5	-5.2%	-1.9	-6.7%	3.1%
Junction Fair	6,000	60.5	66.8	65.4	1.0%	-0.2	-0.2%	2.5%	-1.2	-1.8%	-1.4	-2.1%	8.1%
Hamilton	5,000	45.7	50.4	49.5	1.5%	-0.2	-0.5%	1.5%	-0.7	-1.4%	-1.0	-1.9%	8.3%
Sub-total	**77,900**	**519.3**	**632.6**	**588.4**	**70.0%**	**-11.4**	**-1.8%**	**67.5%**	**-32.8**	**-5.2%**	**-44.2**	**-7.0%**	**13.3%**
Other centres / beyond TA*****					30.0%	-4.9		32.5%	-15.8		-20.7		
Total est. retail sales - rail corridor					**100.0%**	**-16.3**		**100.0%**	**-48.6**		**-64.9**		

Sales expressed inclusive of GST and in $2014/15
**Accounts for impacts of Hunter Street Mall and SCRL on other centres/precincts*
***Assumes a 2,500 sq.m supermarket and around 2,400 sq.m of specialty retail = 4,900 sq.m*
****Assumes that existing tenants in the Hunter Street Mall move to other parts of the CBD (i.e. net addition of 6,500 sq.m).*
*****Accounts for an overall improvement in the CBD retail offer - becoming a more attractive retail destination generally.*
Source: Property Council of Australia; MacroPlan Dimasi

5.3 Consideration of trading impacts

The key points to note regarding the estimated impacts across the surrounding retail hierarchy, as presented in Table 5.1, include the following:

- The retail sector is dynamic, and the development of new retail facilities, or expansions in existing retail facilities, is linked to evident undersupply and/or growth in population. New players, new centres, new concepts and new competition will seek to enter any retail hierarchy where there is a market gap and/or future population growth to support such development.

- A projection of likely impacts on individual centres/precincts must be regarded as indicative only, since there are many factors that will go to determine the future sales performance of any shopping centre/retail precinct. Not least amongst those factors are the initiatives or changes which the centre in question might choose to implement, particularly as a competitive response to new retail development elsewhere.

- The retail component of the corridor lands is expected to be around half of the total retail/commercial allocation (i.e. around 2,500 sq.m). This is a very small provision of retail in the context of the broader offer within the Newcastle CBD, and would be widely dispersed across the rail lands corridor (i.e. not one consolidated offer with an anchor tenant). Even in combination with the Hunter Mall redevelopment (4,900 sq.m), the total additional provision of retail floorspace is not significant.

- Generally, retail trading impacts between 10% and 15% are considered by the industry to be significant but acceptable, with impacts less than 10% considered relatively moderate, and impacts less than 5% generally considered minor/negligible. However, other factors such as the current trading performance; expansions of centres; potential loss of services to the community; expected growth in the region; and overall net community benefit should be considered.

- We estimate the impacts attributable to the corridor lands retail component to be minor/negligible, with all impacts estimated to be less than 4% on any individual centre.

- Estimated impacts on the proposed Hunter Street Mall redevelopment are expected to be around 3.3% and across the rest of the Newcastle CBD retail offer, we estimate impacts in the order of 2.9%.

- The cumulative impacts of both the corridor lands and Hunter Mall redevelopment are estimated to be less than 10% on any individual centre, which is considered to be a moderate level of impact (i.e. within an acceptable range). Allowing for future growth in the surrounding trade areas for the various centres, we estimate that all surrounding retail centres would achieve sales levels in 2019/20 above current trading levels – even with both the corridor lands development and the Hunter Mall redevelopment.

- Impacts on the Marketown sub-regional shopping centre are expected to be around 9 – 10%, primarily due to the Hunter Mall development. We expect a supermarket at Hunter Mall to drive the majority of this impact, with impacts mainly absorbed by supermarket retailers at this centre.

- We estimate impacts on nearby centres/precincts at Hamilton, Junction Fair and Cooks Hill to be moderate to negligible, at less than 7%.

- We expect that retailers in the CBD will, to some extent, benefit from the proposed rezoning of the corridor lands and the Hunter Mall redevelopment because it will result in additional residential population and workers along the corridor. Furthermore, the proposed rezoning would create additional critical mass of retail and commercial floorspace in the CBD, boosting the overall profile of the CBD as a retail and entertainment destination. Potentially, there will improvements to retail/commercial vacancy levels in the CBD. Therefore we estimate around 30% – 32.5% of total sales generated by the proposed development would be attributable to other centres, broadly across the retail hierarchy.

- In summary, the proposed rezoning of the rail corridor lands to enable the potential development of around 5,000 sq.m of retail/commercial floorspace is considered appropriate, and would represent only a small addition to the retail network. Even in combination with the proposed redevelopment of the Hunter Mall precinct, cumulative impacts across the retail hierarchy are expected to be moderate.

- Impacts of the order estimated are highly unlikely to result in any detrimental impacts on the surrounding retail/centres hierarchy across the region, nor other retail precincts within the Newcastle CBD. Additional retail/commercial development within the Newcastle CBD is likely to boost the overall profile and attractiveness of the CBD as a retail, entertainment and commercial destination.

Attachment C - Geotechnical and Contamination Assessment

By Douglas Partners, dated March 2017

Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Preliminary Geotechnical Assessment

Newcastle Urban Transformation and Transport Program - Rezoning of Surplus Rail Corridor Land
Worth Place to Watt Street, Newcastle

Prepared for
Elton Consulting
on behalf of UrbanGrowth NSW

Project 81716.01
March 2017



Douglas Partners
Geotechnics / Environment / Groundwater

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		23 March 2017
Reviewer		23 March 2017

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
15 Callistemon Close
Warabrook NSW 2304
PO Box 324
Hunter Region Mail Centre NSW 2310
Phone (02) 4960 9600
Fax (02) 4960 9601

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Executive Summary

This report presents a desktop geotechnical assessment of government rail corridor lands between Worth Place and Watt Street, Newcastle. It is understood that UrbanGrowth NSW wishes to repurpose the surplus Newcastle rail corridor lands for urban revitalisation.

The scope of work comprised collation and review of geotechnical data from Douglas Partners files and published information, review of previous mine information, development of a broad geotechnical model for the site and provision of preliminary guidance on geotechnical design considerations including material types, excavation conditions, shoring/retaining wall options, foundations, settlement and likely extent of mine workings.

On the basis of the findings of this assessment, the rail corridor site is considered to be suitable for the proposed rezoning from a geotechnical perspective.

It is expected that with suitable investigation, design and construction in accordance with accepted engineering practice, the geotechnical design constraints can be readily managed.

Prior to the detailed design of any proposed developments specific geotechnical investigation will be required appropriate to the nature of the proposed development. Investigation and design will need to consider constraints such as the presence of filling, groundwater and acid sulphate soils, excavation conditions, earthworks requirements and procedures, suitable footing options and requirements relating to potential mine subsidence, where applicable.

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Report on Preliminary Geotechnical Assessment

Newcastle Urban Transformation and Transport Program - Rezoning of Surplus Rail Corridor Land

Worth Place to Watt Street, Newcastle

1. Introduction

1.1 General

This report presents a desktop geotechnical assessment of government rail corridor lands between Worth Place and Watt Street, Newcastle. The report was prepared by Douglas Partners Pty Ltd (DP) at the request of Elton Consulting, acting on behalf of UrbanGrowth NSW.

It is understood that UrbanGrowth NSW wishes to repurpose the surplus Newcastle rail corridor lands for urban revitalisation. To achieve this objective it is necessary to rezone the corridor lands from Special Purpose Infrastructure 2 (SP2) to zones that accommodate a range of urban land uses.

The purpose of the geotechnical assessment is to collate available geotechnical data in and around the rail corridor in order to identify geotechnical constraints and opportunities for development of the land.

This report has been prepared to support the amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor land ('rail corridor land') between Worth Place and Watt Street in Newcastle city centre (Figure 1).

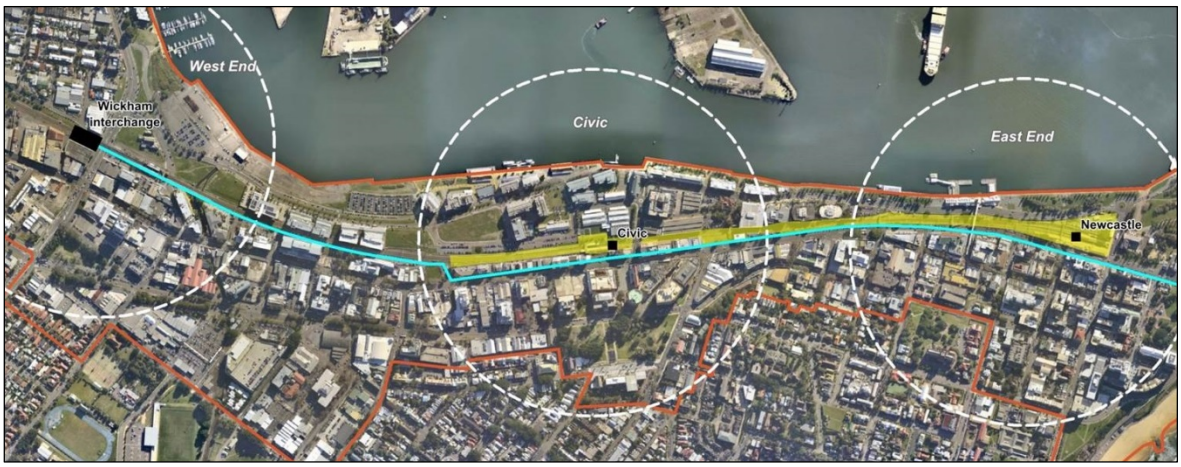


Figure 1: Rezoning study area (Source: Hassell)

The Newcastle Urban Transformation and Transport Program ('Program') has been established to deliver on NSW Government's more than $500m commitment to revitalise the city centre through: the truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange; the provision of a new light rail line from Wickham to the Beach; and the delivery of a package of urban transformation initiatives.

1.2 Newcastle Urban Transformation

The Newcastle Urban Renewal Strategy (NURS) sets out the NSW Government's long term approach and vision for the revitalisation of Newcastle city centre to the year 2036.

The NURS identifies three character precincts in Newcastle city centre (West End, Civic and East End), within which significant housing and employment opportunities, together with built form and public domain changes and improvements exist. The NURS describes these precincts as:

- East End: residential, retail, leisure and entertainment;
- Civic: the government, business and cultural hub of the city;
- West End: the proposed future business district including the western end of Honeysuckle (Cottage Creek).

UrbanGrowth NSW has been directed by NSW Government to deliver on NURS through the Program, in partnership with Transport for NSW (TfNSW), the Hunter Development Corporation (HDC) and the City of Newcastle Council (Council).

1.3 Proposed Rezoning

UrbanGrowth NSW seeks to amend the Newcastle Local Environmental Plan 2012 (NLEP) to enable the delivery of the Program and the objectives of NURS planning outcomes.

Surplus rail corridor land runs through the East End and Civic city centre precincts as established by NURS. Based on this vision and the results of extensive stakeholder and community engagement, an overall urban transformation concept plan (the concept plan) has been prepared for the surplus rail corridor (rezoning sites), as well as surrounding areas.

The concept plan considers and integrates with the delivery of light rail. It is also coordinated with the proposed Hunter Street Mall development to create an interactive, synergised and cohesive city centre and foreshore area.

The concept plan (as shown in Figure 2) includes five key 'key moves', two that relates to the Civic precinct and three of which relate to the East End. Figure 2 provides a red line to define the site rezoning area within the broader program planning outcomes.

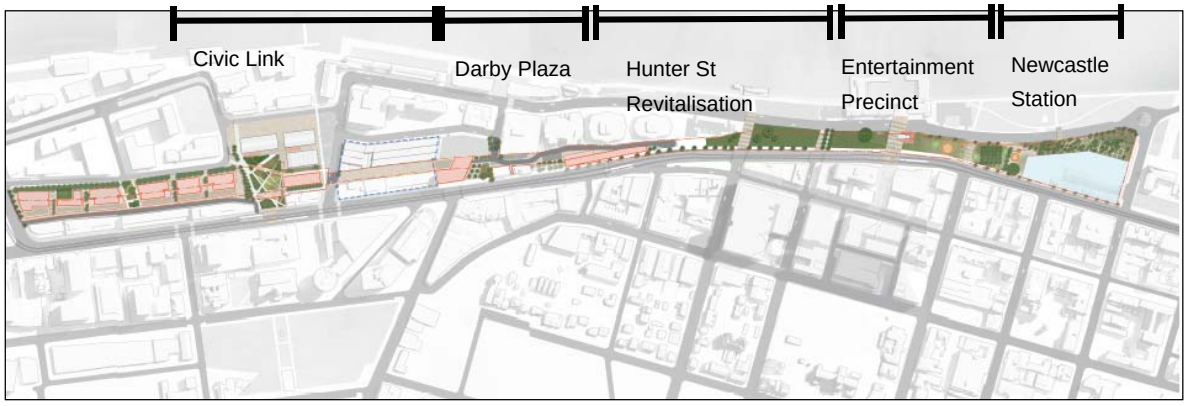


Figure 2: Rezoning concept plan (Source: Hassell)

This planning proposal seeks to rezone rail corridor land (rezoning sites) to enable the delivery of the proposed urban uses established in the concept plan.

An indication of the location of the proposed rezoning parcel is indicated in the map in Figure 3.

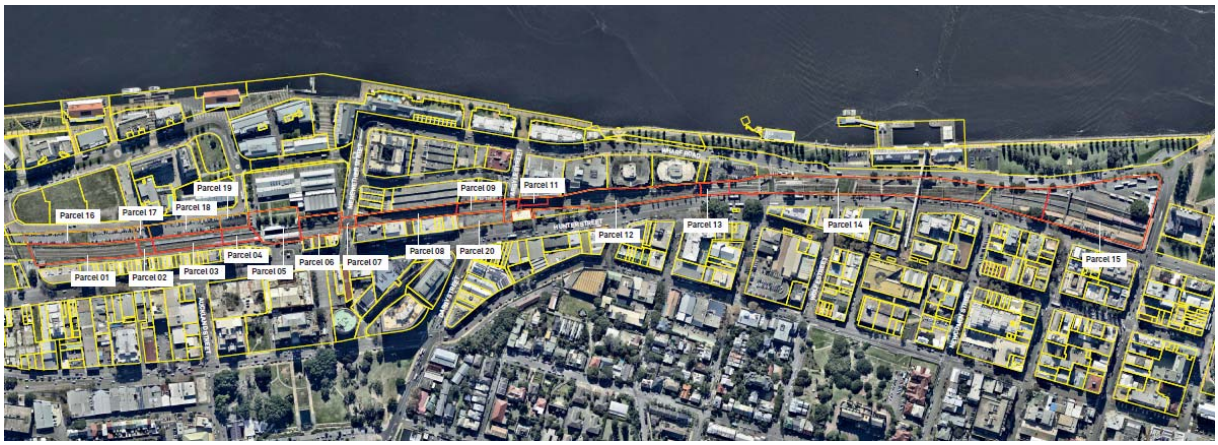


Figure 3: Rezoning explanatory map and Parcels (Source: Hassell)

This report has been based upon the proposed zoning under the Planning Proposal as submitted for Gateway determination, with the inclusion of Parcel 13. It is noted that this parcel has been removed from the current Planning Proposal in accordance with the Gateway determination as issued by the NSW Department of Planning and Environment. Nevertheless, for completeness, this report has considered the potential for some development occurring within this parcel in the future (subject to outcomes of a separate Planning Proposal). The recommendations of this report discuss whether there are any specific implications arising from this additional parcel.

The planning proposal concept plan includes public domain, entertainment, mixed use and commercial and residential development.

In general, the proposed rezoning will provide a mix of uses enabling between 400-500 dwellings which will comprise a variety of styles and types, and around 5,000m^2 of commercial, restaurant and other entertainment uses, as described in Table 1, and excluding any education or associated uses.

Table 1: Sites for Rezoning - Proposed Development Summary

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 01 B4 Mixed Use 3,370m^2	Parcel 01	3,370m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 02 B4 Mixed Use 408m^2	Parcel 02	408m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 03 B4 Mixed Use 3,146m^2	Parcel 03	1,869m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
	Parcel 04	900m^2	B4 Mixed Use	FSR – 3:1	Height - 24m
Parcel 04 RE1 Public Recreation 2,464m^2	Now parcel 05 (and small corner of old 03 where western boundary of park realigned)	2,839m^2	RE1 Public Recreation	N/A	N/A
Parcel 05 B4 Mixed Use 1,603m^2	Now parcel 06	1,604m^2	B4 Mixed Use	FSR – 3:1	Height – 18m
Parcel 06 B4 Mixed Use 295m^2	Now parcel 07	295m^2	B4 Mixed Use (road)	FSR – 2.5:1	Height – 30m
Parcel 07 B4 Mixed Use 2,040m^2	Now parcel 08	2,040m^2	B4 Mixed Use	FSR – 2.5:1	Height – 30m
Parcel 08 B4 Mixed Use 988m^2	Now parcel 09	988m^2	B4 Mixed Use	FSR – 4:1	Height – 24m
Parcel 09 B4 Mixed Use 467m^2	Now parcel 10	467m^2	RE1 Public Recreation	N/A	N/A
Parcel 10 SP2 Infrastructure 386m^2	Now parcel 11	386m^2	SP2 Infrastructure	N/A	N/A
Parcel 11 B4 Mixed Use 4,542m^2	Now parcel 12	4,542m^2	B4 Mixed Use	FSR – 1.5:1	Height – 14m
Parcel 12 B4 Mixed Use 1,544m^2	Now parcel 13 (and has been reduced in size)	659m^2	SP2 Infrastructure	N/A	N/A

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 13 RE1 Public Recreation 303m^2	Now parcel 14 (new parcel 14 encompasses part of old parcel 12, and the whole of old parcel 13, 14 and 15)	11,151m^2	RE1 Public Recreation	N/A	N/A
Parcel 14 B4 Mixed Use 2,251m^2					
Parcel 15 RE1 Public Recreation 7,713m^2					
Parcel 16 SP3 Tourist 10,698m^2	Now parcel 15	10,698m^2	SP3 Tourist	FSR – 1.5:1	Height – 10-15m

2. Site Location and Description

2.1 Site Location

The rezoning site is located in Newcastle city centre and comprises a collection of land holdings within the surplus rail corridor lands.

The site is approximately 2.1 km in length generally bounded by Wharf Road to the north, Watt Street to the east, Hunter and Scott Streets to the south and Worth Street to the west. The site includes Civic and Newcastle Stations.

The site area subject to the rezoning is shown in Figure 4 below and at larger scale in Drawing 1 in Appendix D.



Figure 4: Rezoning Site area (Source: Elton Consulting)

2.2 Site Description

The planning proposal to rezone rail corridor land relates to five (5) land holdings identified in Table 2 below. Together these land holdings are subject to the proposed NLEP Amendment and are known as the 'rezoning sites' for the purpose of this report.

The total area of the rezoning sites is approximately 42,218m^2 or 4.2 hectares (ha).

Table 2: Summary of land holdings subject to proposed NLEP Amendment

Previous Legal description (Lot/DP)	Current Legal Description (Lot/DP)	Current use	Current zone (as per NLEP)	Current ownership (as at March 2017)
Part Lot 22 DP1165985	Lot 2 in DP1226145	Railway and rail associated	SP2 Infrastructure (Railway)	Hunter Development Corporation
Lot 1 DP 1192409	Remained the same	Railway and level crossing (Merewether Road)	SP2 Infrastructure (Railway)	Rail Corporation NSW
Lot 1001 DP1095836	Lot 2 in DP1226551	Railway and rail associated	SP2 Infrastructure (Railway)	Hunter Development Corporation
Lot 21 DP 1009735	Lot 4 in DP1226551	Railway and rail associated	SP2 Infrastructure (Railway)	Hunter Development Corporation
Lot 22 DP 1009735	Lot 6 in DP1226551	Railway and rail associated	SP2 Infrastructure (Railway)	Hunter Development Corporation

The site is currently zoned 'SP2 – Infrastructure (Railway) under the Newcastle Local Environment Plan.

3. Scope of Work

The scope of work for this assessment was developed with reference to the brief prepared by Elton Consulting, including consideration of the staging of the work, consultation and meetings. The detailed scope is as follows:

- Collate and review in-house geotechnical data from Douglas Partners files;
- Collate and review published geological and geotechnical information, including geology maps, acid sulphate maps, soil landscape maps and other information available in the public domain;
- Obtain relevant mine workings maps ('record traces') from the NSW Department of Industry, department of Resources and Energy to assess the potential impact of abandoned coal mines;
- Develop a broad geotechnical model of the rail corridor site, including likely sub-surface profile, presence of groundwater, assessment of mine workings;
- Provide preliminary guidance on geotechnical design matters, including excavation conditions, likelihood of unsuitable materials, shoring/retaining wall options, shallow footings, piles, and settlement;
- Provide comment of mine workings, likely extent of influence and preliminary assessment of mine stability based on the available mine plans;
- Preliminary assessment of mine subsidence design parameters based on available data and previous experience;
- Preparation of a draft report at Pre-Gateway phase, presenting the findings and commenting on the suitability of the land for development purposes;
- Updating of report following client comments and review of the Secretary's Study Requirements (Pre and Post-Gateway).

Following submission of this report, it is understood that further involvement by DP may include:

- Input into the Development Control Plan;
- Consultation with government agencies;
- Attendance at meetings and community consultation session as required.

4. Background Geotechnical Data

4.1 Regional Geology

The regional geology along the rail corridor is shown on the 1:100,000 scale regional geology map for Newcastle (Newcastle Coalfield Regional Geology, Sheet 9321, NSW Department of Mineral Resources). Figure 5 shows the regional geology with the approximate extent of the site delineated in blue.

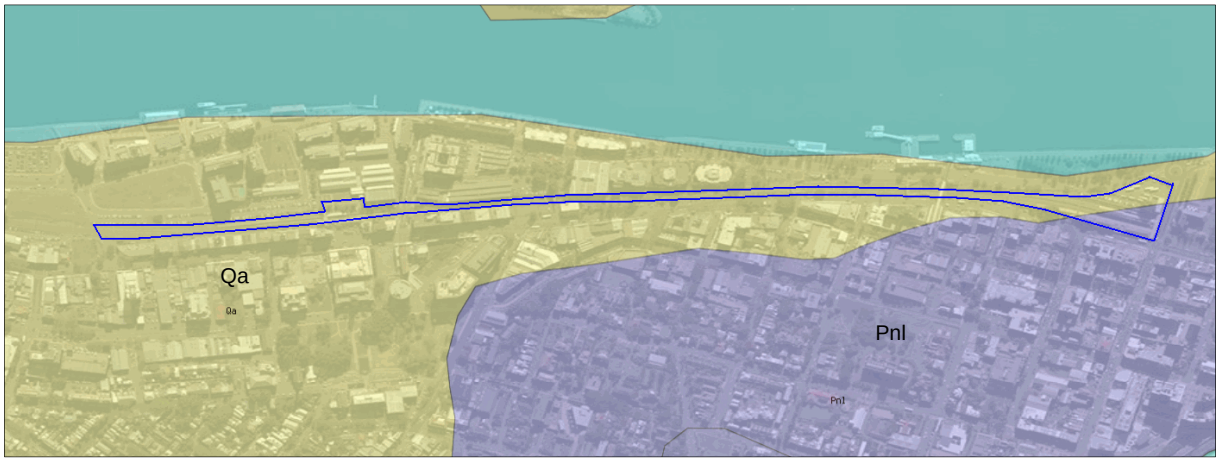


Figure 5: Published Regional Geology

The geology is characterised by the following components:

- The majority of the rail corridor site is underlain by Quaternary Alluvium (Qa), which comprises gravel, sand, silt and clay (yellow shading);
- A small section of the site at the eastern end, in the vicinity of Newcastle Station, is underlain by the Permian-aged Newcastle Coal Measures (Pnl), which in this area comprises the Lambton Subgroup. This formation is characterised by sandstone, siltstone, claystone, coal and tuff (purple shading).

The natural soils are typically overlain by man-made fill materials to varying depths, related to reclamation, historical industrial usage, infrastructure and commercial development.

4.2 Acid Sulphate Soils

The risk of the presence of acid sulphate soils is presented on maps prepared by the NSW Department of Land and Water Conservation. The mapped risk zones from the Newcastle risk map is shown in Figure 6.



Figure 6: Acid Sulphate Soil Risk in the Vicinity of the Project Site

The mapped acid sulphate soils are characterised as follows:

- High probability of occurrence of acid sulphate soils at depths of between 1 m and 3 m below the ground surface in the eastern portion of the site (i.e. the red shaded area);
- Low probability of occurrence of acid sulphate soils at depths greater than 3 m below the ground surface over the majority of the site (orange shaded area);
- There is a high probability of acid sulphate soil materials at depths between 1 m and 3 m below the ground surface in a narrow area of the site, from the western portion of the Civic Station platform to Worth Place, marginally encroaching the northern portion of the rail corridor in that area.

4.3 Coal Mining

4.3.1 General

The majority of the subject site lies within the Newcastle Mine Subsidence district, except the portion to the east of Market Street (part of Parcel 14 and Parcel 15) which is not within a district. The development of sites within a mine subsidence district requires Mine Subsidence Board (MSB) approval and may have a number of conditions applied. Development of sites outside of a mine subsidence district do not require formal MSB approval, however still have access the mine subsidence compensation fund and informal MSB requirements may be sought or invoked through the Consent Authority conditions.

There are three major coal seams present beneath the site, all of which have been mined at various locations and times, but not necessarily at the same location. Plans of mine workings, where they exist, are not always accurate as they were prepared before the advent of modern survey techniques. The plans indicate that most of the rail corridor itself is not directly undermined.

The three major coal seams and known history of mining relative to the subject site are discussed in the following sections. Reference may also be made to the geotechnical cross-sections (Drawings 2 and 3) which illustrate the recorded depth and thickness of these coal seams at the site.

4.3.2 Dudley Seam

The Dudley Seam is the shallowest of the three major coal seams. It has been encountered at depths ranging from about 10 m to 25 m below the ground surface.

Previously uncharted mine workings in the Dudley Seam have been ‘discovered’ during foundation construction on a number of sites in the Newcastle inner city area during the past two or three decades, notably in the eastern part of the CBD. The workings are thought to have been convict workings, mined prior to about the 1830s in a typically random layout, making investigation and delineation of the workings difficult.

Available information and MSB records indicate that no mining has occurred within the Dudley Seam in the vicinity of the subject site. The closest location to the subject site where DP is aware of workings within the Dudley Seam is well south of the subject site between Newcomen and Bolton Streets.

4.3.3 Yard Seam

The Yard Seam is typically encountered at depths ranging from 25 m to 40 m beneath the Newcastle inner city area. Mining typically occurred in a regular pattern.

The closest location to the subject site where DP is aware of workings in the Yard Seam is to the west of the intersection of Hunter and Darby Streets, where mine workings were encountered during geotechnical investigations for the new courthouse building. MSB has commented that the Yard Seam is unlikely to affect the rail corridor site based its recorded extent, however this should be confirmed by investigation drilling (see Section 6.5.3 and MSB letter Appendix C).

4.3.4 Borehole Seam

The Borehole seam is typically found at a depths ranging from of 70 m to 80 m in the vicinity of the site. Some areas bordering the site are underlain by abandoned coal mine workings undertaken in the Borehole Seam by AA Company, based on Record Trace (RT) 566. Abandoned coal mine workings in the Borehole Seam by Hetton Colliery and Delta Collieries are also present to the north of the site.

The mining plans indicate the following:

- Bord and pillar workings, with pillar widths in the range 7 m to 17 m, and bord widths of 3 m to 6 m. The pillars are generally rectangular with typical lengths of 10 m to 35 m, with occasional smaller and larger pillars. Pillar width to height ratios are typically in the range 1.5 to 3.5;
- The workings are shown to be primarily located south of Hunter Street, with some sections extending beneath Hunter Street to the edge of the rail corridor;
- The workings are also present to the north the rail corridor on both sides of Merewether Street;
- There are two areas where the workings cross beneath the rail corridor - one near the intersection of Darby and Hunter Streets and one between Auckland Street and Union Lane. These crossings consist of two bord and intervening pillar;
- A structure described as “AA Coy’s Bridge” is shown to cross the site near Crown Street. It is likely that this was a reference to a surface feature present at the time of mining operations.

Based on information on RT566, the thickness of the Borehole Seam is commonly about 6.2 m to 6.4 m but can range from about 5 m to 7 m. Workings were typically undertaken in three stages as follows:

- First Workings – 2.6 m;
- Second Workings – 1.6 m;
- Third Workings – 1.2 m.

Therefore the total worked section ranged up to about 5.4 m in height, however in places only the first or both first and second workings were undertaken in which case the workings section would be 2.6 m or 4.2 m in height respectively. Drawing 4 (Appendix D) shows the recorded extent of mine workings in the Borehole Seam in the vicinity of the site.

4.4 Seismicity

The region is an area of low to moderate seismicity and lies within an intra-plate tectonic region. A significant earthquake occurred in December 1989 (''the Newcastle Earthquake'') which registered approximately 5.6 on the Richter scale, and was assessed to have a return period of about 500 years.

Where deep alluvial soils are present the bedrock motion can be amplified at the surface, and may become a design consideration for certain structures. See Section 6.4 for appropriate seismic factors.

4.5 In-house Geotechnical Records

DP has completed a large number of investigations in and around the subject site, dating back to 1965. The most relevant of these investigation reports are listed in Table 3 and represent the principal sources of geotechnical information for this assessment.

Table 3: Principal Sources of Geotechnical Information from DP Files

No	Date	DP Project	Report Title	Field Work (max depth)
1	Jul 1965	00865	Report on Foundation Conditions, Maritime Services Board. Scott and Newcomen Streets, Newcastle	7 bores (6.1 m)
2	Feb 1985	08768	Preliminary Geotechnical Investigation for Redevelopment of Darks Ice Works Site, Wharf Road, Newcastle	3 bores (25.3 m)
3	Jan 1986	09374	Geotechnical Investigation, Proposed Queens Wharf Development	11 bores (9.9 m)
4	Mar 1986	08768-2	Geotechnical Investigation for Stage 1, Development of Darks Ice Works Site, Wharf Road, Newcastle (NSW Government Buildings)	3 CPTs (9.0 m)
5	May 1988	11001	Geotechnical Investigation, Proposed Two Storey Building, 520 Hunter Street, Newcastle	3 CPTs (10.3 m)
6	Nov 1993	16670	Geotechnical and Mine Subsidence Investigation, Proposed Commercial Development, Civic Workshops, Honeysuckle	30 HA bores (2.0 m) 2 cored bores (87.4 m) 15 CPTs (23.9 m) 14 test pits (2.2 m)
7	Dec 1996	18606	Geotechnical Investigation and Contamination Assessment, Proposed Newcastle Station Interchange, Wharf Road and Watt Street, Newcastle	8 bores (23.5 m) 3 groundwater wells
8	Aug 1997	18711	Borehole Seam Investigation, Proposed Holiday Inn, Wharf Road, Newcastle (Crown Plaza)	1 bore (86.9 m)
9	Nov 1998	18862/1	Cone Penetration Testing, Mine Workings and Geotechnical Investigation, Honeysuckle Development Precinct	6 CPTs (38.1 m)
10	Dec 1998	18862/3	Geotechnical Investigation of Abandoned Mine Workings, Wickham and Bullock Island Coal Company, Honeysuckle	4 bores (84.3 m)
11	Sep 2000	18862C	Geotechnical Investigation of Abandoned Mine Workings, Wickham and Bullock Island Coal Company, Honeysuckle	2 bores (84.4 m)
12	Oct 2000	31145	Geotechnical Investigation, Lot 1112 (Honeysuckle House)	5 bores (78.7 m)

Table 3: Principal Sources of Geotechnical Information from DP Files (Continued)

No	Date	DP Project	Report Title	Field Work (max depth)
13	Sep 2001	31395	Geotechnical Investigation, proposed Building Development 141 Scott St Newcastle	2 HA bores (2 m)
14	Oct 2001	31159B	Geotechnical and Environmental Investigation, The Boardwalk Development, Workshop Way, Newcastle	3 bores (4.8 m) 12 test pits (4.8 m) 5 CPTs (15.6 m)
15	May 2002	31395A	Geotechnical Investigation, Proposed Building Development 141 Scott St Newcastle	4 bores (4.9 m)
16	Jun 2003	31752	Geotechnical Investigation, Proposed Carrier Main, Merewether Street, Newcastle	6 bores (3.5 m)
17	Feb 2004	31854	Geotechnical Investigation, Mine Subsidence Risk, Proposed Commercial and Residential Building, 200 Hunter Street	3 bores (83.5 m)
18	Sep 2004	39055	Preliminary Acid Sulphate Soil Assessment, 196 Hunter Street Newcastle	2 bores (12 m)
19	Oct 2004	39058	Geotechnical Investigation and Waste Classification. Proposed Polyclinic, 670 Hunter Street, Newcastle	7 bores (4.5 m) 6 CPTs (30.48 m) 5 test pits (3.0 m)
20	Jul 2005	39058A	Geotechnical Investigation, Proposed Polyclinic, 670 Hunter Street, Newcastle	1 CPT (30.5 m)
21	Jun 2006	39543	Geotechnical Investigation, Proposed Mixed Residential/Commercial Development, 123-127 Scott Street Newcastle (8 storey)	2 bores (14.4 m)
22	Mar 2008	39831.01	Geotechnical Investigation, Proposed Development, Lot 230 Honeysuckle Drive (not completed)	6 CPTs (23.4 m)
23	Dec 2009	49314	Geotechnical Investigation, Proposed Grand Central Apartments, 111 Scott Street Newcastle	2 bores (20.6 m)
24	Nov 2011	49799	Mine Subsidence Investigation, Proposed Courthouse Development	10 bores (87.1 m)
25	Feb 2014	81306	Detailed Site Investigation, Former Lynchs Prawns site, 292 Wharf Road, Newcastle	3 bores (5 m)
26	Sep 2015	81716	Targeted Detailed Site Investigation (Contamination), Newcastle Urban Transformation and Transport Program	36 bores (21.3 m) 29 test pits (2.4 m)

5. Geotechnical Model

5.1 Stratification

A generalised geotechnical model of subsurface conditions has been compiled based on the results of previous tests and broad geological processes.

The subsurface profile may be generalised as a sequence of geotechnical units as described in Table 4. It is noted that the descriptions are simplified to aid interpretation: at a given location a soil unit may include variations of the predominant soil type and sub-layers of other soil types. Not all units will necessarily be present at all locations.

Table 4: Geotechnical Soil Units (Vertical Profile)

Unit	Primary Name	Description
1	FILL	Materials placed or disturbed by man; typically includes sand, gravel, cobbles, slag and ash. Variable strength and consistency.
2	SAND	Includes sand, silty sand, clayey sand and gravelly sand, naturally deposited under fluvial conditions; typically loose to medium dense, grading to dense at some locations.
3	CLAY	Includes clay, silty clay and sandy clay; typically stiff to hard consistency. Mainly of residual origin but some upper layers may be of estuarine/fluvial origin.
4	BEDROCK	Includes sandstone, siltstone, mudstone, claystone, laminate and coal; typically very low to low strength in the upper weathered profile, increasing to medium to high strength at depth.
4.1	DUDLEY SEAM	Coal seam (bedrock sub-unit) typically 1 m to 1.5 m thick.
4.2	YARD SEAM	Coal seam (bedrock sub-unit) typically 1 m to 1.5 m thick.
4.3	BOREHOLE SEAM	Coal seam (bedrock sub-unit) typically 5 m to 7 m thick.

The typical depths encountered for each of the units in Table 4 are provided in Table 5 which summarises lateral variations between geotechnical zones.

5.2 Groundwater

Groundwater is typically encountered at depths ranging from 1 m to 2.5 m below ground level. Due to the proximity of the site to Newcastle Harbour, a subdued tidal variation would be expected, such as recorded at the Newcastle Interchange site (see Figure 7).

It is noted that groundwater levels are transient and will also vary with climatic conditions, surface drainage features and soil permeability. During or following periods of intense or prolonged rainfall, groundwater levels could rise close to the ground surface level.

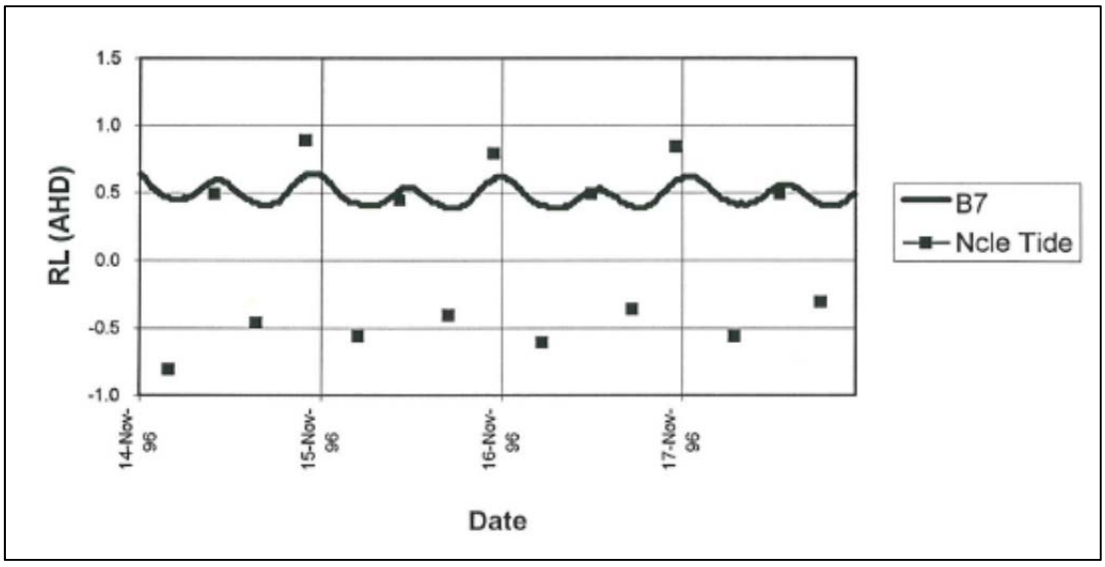


Figure 7: Tidal Groundwater Level Variations at Newcastle Interchange (Project 18606)

5.3 Lateral Variations

Drawings 2 and 3 show a geotechnical cross-section through the site, from west to east, based on the geotechnical data extracted from the previous investigation reports. The stratification has been simplified in terms of the Units listed in Table 4 and should be regarded as indicative. It should be noted that the layer boundaries have been interpolated between test locations for illustration purposes and may not represent actual boundaries.

Further, a number of test locations have been projected onto the section from outside the subject site, hence may not reflect true elevations of layer boundaries at the section location. Lateral variations in the soil profile from north to south should also be anticipated.

As indicated by the cross-section, the sub-surface profile also varies laterally from one end of the site to the other end. Notably the depth to bedrock generally increases to the west, with the shallowest depth to rock recorded in the vicinity of Queens Wharf.

To capture the lateral variation in subsurface conditions, the site has been divided into geotechnical zones as shown on Drawing 1. A summary of the generalised geotechnical model for each zone is presented in Table 5, which also notes the corresponding Parcels of land.

Table 5: Geotechnical Zones (Lateral Variation of Sub-surface Conditions)

Zone	Parcels	General Subsurface Profile
A	1, 2	• Unit 1: uncontrolled fill to about 3 m/4 m depth; • Unit 2: loose to medium dense sands to about 9 m/13 m depth; • Unit 3: stiff to very stiff clays to about 20 m/28 m depth; • Unit 4: sandstone or siltstone from about 20 m/28 m depth, initially very low strength; coal (Yard Seam) at 30 m/35 m depth.
B	3, 4, 5, 6, 7, Part 8	• Unit 1: uncontrolled fill to about 1 m/3 m depth; • Unit 2: loose to medium dense sands to about 6 m/13 m depth; • Unit 3: stiff to very stiff clays to about 8 m/22 m depth; • Unit 4: sandstone, siltstone or laminate from about 8m/22 m depth, initially very low strength; coal (Dudley Seam) at 20 m/22 m depth.
C	Part 8, 9, 10, 11, 12, 13, Part 14	• Unit 1: uncontrolled fill to about 0.8m/3m depth; • Unit 2: loose to medium dense sands to about 6 m/14 m depth; • Unit 3: stiff to very stiff clays to about 7 m/14 m depth - not present at all locations; • Unit 4: sandstone, claystone, mudstone or laminite, from 6 m/14 m depth, initially very low strength; coal (Yard Seam) at 19 m/26 m depth.
D	Part 14, Part 15	• Unit 1: uncontrolled fill to about 0.5 m/4 m depth; • Unit 2: loose to medium dense sands to about 3 m/5 m depth - not present at all locations; • Unit 3: clays generally not present; • Unit 4: sandstone or siltstone from 3 m/5 m depth, initially very low strength; coal (Dudley Seam) at 9 m/15 m depth.
E	Part 15	• Unit 1: uncontrolled fill to about 4 m/8 m depth; • Unit 2: loose to medium dense sands to about 5 m/20 m depth; • Unit 3: upper layer of firm silty or sandy clay to 10 m/12 m depth; lower layer of stiff to very stiff clays to about 20 m/22 m depth (separated by Unit 2) - only present in north-eastern part of site (interchange area); • Unit 4: sandstone or siltstone, initially very low strength from 4 m/22 m depth; coal (Yard Seam) likely present at about 25 m/30 m depth but not confirmed.

Notes to Table 5:

Depths are approximate, as measured from the ground surface at the time of investigation.

6. Comments

6.1 Excavation Conditions and Support

Excavation through fill materials, natural soils (sands and clays) and the upper zones of weathered rock (if encountered) is expected to be relatively straightforward using conventional excavation equipment such as backhoes and excavators. The fill is predominantly sandy in nature, however, in some areas the fill may include slag, cobbles or other larger inclusions that could impede excavation, however, their occurrence is not expected to be widespread. Zone E has the deepest areas of fill (within the former Newcastle Station site) thought to have resulted from an infilled/reclaimed channel.

Due to the presence of a sandy upper soil profile and relatively shallow groundwater across much of the site, excavations will need to be either battered (where there is sufficient space) or fully supported by shoring / retaining systems - these may be temporary or permanent support measures depending on the application. The type of support will be dependent on proximity to nearby structures and the duration for which the excavation will remain open.

It is recommended that all excavations adjacent to existing buildings and services should be fully supported in order to minimise lateral deflections. Cantilever type walls are not recommended for such situations as deflections typically associated with such walls can lead to damage of adjacent structures. This includes un-propped sheet pile walls.

If permanent retaining systems are required for a basement structure or similar, suitable methods would include contiguous piles, secant piles or soldier piles with shotcrete panels. These are laterally supported during excavation using soil nails or anchors extending below the adjacent properties or buildings, or props which are internal to the excavation. Permanent support after construction is usually provided by the floor slabs acting as struts.

Design parameters will depend on specific soil conditions at individual sites. The type of proposed development and extent of existing data will determine the scope of additional specific site investigation required for the detailed design of support measures.

Preliminary assessment of batter slopes may be based on the values provided in Table 6, however, these should be confirmed by site-specific investigation for individual developments.

Table 6: Preliminary Temporary and Permanent Batter Slopes

Stratum	Short Term (Temporary)[1]	Long Term (Permanent)[2]
Fill - uncompacted (assumed existing state)	2H:1V	2.5H:1V
Fill - compacted	1.5H:1V	2H:1V
Sand - above the water table	2H:1V	2.5H:1V
Clay - above the water table (stiff or better)	1.5H:1V	2H:1V
Rock – very low strength [3] (Class V sandstone / Class IV siltstone)	1H:1V	1.5H:1V

Notes to Table 6:

1. Above values are for a maximum vertical depth/height of 3 m. Greater depths to be specifically assessed, and may require additional measures for stability and drainage.
2. Long term batter slopes forming part of a development are generally expected to be of limited depth/height.
3. Excavations deep enough to penetrate rock are generally not anticipated; batters in rock are dependent on jointing and would require confirmation at time of excavation.

Excavations in soil below the water table are expected to require shoring or retention to maintain stability.

6.2 Preliminary Footing Options for Development

6.2.1 Shallow Footings

Where the proposed developments include multi storey structures, high column loads are anticipated and it is expected that shallow footings would not be suitable for the support of structural loads over most of the site due to the presence of filling, loose to medium dense sand and some clay to depths of approximately 3 m to greater than 20 m.

Shallow footings could be considered for lightly loaded structures; however the effect of potential settlement due to weak alluvial soils would need to be considered.

Table 7 shows preliminary design parameters for shallow pad or strip footings founded on each of the main geotechnical units.

Table 7: Preliminary Design Parameters for Pad or Strip Footings

Stratum	Ultimate Bearing Pressure (kPa)	Serviceability Bearing Pressure (Working Loads) (kPa)
Fill - uncompacted (assumed existing state)	NA	NA
Fill – cohesive - compacted	600	120
Fill – granular - compacted	1000	200
Sand - loose to medium dense	750	150
Clay – stiff to very stiff	1000	200
Clay – hard / extremely weathered rock	2000	400
Rock – very low strength (Class V sandstone / Class IV siltstone)	3000	1000

Notes to Table 7:

1. The design bearing pressures should be adjusted to account for weaker layers below the bearing layer if present.
2. Ultimate Values occur at large settlements (> 5% of minimum footing dimension).
3. Serviceability / Max Allowable end bearing to cause settlement of < 1% of minimum footing dimension.

Raft slabs apply a spread load to the foundation, typically with concentrated pressures on edge beams and internal beams. The relative distribution of foundation pressure depends primarily on the slab stiffness. Raft slabs generate a deeper stress field hence settlement needs to be considered, particularly if any soft or weak layers are present in the subsurface profile. Applied pressure and settlement are linked via the vertical modulus of subgrade reaction (k_v).

Edge and internal footing beams should not apply a local bearing pressure exceeding the values in Table 7 for pad and strip footings. The overall allowable bearing pressure for the slab will be governed by tolerable settlement. Typically a “spread” applied pressure in the order of 20 kPa to 30 kPa would be feasible where founded over good ground conditions.

In general, footings should not be founded in uncontrolled fill. In some cases it may be possible to found lightly-loaded structures that are not sensitive to settlement in fill, subject to prior geotechnical investigation and analysis.

The footing design values for individual structures should be refined when the location, type of structure, loads and dimensions are known. This would require specific investigation at the structure’s location to determine the soil profile for settlement and bearing capacity analysis.

During construction the design bearing pressures should be confirmed by geotechnical inspection and testing.

6.2.2 Deep Footings

Deep foundation systems would be appropriate for the support of major structural loads and where the depth of uncontrolled fill or excessive settlement precludes the use of shallow footings. Piles could potentially be founded either in medium dense to dense sand, stiff or better residual clay, or bedrock. The suitability of founding piles in the upper soil strata would depend on the ground conditions at the individual site, proposed foundation loads, settlement tolerances of proposed structures and the relative cost benefit of installing in the upper soil profile versus the underlying bedrock.

A number of deep footing options are summarised and discussed below:

Uncased Bored Piles - Due to the shallow water table and the risk of collapsing conditions in water-charged sand, conventional uncased bored piles are not expected to be suitable for the majority of this site. They could be considered in areas of shallow bedrock, however the risk of shallow groundwater and potentially high water inflow rates would need to be assessed.

Driven Piles - Driven piles could be considered, however vibration impacts during installation may impact on neighbouring structures and would need to be assessed. Furthermore, due to the presence of uncontrolled filling of variable depth across much of the site, there may be a risk of premature pile refusal or damage due to obstructions in the filling. Pre-drilling pile holes through the filling could be considered to mitigate this risk.

Screw Piles - Screw piles could be considered for light to moderate structural loads. It is noted that screw piles derive their capacity from a combination of geotechnical strength of the founding stratum and structural strength of the pile helix. Specific geotechnical design should be undertaken. Screw piles will typically undergo more settlement than equivalent-sized fully formed piles. The presence of uncontrolled filling may present a risk of premature pile refusal or damage due to obstructions in the filling.

Cased Bored / Continuous Flight Auger (CFA) / Screw Cast Concrete Piles - These pile types are considered to be the most suitable options for support of structural loads at this site, as they can be formed within saturated and collapsing soil conditions, as is expected to be encountered over the majority of the site. It should be noted that for CFA piles, decompression can occur in sands whereby excess material is ‘sucked’ into the auger and removed to the surface, resulting in surface depression. Piles should be installed by experienced operators, using suitably sized piling rigs, monitoring equipment and supervision.

The preliminary design parameters for bored or CFA piles are shown in Table 8 for the anticipated range of soil and rock strata at the site. The capacity of driven piles is typically higher, relative to equivalent dimensions, especially if driven into rock and may be governed by the structural capacity of the piled section used.

Pile design, installation and testing should be undertaken with reference to the Piling code (Ref 1).

Table 8: Preliminary Design Parameters for Piles (Bored or CFA Piles)

Stratum	Ultimate		Serviceability (Working Loads)	
	End Bearing (kPa)	Shaft Adhesion (kPa)	End Bearing (kPa)	Shaft Adhesion (kPa)
Fill – cohesive – compacted	700	-	120	-
Fill – granular – compacted	1000	-	200	-
Sand – medium dense ≥ 5 m depth	1750	25	700	10
Clay – stiff to very stiff	900	40	350	15
Clay – hard / extremely weathered rock	1800	80	600	50
Rock – very low strength (Class V sandstone / Class IV siltstone)	4000	200	1200	100
Rock – low strength (Class IV sandstone / Class III siltstone)	10000	500	2500	250

Notes to Table 8:

1. The design bearing pressures should be adjusted to account for weaker layers below the bearing layer if present.
2. Piles founded on coal or claystone should be avoided due to potential for softening and excessive settlement.
3. Ultimate Values occur at large settlements (> 5% of minimum pile diameter / width).
4. Design geotechnical strength ($R_{d,g}$) should initially be based on a strength reduction factor of $\phi_g = 0.40$.
5. Shaft adhesion values based on a shaft roughness of R2 or better.
6. Serviceability / Max Allowable end bearing to cause settlement of < 1% of minimum pile diameter / width.
7. AS 2159- 2009 (Ref 1) requires that the contribution of the shaft from ground surface to 1.5 times pile diameter or 1 m (whichever is greater) shall be ignored.

It should be noted that the above design parameters given in Table 8 are primarily for bored piles with clean sockets and bases: specific cleaning buckets and grooving tools should be used in construction. The preliminary design of driven piles may also be based on the above parameters, however in practice, they are usually driven to a specified 'set' to achieve the required load or 'refusal'. In the latter case the pile capacity may be governed by the structural capacity of the pile in axial compression or bending. Pile installation could be affected by the possible presence of obstructions within existing fill such as concrete, steel and other coarse inclusions. The available information suggests that this will not be a widespread problem however the possibility cannot be precluded.

If piles are installed through deep uncontrolled fill there will be the potential for negative shaft adhesion (downdrag) loads on the pile due to on-going creep settlement of the fill. In some cases this can significantly reduce the available load capacity of piles to support of the structural loads.

For piles in tension, the shaft adhesion parameters should be reduced by 25%.

During construction the design bearing pressures should be confirmed by geotechnical inspection and / or quality assurance testing relevant to the type of pile and method of installation.

6.3 Acid Sulphate Soils

With reference to Section 4.2, the site contains two categories of potential acid sulphate soils:

- Geotechnical Zones A to C generally have a low probability of occurrence of acid sulphate soils at depths greater than 3 m below the ground surface, although the western end (Zone A) includes a high probability zone that marginally encroaches the northern boundary of the site;
- Geotechnical Zones D and E (eastern end of site) have a high probability of occurrence of acid sulphate soils at depths of between 1 m and 3 m below the ground surface.

Previous investigations carried out in the Honeysuckle and Newcastle area have indicated that potential acid sulphate soils (PASS) are generally present in the near-surface fine-grained natural soils (i.e. silts and clays), however, the overlying fill materials are usually not acid sulphate soils. Natural sands (particularly silty sands) may also be acid sulphate soils, but if so, tend to have less acid generation potential.

Recent experience at nearby sites indicates that acid sulphate soils at this site are unlikely to be strongly acid sulphate and can be readily managed during construction using standard procedures (such as liming) in accordance with the relevant guidelines.

Construction activities that will potentially disturb acid sulphate soils include:

- Excavations that extend below fill into natural soils, such as basement excavations, remediation activities (notably Zone E), and deep services trenches; the excavated material will be exposed to oxidation ex situ;
- Dewatering during construction to aid earthworks, excavation and construction activities that lowers the water table within natural soils and exposes them to oxidation in situ.

It is recommended that a site-specific acid sulphate soils management plan (ASSMP) should be developed for the project and implemented where the above activities are undertaken. It is noted that the ASSMP may include a requirement for groundwater treatment / management related to dewatering activities or leachate generated by stockpiles of PASS.

6.4 Seismic Factors for Design

The earthquake code (AS1170.4-2007, Ref 2) provides design factors based on location (earthquake risk) geotechnical conditions.

The Hazard Factor (Z) for Newcastle is 0.11 as given in Table 3.2 of AS1170.4. This is the bedrock acceleration coefficient with an annual probability of exceedance of 1 in 500.

For the whole subject site (Geotechnical Zones A to E) the site sub-soil class is assessed to be Class C_e – “shallow soil site”, with reference to Table 4.1 of AS1170.4.

6.5 Mine Subsidence Assessment

6.5.1 Areas Potentially Affected by Mine Subsidence

This assessment assumes that only workings in the Borehole Seam could affect the site, notwithstanding MSB comments that the extent of the Yard seam and the possibility of shallower unmapped workings should be assessed (see Section 6.5.3).

In the event of mine collapse or pillar crush in the Borehole Seam, mine subsidence would occur. Although the majority of the subject site is not directly undermined, areas of the site are within the potential zone of influence if subsidence did occur. The zone of influence is defined by the 'angle of draw', a line taken from the edge of the workings to the ground surface at a designated angle. The accepted value of this angle that is routinely adopted for the Newcastle area is 26° from vertical (1H:2V).

Based on the plan location of the Borehole Seam workings, it can be shown that the majority of the rail corridor site could be potentially affected by mine subsidence (i.e. within the angle of draw). To aid interpretation, Drawing 4 shows the areas of the site that lie beyond the angle of draw and hence would NOT affected by mine subsidence (green hatched areas). These are:

- A small area in the north-west corner of the site being part of Parcel 1 (in Geotechnical Zone A);
- The southern portions of Parcels 5 and 6 (in Geotechnical Zone B);
- A small area in the north-eastern part of Parcel 12 (in Geotechnical Zone C);
- The eastern half of Parcel 14 and all of parcel 15 (in Geotechnical Zones D and E), which is the largest contiguous area of the site that lies beyond the angle of draw.

The remainder of the site and most of the immediately adjacent areas are either directly undermined or potentially within the angle of draw in the event of mine subsidence.

6.5.2 Stability of Borehole Seam

In Drawing 4 the blue dashed line represents the 'reverse angle of draw' relative to the site boundary. All mine workings that lie inside this area have the potential to affect the site in the event of subsidence. Preliminary stability analyses have been carried out for all coal pillars within this zone, a total of 98 pillars. The results of the analyses are shown in the tables in Appendix B.

The analysis adopted a working section height of 5.4 m, and pillar dimensions were measured off RT566. The pillars were grouped in three 'panels'. The results indicated the following in regard to mine stability:

- The factor of safety against failure of individual pillars ranged from 1.33 to 3.36;
- The probability of failure of individual pillars ranged from 3×10^{-2} to 2×10^{-14};
- 'Panel' factors of safety, which account for the ability of smaller pillars to shed load to larger adjacent pillars, ranged from 2.18 to 2.49;
- The probability of failure of the panels ranged from approximately 1×10^{-7} to 1×10^{-9};
- The panel extraction ratio ranged from 0.35 to 0.41.

It is noted, however, that due to the proximity of the smallest pillars to the unmined 'barrier' of coal which is present beneath the site, the analysis likely underestimates the actual factors of safety in this area.

Based on the review of available information, and the results of the preliminary pillar stability analysis, it is DP's opinion that there is some risk, albeit low, of mine subsidence affecting significant parts of the subject site (i.e. the parts of the site not shown in green hatching on Drawing 4).

It is noted that the available data indicated no mine workings within the Dudley Seam or Yard Seam in the vicinity of the subject site. Accordingly it is assessed that these seams do not pose a risk of mine subsidence at the site.

6.5.3 Consultation with the Mine Subsidence Board

A meeting was held with the MSB at their Newcastle office on 8 January 2016. Attendees were Ian Bullen and Peter Evans of the MSB, and Stephen Jones and Scott McFarlane of DP. A letter was subsequently received from the MSB on 15 January 2016 (see Appendix C for a copy).

The following summarises the outcomes of the MSB meeting and their subsequent letter:

- Each proposed building is assessed separately and specific development guidelines cannot be provided until specific plans are presented to the MSB for consideration;
- The section of the rail corridor within the Newcastle Mine Subsidence district is nominated as "Guideline No. 9" by MSB which essentially allows buildings of up to three storeys and 30 m long without assessment of mine subsidence risk;
- Buildings over three storeys will require investigation to assess mine subsidence risk and determine mine subsidence site parameters. The investigations are likely to include exploratory drilling and would aim to:
    - verify the limit of workings in the Borehole and Yard seams;
    - verify the location of workings that cross over the rail corridor;
    - determine the possibility of unmapped workings above the Borehole seam.
- The mine subsidence risk analysis should include sensitivity / risk review and consider potential subsidence scenarios including a worst case;
- If grouting is required the MSB would likely request a grouting plan for approval and a verification report upon completion of the works;
- Where the MSB accepts mine subsidence design parameters, it would likely request an "Impact Statement" that provides details of the structures, risk assessment outcomes and the proposed mitigation measures;
- When considering the number of storeys (and hence risk and repair costs) the MSB include basements as a storey. For example, a proposed 30 m high building (potentially 10 storeys) plus two levels of basement would be regarded by MSB as a 12 storey structure;
- For significant structures, the recommendations need to go to a MSB Board meeting; these are held monthly but the response time depends on the number of applications before the Board.

Based on the above a preliminary 'first pass' assessment has been undertaken taking into account the location of mine workings and the potential maximum building heights from the concept plan layout. The findings are presented in Section 6.5.5.

The 'Newcastle Mines Grouting Fund', which commenced in November 2015, was also discussed at the meeting. The fund is managed by the Hunter Development Corporation (HDC). The MSB's role runs in parallel to HDC in relation to remedial design, delivery and validation. The fund underwrites grouting costs that exceed a designated cap, based on mine category and site area. This provides financial certainty for developers in that if grouting costs exceed the cap the fund will pay the difference. It is noted that the determination of grouting costs excludes investigation and consultant fees. Further information is available by following this link to an HDC brochure:
http://www.hdc.nsw.gov.au/sites/default/files/HDC_Newcastle-Mines-Grouting-Fund%20brochure.pdf

The mine categories are shown in the MSB drawing "Newcastle City Centre Area Mine Subsidence Categories included in Appendix C. It is noteworthy that the rail corridor site itself does not have a category assigned, presumably because development of the rail corridor was not envisaged.

The current fund rates published by HDC are also included in Appendix C. The status of the site (or parts of the site) in relation to the Newcastle Mines Grouting Fund is unclear as the rail corridor is not assigned a category. MSB has advised that the HDC should be consulted on this matter.

6.5.4 Preliminary Subsidence Parameters

A preliminary assessment of subsidence parameters was undertaken using the method of Holla (1987). In the event of subsidence in workings adjacent to the site and in the absence of grouting or other remedial measures, the subsidence effects would be worst at the site boundary.

Estimated preliminary subsidence parameters for the un-grouted site would be:

- Subsidence: 230 mm
- Tensile strain: 3 mm/m
- Tilt: 10 mm/m

It is unlikely that buildings could be economically designed to withstand the above movements. If the associated risk of occurrence is considered unacceptable, remedial grouting would likely be required to reduce the subsidence parameters to levels that could be managed through structural design. While this depends on the sensitivity of the specific structure to movement, based on previous experience typical post-grouting subsidence parameters accommodated by designed are:

- Subsidence: 50 to 100 mm
- Tensile strain: 0.5 to 2 mm/m
- Tilt: 5 to 6 mm/m

6.5.5 Preliminary Estimated Grouting Volumes

A preliminary estimate of potential grouting has been made adopting a conservative scenario and assuming that structures might be built to the maximum permissible height under the zoning. Although the preliminary estimate is based on grouting within the angle of draw, it should be noted that in some cases it may be beneficial to grout workings beyond the angle of draw where this is shown to prevent a more global 'pillar run' that could affect the site.

When the relevant constraints are overlain: angle of draw, mine categories of adjoining mined areas, and adjacent proposed land use that would allow multi-storey buildings, the following is indicated:

- Grouting of workings east of Wolfe Street and west of Union Lane is unlikely to be necessary;
- Grouting of workings west of Wright Lane (Parcels 3 and 4) *may or may not* be necessary, considering the beneficial effect on global stability of nearby grouting of sites in Honeysuckle, but has been included in preliminary estimates in case;
- The remaining central area (Parcels 8 to 14) *may* require grouting, subject to the findings of detailed investigation, modelling and the specifics of individual proposed structures;
- The areas adjoining the central area are mainly Fund Category A and Category B and some Category C areas. Actual categories, however, will depend on MSB and/or HDC responses in relation to the rail corridor.

Drawing 5 indicates the areas of mine workings that *may* require grouting adjacent to Parcels 3 and 4 and 8 to 14 as noted above. The total volume of voids in the workings may be approximately estimated, however, it depends on the accuracy of the plan in terms of bord widths, worked seam height and degree of roof collapse. If grouting of workings beyond the angle of draw is later determined to be required, it has been assumed that these areas would be offset by not requiring grouting of all voids within the angle of draw.

The estimated 'worst case' plan area of the workings that may require grouting is about 13,600 m^2. Adopting an estimated average worked height of 4.8 m the total volume of voids is estimated to be in the order of 65,000 m^3.

If Parcel 12 is limited to a three-storey structure, remedial grouting in the vicinity of this land would be unlikely to be needed. This would potentially reduce the volume of grout required by about 9000 m^3 (to about 56,000 m^3 in total).

If the Grouting Fund applies to these parcels, and the parcel area is taken as the site area, there would be a cap on grouting costs. If grouting costs exceeds the relevant cap amount the fund would pick up the difference. If the grouting costs are less than the cap amount then no claim can be made on the fund.

It should be noted that the areas that may require grouting lie beneath properties/buildings outside the corridor and public roads. This might create legal, access and logistical challenges to undertaking the work. It may be necessary to make extensive use of angled boreholes to both locate the workings and undertaking the grouting. These constraints may have additional and uncertain cost implications, hence it is recommended that a contingency be allowed for.

Important Assumptions and Limitations related to Grouting Volumes

It is not certain at this early stage whether grouting of workings will be required at all. Detailed investigations and modelling may indicate that potential subsidence has a low risk of occurrence or can be managed through structural design (although this will depend to some extent on the specifics of proposed structures).

The foregoing estimates of grout volumes are preliminary and conservative and are based on a number of assumptions derived from experience. Assumptions and limitations include:

- The layout of the mine workings is assumed to be approximately the same as recorded on the mine plans, such that only the Borehole Seam could influence the site;
- Full grouting of the voids, where the development footprint is within the angle of draw, comprising grouting to at least the top of coal seam and possibly to the roof;
- Where grouting is required the assumed plan extent is the angle of draw, however grouting beyond the angle of draw is a possible requirement for global stability and prevention of a 'pillar run' that could affect the site;
- Low strength (1 MPa) grout will be acceptable;
- The structures could be designed to accommodate subsidence parameters of a similar order to previous developments subject to grouting;
- Access to adjacent properties and roads will be both permissible and feasible for the works. Angled drilling extending from the rail corridor to beyond the site boundary will also be permitted;
- Uncertainties related to the work and potential costs include:
    - Actual ground conditions, mine layout, extent of mine rubble and volume of voids requiring grout;
    - Contractor market rates at time of work;
    - Whether the work is done as a single package for the whole site or separate packages for individual parcels of land or developments;
    - Final MSB requirements for specific developments;
    - The applicability of the Grouting Fund and the designated rates for the development sites.
- Additional investigations and numerical modelling will be required to confirm the need for grouting and the design details.

6.6 Suitability of the Site for Development

The rail corridor site is considered to be geotechnically suitable for the proposed residential and commercial type developments. Preliminary geotechnical design parameters are provided in this report to facilitate preliminary planning and assessment of feasibility of specific proposed developments.

Prior to the detailed design of any proposed developments specific geotechnical investigation will be required appropriate to the nature of the proposed development. Investigation and design will need to consider some or all of the following matters:

- The presence and depth of uncontrolled fill;
- The presence, depth and likely variation in groundwater levels;
- Appropriate treatment and management of acid sulphate soils where encountered;
- Excavation conditions and shoring requirements, if relevant;
- Earthworks procedures and whether any ground improvement measures (such as removal and compaction) are required, taking into account the requirements of the Remediation Action Plan (RAP);
- Suitable footing options and design parameters for support of structures;
- Requirements relating to potential mine subsidence, where relevant.

It is expected that with suitable investigation, design and construction in accordance with accepted engineering practice, the above matters can be readily managed.

7. Concurrent Contamination Investigations

DP has conducted concurrent contamination investigations within the surplus Newcastle Rail corridor between Newcastle Station in the east and Worth Place in the west.

The investigations have comprised the following:

- Brief review of previous investigations conducted within the site;
- Review and revision of the sampling, analysis and quality plan for assessment of contamination at the site;
- Subsurface investigation and sampling at systematic and targeted locations;
- Assessment of soil and groundwater contamination within the site, targeting the locations and contaminants of concern on the basis of the historical landuse;
- Assessment of remediation strategies/options;
- Preparation of a draft RAP, outlining the strategies, procedures and responsibilities for remediation of identified contamination.

The results of the investigation indicated the following with respect to contamination at the site:

- The presence of hydrocarbon contamination in soil associated with the former gas works in the eastern portion of the site (i.e. current bus interchange);
- The presence of hydrocarbon contamination in near-surface soils in the vicinity of Newcastle Station and the Newcastle Signal Box as a results of historical train use;
- The presence of heavy metal-impacted near-surface soils to the west of Civic Station, likely to be as a result of impacted historical filling and/or historical ash dumping in the area;
- The presence of minor soil contamination in filling across the site, likely due to historical use as a railway and historical filling of the site;
- Contamination in soil at the site should be addressed due to the potential for impacts on human health and the environment, including groundwater impact.

At this stage the proposed remediation strategy for the site is for localised removal and/or remediation of impacted soils, with capping of the remainder of the site with structures, pavements or soils. This strategy has been documented in the RAP (Ref 4).

The contamination assessment and RAP will be subject to review and approval by Graeme Nyland, a NSW EPA accredited Auditor.

8. References

1. Australian Standard 2159-2009, “Piling – Design and Installation”, Standards Australia.
2. Australian Standard 1170.4-2005, “Structural design actions, Part 4: Earthquake actions in Australia”, Standards Australia.
3. Pells, Mostyn & Walker (1998), “Foundations on Sandstone and Shale in the Sydney Region”, Australian Geomechanics Society, December 1998.
4. Douglas Partners Pty Ltd, “Remediation Action Plan, Newcastle Urban Transformation and Transport Program”, Project 81716.00.R.009 (Rev 0), March 2016.

9. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report (or services) for this project at in accordance with DP’s proposal NCL 150577 dated 30 September 2015. The work was carried out under UrbanGrowth NSW contract 2724/14, dated 4 May 2015. This report is provided for the exclusive use of UrbanGrowth NSW for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction. The scope for work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of filling of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such filling may contain contaminants and hazardous building materials.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the (geotechnical / environmental / groundwater) components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Mine Subsidence Stability Assessment

Table B1 - Pillar Stability Analysis - Measured Pillar Dimensions - Panel 1

Douglas Partners
Geotechnics · Environment · Groundwater

Mine Workings - RT566 - Borehole Seam
Project: Newcastle Rail Corridor
Location: Newcastle
Analysis Assumptions: Pillar dimensions from RT.

Client: UrbanGrowth NSW
Date: 2 December 2015
Sheet: 1

Project No: 81720.01

Pillar Id:	Comment	Depth D (m)	Seam Thickness (m)	Working Section H (m)	Pillar Height Section H (m)	Unit Weigth γ (kN/m³)	Pillar Details Width Wp (m)	Length Lp (m)	Internal Angle (°)	Roadway Details Wr (m)	Lr (m)	Extract. Ratio (%)	Pillar Area m²	Total Area m²	Width/ Height Ratio Wp/H	Width Modifier Θ_0	Θ	Pillar Stress (Tributary) (MPa)	Pillar Load (Tributary) MN	Abut (A) Yield (Y) (?)	Shed Load MN	Lodad Received MN	Pillar Stress ("Yield") (MPa)	Pillar Stress ("Abut") (MPa)	Power Law Strength (MPa)	"Ultimate" Load MN	FoS	Probability of Failure
1		77.0	6.4	5.4	5.4	25	12.9	28.1	90.0	3.5	2.3	27.3	362.5	498.6	2.4	1.371	1.000	2.65	960						7.69	2786	2.90	1.4E-11
2		77.0	6.4	5.4	5.4	25	14.6	27.8	90.0	2.8	2.8	23.8	405.9	532.4	2.7	1.311	1.000	2.53	1025						8.19	3323	3.24	1.1E-13
3		77.0	6.4	5.4	5.4	25	14.2	36.2	90.0	3.0	2.8	23.4	514.0	670.8	2.6	1.437	1.000	2.51	1291						8.07	4149	3.21	1.7E-13
4		77.0	6.4	5.4	5.4	25	10.6	26.1	90.0	4.2	3.4	36.6	276.7	436.6	2.0	1.422	1.000	3.04	840						6.95	1924	2.29	9.9E-08
5		77.0	6.4	5.4	5.4	25	11.8	27.9	90.0	3.3	3.4	30.3	329.2	472.6	2.2	1.406	1.000	2.76	910						7.34	2418	2.66	4.9E-10
6		77.0	6.4	5.4	5.4	25	11.5	36.6	90.0	3.4	2.8	28.3	420.9	587.1	2.1	1.522	1.000	2.68	1130						7.25	3051	2.70	2.7E-10
7		77.0	6.4	5.4	5.4	25	12.1	28.7	90.0	3.0	2.9	27.2	347.3	477.2	2.2	1.407	1.000	2.65	919						7.44	2583	2.81	5.3E-11
8		77.0	6.4	5.4	5.4	25	11.5	29.0	90.0	3.2	3.0	29.1	333.5	470.4	2.1	1.432	1.000	2.72	906						7.25	2417	2.67	4.1E-10
9		77.0	6.4	5.4	5.4	25	11.2	27.5	90.0	3.6	3.4	32.7	308.0	457.3	2.1	1.421	1.000	2.86	880						7.15	2203	2.50	4.6E-09
10		77.0	6.4	5.4	5.4	25	11.9	29.8	90.0	3.9	3.2	32.0	354.6	521.4	2.2	1.429	1.000	2.83	1004						7.38	2616	2.61	1.0E-09
11		77.0	6.4	5.4	5.4	25	11.8	28.5	90.0	4.9	3.7	37.5	336.3	537.7	2.2	1.414	1.000	3.08	1035						7.34	2470	2.39	2.4E-08
12		77.0	6.4	5.4	5.4	25	13.1	30.6	90.0	4.7	3.4	33.8	400.9	605.2	2.4	1.400	1.000	2.91	1165						7.75	3105	2.67	4.4E-10
13		77.0	6.4	5.4	5.4	25	10.1	28.2	90.0	5.3	3.6	41.8	284.8	489.7	1.9	1.473	1.000	3.31	943						6.78	1932	2.05	3.1E-06
14		77.0	6.4	5.4	5.4	25	9.9	30.8	90.0	5.5	3.7	42.6	304.9	531.3	1.8	1.514	1.000	3.35	1023						6.72	2048	2.00	6.1E-06
15		77.0	6.4	5.4	5.4	25	9.8	27.8	90.0	5.7	3.3	43.5	272.4	482.1	1.8	1.479	1.000	3.41	928						6.68	1820	1.96	1.1E-05
16		77.0	6.4	5.4	5.4	25	10.9	30.6	90.0	5.7	3.8	41.6	333.5	571.0	2.0	1.475	1.000	3.30	1099						7.05	2352	2.14	8.4E-07
17		77.0	6.4	5.4	5.4	25	11.0	27.6	90.0	5.8	3.2	41.3	303.6	517.4	2.0	1.430	1.000	3.28	996						7.09	2151	2.16	6.3E-07
18		77.0	6.4	5.4	5.4	25	12.2	26.8	90.0	5.6	3.8	40.0	327.0	544.7	2.3	1.374	1.000	3.21	1049						7.47	2442	2.33	5.5E-08
19		77.0	6.4	5.4	5.4	25	13.1	26.4	90.0	5.5	3.5	37.8	345.8	556.1	2.4	1.337	1.000	3.10	1071						7.75	2679	2.50	4.6E-09
20		77.0	6.4	5.4	5.4	25	11.0	26.7	90.0	5.5	3.6	41.3	293.7	500.0	2.0	1.416	1.000	3.28	962						7.09	2081	2.16	6.1E-07
21		77.0	6.4	5.4	5.4	25	11.3	30.9	90.0	5.1	3.7	38.5	349.2	567.4	2.1	1.464	1.000	3.13	1092						7.18	2508	2.30	8.9E-08
22		77.0	6.4	5.4	5.4	25	11.7	15.0	90.0	4.8	3.8	43.4	175.5	310.2	2.2	1.124	1.000	3.40	597						7.31	1283	2.15	7.4E-07
												Total	7380.2	11337.3														

Notes:

1. Pillar stability analysis based on the methods of Galvin, Hebbelwhite, Salamon and Lin (1998) UNSW Mining Research Centre Report RR3/98.
2. Relationship between Factor of Safety (FoS) and probability of coal pillar failure is based on interpolation and extrapolation of data in the above publication. It should be noted that the probability of failure does not extend beyond a FoS of 2.11 (equivalent to a probability of failure of 1 in 1,000,000) in the above and therefore probabilities of failure for FoSs above this are an extrapolation based on a curve of best fit for data for FoSs of 2.11 and less
3. Load on weaker pillars reduced by 30% as discussed in “Prefailure Pillar Yielding”, by Agapto and Goodrich (2002) Load transferred to adjacent pillars.
4. Extraction ratio is relative to working section not full seam height.
5. Pillar Height should be the same as the working section unless roof collapse is being considered.

Panel Extraction Ratio 0.35

Summary	FoS
Max	3.24
Min	1.96
Mean	2.47

Panel Factor of safety Based on Tributary load

Total Pillar Load	21824.24	MN
Total Pilla Capacity	54342.32	MN
Panel FoS	2.49	

Table B2 - Pillar Stability Analysis - Measured Pillar Dimensions - Panel 2

Douglas Partners
Geotechnics · Environment · Groundwater

Mine Workings - RT566 - Borehole Seam
Project: Newcastle Rail Corridor
Location: Newcastle
Analysis Assumptions: Pillar dimensions from RT.

Client: UrbanGrowth NSW
Date: 2 December 2015
Sheet: 1

Project No: 81720.01

Pillar Id:	Comment	Depth D (m)	Seam Thickness (m)	Working Section H (m)	Pillar Height Section H (m)	Unit Weigth γ (kN/m³)	Pillar Details Width Wp (m)	Pillar Details Length Lp (m)	Pillar Details Internal Angle (°)	Roadway Details Wr (m)	Roadway Details Lr (m)	Extract. Ratio (%)	Pillar Area m²	Total Area m²	Width/ Height Ratio Wp/H	Width Modifier Θ_0	Width Modifier Θ	Pillar Stress (Tributary) (MPa)	Pillar Load (Tributary) MN	Abut (A) Yield (Y) (?)	Shed Load MN	Lodad Received MN	Pillar Stress ("Yield") (MPa)	Pillar Stress ("Abut") (MPa)	Power Law Strength (MPa)	Power Law "Ultimate" Load MN	Power Law FoS	Power Law Probability of Failure
23		77.0	6.4	5.4	5.4	25	10.0	11.7	90.0	5.3	4.5	52.8	117.0	247.9	1.9	1.078	1.000	4.08	477						6.75	790	1.66	9.0E-04
24		77.0	6.4	5.4	5.4	25	10.5	22.1	90.0	5.7	4.0	45.1	232.1	422.8	1.9	1.356	1.000	3.51	814						6.92	1606	1.97	9.4E-06
25		77.0	6.4	5.4	5.4	25	10.4	24.2	90.0	5.3	3.7	42.5	251.7	438.0	1.9	1.399	1.000	3.35	843						6.89	1733	2.06	2.9E-06
26		77.0	6.4	5.4	5.4	25	11.3	24.3	90.0	5.8	3.6	42.4	274.6	477.1	2.1	1.365	1.000	3.34	918						7.18	1973	2.15	7.5E-07
27		77.0	6.4	5.4	5.4	25	11.8	31.0	90.0	6.0	3.5	40.4	365.8	614.1	2.2	1.449	1.000	3.23	1182						7.34	2687	2.27	1.3E-07
28		77.0	6.4	5.4	5.4	25	10.7	24.1	90.0	6.8	3.5	46.6	257.9	483.0	2.0	1.385	1.000	3.61	930						6.99	1802	1.94	1.5E-05
29		77.0	6.4	5.4	5.4	25	11.0	31.1	90.0	5.9	3.4	41.3	342.1	583.1	2.0	1.477	1.000	3.28	1122						7.09	2424	2.16	6.3E-07
30		77.0	6.4	5.4	5.4	25	11.2	29.2	90.0	5.9	3.9	42.2	327.0	566.0	2.1	1.446	1.000	3.33	1090						7.15	2339	2.15	7.7E-07
31		77.0	6.4	5.4	5.4	25	10.3	30.5	90.0	5.5	3.6	41.7	314.2	538.8	1.9	1.495	1.000	3.30	1037						6.85	2153	2.08	2.1E-06
32		77.0	6.4	5.4	5.4	25	10.1	28.8	90.0	6.0	4.1	45.1	290.9	529.7	1.9	1.481	1.000	3.51	1020						6.78	1973	1.94	1.6E-05
33		77.0	6.4	5.4	5.4	25	11.3	38.4	90.0	5.9	1.8	37.2	433.9	691.4	2.1	1.545	1.000	3.07	1331						7.18	3117	2.34	4.6E-08
34		77.0	6.4	5.4	5.4	25	12.2	30.3	90.0	3.9	4.8	34.6	369.7	565.1	2.3	1.426	1.000	2.94	1088						7.47	2761	2.54	2.7E-09
35		77.0	6.4	5.4	5.4	25	12.3	29.9	90.0	4.7	3.8	35.8	367.8	572.9	2.3	1.417	1.000	3.00	1103						7.50	2759	2.50	4.6E-09
36		77.0	6.4	5.4	5.4	25	12.0	16.5	90.0	3.5	4.0	37.7	198.0	317.8	2.2	1.158	1.000	3.09	612						7.41	1467	2.40	2.1E-08
37		77.0	6.4	5.4	5.4	25	11.2	35.5	90.0	4.7	4.4	37.3	397.6	634.4	2.1	1.520	1.000	3.07	1221						7.15	2843	2.33	5.6E-08
38		77.0	6.4	5.4	5.4	25	12.7	26.5	90.0	3.6	3.7	31.6	336.6	492.3	2.4	1.352	1.000	2.82	948						7.62	2566	2.71	2.4E-10
39		77.0	6.4	5.4	5.4	25	10.5	32.0	90.0	5.3	3.9	40.8	336.0	567.2	1.9	1.506	1.000	3.25	1092						6.92	2325	2.13	9.8E-07
40		77.0	6.4	5.4	5.4	25	10.7	18.1	90.0	4.7	3.8	42.6	193.7	337.3	2.0	1.257	1.000	3.35	649						6.99	1353	2.08	1.9E-06
41		77.0	6.4	5.4	5.4	25	9.8	12.0	90.0	3.6	4.1	45.5	117.6	215.7	1.8	1.101	1.000	3.53	415						6.68	786	1.89	3.0E-05
42		77.0	6.4	5.4	5.4	25	10.7	26.4	90.0	4.6	4.1	39.5	282.5	466.7	2.0	1.423	1.000	3.18	898						6.99	1974	2.20	3.7E-07
43		77.0	6.4	5.4	5.4	25	9.8	12.0	90.0	3.6	4.1	45.5	117.6	215.7	1.8	1.101	1.000	3.53	415						6.68	786	1.89	3.0E-05
44		77.0	6.4	5.4	5.4	25	10.4	26.4	90.0	5.1	4.7	43.0	274.6	482.1	1.9	1.435	1.000	3.38	928						6.89	1891	2.04	3.7E-06
45		77.0	6.4	5.4	5.4	25	13.0	23.0	90.0	4.2	4.3	36.3	299.0	469.6	2.4	1.278	1.000	3.02	904						7.72	2307	2.55	2.2E-09
46		77.0	6.4	5.4	5.4	25	10.1	16.3	90.0	4.5	3.6	43.3	164.6	290.5	1.9	1.235	1.000	3.40	559						6.78	1117	2.00	6.6E-06
47		77.0	6.4	5.4	5.4	25	8.8	17.4	90.0	5.3	3.2	47.3	153.1	290.5	1.6	1.328	1.000	3.65	559						6.32	968	1.73	3.0E-04
48		77.0	6.4	5.4	5.4	25	10.2	13.9	90.0	5.4	3.2	46.9	141.8	266.8	1.9	1.154	1.000	3.62	514						6.82	967	1.88	3.4E-05
												Total	6957.1	11776.3														

Notes:

1. Pillar stability analysis based on the methods of Galvin, Hebbelwhite, Salamon and Lin (1998) UNSW Mining Research Centre Report RR3/98.
2. Relationship between Factor of Safety (FoS) and probability of coal pillar failure is based on interpolation and extrapolation of data in the above publication. It should be noted that the probability of failure does not extend beyond a FoS of 2.11 (equivalent to a probability of failure of 1 in 1,000,000) in the above and therefore probabilities of failure for FoSs above this are an extrapolation based on a curve of best fit for data for FoSs of 2.11 and less
3. Load on weaker pillars reduced by 30% as discussed in "Prefailure Pillar Yielding", by Agapto and Goodrich (2002) Load transferred to adjacent pillars.
4. Extraction ratio is relative to working section not full seam height.
5. Pillar Height should be the same as the working section unless roof collapse is being considered.

Panel Extraction Ratio 0.41

Summary	FoS
Max	2.71
Min	1.66
Mean	2.14

Panel Factor of safety Based on Tributary load

Total Pillar Load	22669.34	MN
Total Pilla Capacity	49464.53	MN
Panel FoS	2.18	

Table B3 - Pillar Stability Analysis - Measured Pillar Dimensions - Panel 3

Douglas Partners
Geotechnics · Environment · Groundwater

Mine Workings - RT566 - Borehole Seam
Project: Newcastle Rail Corridor
Location: Newcastle
Analysis Assumptions: Pillar dimensions from RT.

Client: UrbanGrowth NSW
Date: 2 December 2015
Sheet: 1

Project No: 81720.01

Pillar Id:	Comment	Depth D (m)	Seam Thickness (m)	Working Section H (m)	Pillar Height Section H (m)	Unit Weigth γ (kN/m³)	Pillar Details Width Wp (m)	Pillar Details Length Lp (m)	Pillar Details Internal Angle (°)	Roadway Details Wr (m)	Roadway Details Lr (m)	Extract. Ratio (%)	Pillar Area m²	Total Area m²	Width/ Height Ratio Wp/H	Width Modifier Θ_0	Width Modifier Θ	Pillar Stress (Tributary) (MPa)	Pillar Load (Tributary) MN	Abut (A) Yield (Y) (?)	Shed Load MN	Lodad Received MN	Pillar Stress ("Yield") (MPa)	Pillar Stress ("Abut") (MPa)	Power Law Strength (MPa)	Power Law "Ultimate" Load MN	Power Law FoS	Power Law Probability of Failure
49		77.0	6.4	5.4	5.4	25	11.0	40.3	90.0	5.3	3.6	38.0	443.3	715.6	2.0	1.571	1.000	3.11	1377						7.09	3141	2.28	1.1E-07
50		77.0	6.4	5.4	5.4	25	10.5	32.1	90.0	4.7	1.8	34.6	337.1	515.3	1.9	1.507	1.000	2.94	992						6.92	2332	2.35	4.0E-08
51		77.0	6.4	5.4	5.4	25	10.9	34.1	90.0	5.1	3.8	38.7	371.7	606.4	2.0	1.516	1.000	3.14	1167						7.05	2622	2.25	1.8E-07
52		77.0	6.4	5.4	5.4	25	11.0	21.6	90.0	5.2	2.1	38.1	237.6	383.9	2.0	1.325	1.000	3.11	739						7.09	1684	2.28	1.2E-07
53		77.0	6.4	5.4	5.4	25	10.5	29.1	90.0	5.1	4.0	40.8	305.6	516.4	1.9	1.470	1.000	3.25	994						6.92	2114	2.13	1.0E-06
54		77.0	6.4	5.4	5.4	25	10.3	15.8	90.0	5.0	2.0	40.2	162.7	272.3	1.9	1.211	1.000	3.22	524						6.85	1115	2.13	1.0E-06
55		77.0	6.4	5.4	5.4	25	11.0	29.7	90.0	5.4	4.4	41.6	326.7	559.2	2.0	1.459	1.000	3.30	1077						7.09	2315	2.15	7.3E-07
56		77.0	6.4	5.4	5.4	25	12.2	25.8	90.0	4.5	3.6	35.9	314.8	491.0	2.3	1.358	1.000	3.00	945						7.47	2351	2.49	5.7E-09
57		77.0	6.4	5.4	5.4	25	11.6	21.1	90.0	4.0	3.8	37.0	244.8	388.4	2.1	1.291	1.000	3.06	748						7.28	1782	2.38	2.6E-08
58		77.0	6.4	5.4	5.4	25	12.6	30.6	90.0	4.9	4.3	36.9	385.6	610.8	2.3	1.417	1.000	3.05	1176						7.59	2928	2.49	5.4E-09
59		77.0	6.4	5.4	5.4	25	12.4	24.4	90.0	4.9	4.3	39.1	302.6	496.5	2.3	1.326	1.000	3.16	956						7.53	2279	2.38	2.5E-08
60		77.0	6.4	5.4	5.4	25	10.8	19.9	90.0	5.0	3.7	42.4	214.9	372.9	2.0	1.296	1.000	3.34	718						7.02	1509	2.10	1.5E-06
61		77.0	6.4	5.4	5.4	25	11.7	24.6	90.0	5.1	4.2	40.5	287.8	483.8	2.2	1.355	1.000	3.24	931						7.31	2105	2.26	1.5E-07
62		77.0	6.4	5.4	5.4	25	10.4	23.9	90.0	4.7	3.7	40.4	248.6	416.8	1.9	1.394	1.000	3.23	802						6.89	1712	2.13	9.3E-07
63		77.0	6.4	5.4	5.4	25	11.1	12.9	90.0	4.4	4.4	46.6	143.2	268.2	2.1	1.075	1.000	3.60	516						7.12	1019	1.97	9.1E-06
64		77.0	6.4	5.4	5.4	25	11.8	21.1	90.0	5.3	5.1	44.4	249.0	448.0	2.2	1.283	1.000	3.46	862						7.34	1829	2.12	1.1E-06
65		77.0	6.4	5.4	5.4	25	10.1	11.2	90.0	4.9	4.2	51.0	113.1	231.0	1.9	1.052	1.000	3.93	445						6.78	767	1.73	3.3E-04
66		77.0	6.4	5.4	5.4	25	10.6	30.2	90.0	5.0	4.5	40.9	320.1	541.3	2.0	1.480	1.000	3.26	1042						6.95	2226	2.14	8.9E-07
67		77.0	6.4	5.4	5.4	25	10.8	25.1	90.0	5.1	3.5	40.4	271.1	454.7	2.0	1.398	1.000	3.23	875						7.02	1903	2.17	5.2E-07
68		77.0	6.4	5.4	5.4	25	10.6	31.0	90.0	5.1	5.0	41.9	328.6	565.2	2.0	1.490	1.000	3.31	1088						6.95	2285	2.10	1.5E-06
69		77.0	6.4	5.4	5.4	25	10.8	28.5	90.0	5.5	4.5	42.8	307.8	537.9	2.0	1.450	1.000	3.36	1035						7.02	2161	2.09	1.8E-06
70		77.0	6.4	5.4	5.4	25	10.7	28.8	90.0	5.5	3.3	40.7	308.2	520.0	2.0	1.458	1.000	3.25	1001						6.99	2153	2.15	7.2E-07
71		77.0	6.4	5.4	5.4	25	11.1	28.0	90.0	6.0	4.2	43.6	310.8	550.6	2.1	1.432	1.000	3.41	1060						7.12	2213	2.09	1.8E-06
72		77.0	6.4	5.4	5.4	25	11.5	28.6	90.0	5.7	3.8	41.0	328.9	557.3	2.1	1.426	1.000	3.26	1073						7.25	2384	2.22	2.6E-07
73		77.0	6.4	5.4	5.4	25	10.3	13.0	90.0	5.5	3.4	48.3	133.9	259.1	1.9	1.116	1.000	3.73	499						6.85	918	1.84	6.4E-05
74		77.0	6.4	5.4	5.4	25	11.3	28.5	90.0	5.8	3.7	41.5	322.1	550.6	2.1	1.432	1.000	3.29	1060						7.18	2314	2.18	4.6E-07
75		77.0	6.4	5.4	5.4	25	12.3	25.1	90.0	5.2	3.6	38.5	308.7	502.3	2.3	1.342	1.000	3.13	967						7.50	2316	2.40	2.1E-08
76		77.0	6.4	5.4	5.4	25	11.6	14.5	90.0	5.4	3.8	45.9	168.2	311.1	2.1	1.111	1.000	3.56	599						7.28	1225	2.04	3.3E-06
77		77.0	6.4	5.4	5.4	25	10.9	23.5	90.0	5.2	3.6	41.3	256.2	436.3	2.0	1.366	1.000	3.28	840						7.05	1807	2.15	7.2E-07
78		77.0	6.4	5.4	5.4	25	17.4	39.0	90.0	5.7	2.2	28.7	678.6	951.7	3.2	1.383	1.024	2.70	1832						9.06	6150	3.36	2.1E-14
79		77.0	6.4	5.4	5.4	25	14.3	16.6	90.0	4.8	3.9	39.4	237.4	391.6	2.6	1.074	1.000	3.18	754						8.10	1923	2.55	2.3E-09
80		77.0	6.4	5.4	5.4	25	8.5	21.8	90.0	4.9	3.6	45.6	185.3	340.4	1.6	1.439	1.000	3.54	655						6.21	1151	1.76	2.1E-04
81		77.0	6.4	5.4	5.4	25	8.2	17.9	90.0	4.8	4.5	49.6	146.8	291.2	1.5	1.372	1.000	3.82	561						6.10	895	1.60	1.6E-03
82		77.0	6.4	5.4	5.4	25	9.1	54.0	90.0	5.3	2.4	39.5	491.4	812.2	1.7	1.712	1.000	3.18	1563						6.43	3161	2.02	4.6E-06
83		77.0	6.4	5.4	5.4	25	11.0	36.2	90.0	5.1	4.4	39.1	398.2	653.7	2.0	1.534	1.000	3.16	1258						7.09	2822	2.24	1.9E-07
84		77.0	6.4	5.4	5.4	25	11.3	38.9	90.0	5.4	2.2	36.0	439.6	686.4	2.1	1.550	1.000	3.01	1321						7.18	3158	2.39	2.3E-08
85		77.0	6.4	5.4	5.4	25	12.7	25.9	90.0	5.1	4.4	39.0	328.9	539.3	2.4	1.342	1.000	3.16	1038						7.62	2508	2.42	1.6E-08
86		77.0	6.4	5.4	5.4	25	12.9	38.9	90.0	5.0	2.3	32.0	501.8	737.5	2.4	1.502	1.000	2.83	1420						7.69	3857	2.72	2.1E-10
87		77.0	6.4	5.4	5.4	25	8.8	69.6	90.0	5.4	1.5	39.3	612.5	1009.6	1.6	1.776	1.000	3.17	1944						6.32	3873	1.99	7.0E-06
88		77.0	6.4	5.4	5.4	25	9.8	47.7	90.0	5.7	3.9	41.6	467.5	799.8	1.8	1.659	1.000	3.29	1540						6.68	3123	2.03	4.2E-06
89		77.0	6.4	5.4	5.4	25	10.2	34.3	90.0	5.6	3.9	42.0	349.9	603.6	1.9	1.542	1.000	3.32	1162						6.82	2385	2.05	2.9E-06
90		77.0	6.4	5.4	5.4	25	12.0	54.4	90.0	5.0	4.0	34.2	652.8	992.8	2.2	1.639	1.000	2.93	1911						7.41	4836	2.53	3.1E-09
91		77.0	6.4	5.4	5.4	25	11.3	16.2	90.0	5.1	1.9	38.3	183.1	296.8	2.1	1.178	1.000	3.12	571						7.18	1315	2.30	8.3E-08
92		77.0	6.4	5.4	5.4	25	7.4	8.6	90.0	3.3	4.8	55.6	63.6	143.4	1.4	1.075	1.000	4.34	276						5.79	368	1.33	3.1E-02
93		77.0	6.4	5.4	5.4	25	9.5	28.2	90.0	5.5	3.9	44.4	267.9	481.5	1.8	1.496	1.000	3.46	927						6.58	1762	1.90	2.6E-05
94		77.0	6.4	5.4	5.4	25	10.6	28.4	90.0	4.8	4.2	40.0	301.0	502.0	2.0	1.456	1.000	3.21	966						6.95	2093	2.17	5.8E-07
95		77.0	6.4	5.4	5.4	25	9.2	23.8	90.0	5.0	2.8	42.0	219.0	377.7	1.7	1.442	1.000	3.32	727						6.47	1416	1.95	1.3E-05
96		77.0	6.4	5.4	5.4	25	11.1	27.3	90.0	5.1	3.5	39.3	303.0	499.0	2.1	1.422	1.000	3.17	960						7.12	2157	2.25	1.8E-07
97		77.0	6.4	5.4	5.4	25	12.7	30.1	90.0	4.8	1.7	31.3	382.3	556.5	2.4	1.407	1.000	2.80	1071						7.62	2915	2.72	2.0E-10
98		77.0	6.4	5.4	5.4	25	11.5	26.3	90.0	4.8	1.8	34.0	302.5	458.0	2.1	1.392	1.000	2.92	882						7.25	2192	2.49	5.8E-09
												Total	15566.3	25687.5														

Notes:

1. Pillar stability analysis based on the methods of Galvin, Hebbelwhite, Salamon and Lin (1998) UNSW Mining Research Centre Report RR3/98.
2. Relationship between Factor of Safety (FoS) and probability of coal pillar failure is based on interpolation and extrapolation of data in the above publication. It should be noted that the probability of failure does not extend beyond a FoS of 2.11 (equivalent to a probability of failure of 1 in 1,000,000) in the above and therefore probabilities of failure for FoSs above this are an extrapolation based on a curve of best fit for data for FoSs of 2.11 and less
3. Load on weaker pillars reduced by 30% as discussed in "Prefailure Pillar Yielding", by Agapto and Goodrich (2002) Load transferred to adjacent pillars.
4. Extraction ratio is relative to working section not full seam height.
5. Pillar Height should be the same as the working section unless roof collapse is being considered.

Panel Extraction Ratio 0.39

Summary	FoS
Max	3.36
Min	1.33
Mean	2.20

Panel Factor of safety Based on Tributary load

Total Pillar Load	49448.50	MN
Total Pilla Capacity	111567.11	MN
Panel FoS	2.26	

Appendix C

Letter from Mine Subsidence Board, 15 January 2016

Mine Subsidence Board “Newcastle City Area Mine Subsidence Categories” 8 June 2012

Mine Subsidence Board - Newcastle Plan Legend

Hunter Development Corporation - “Newcastle Mines Grouting Fund 2015/2016 Area Category Rates - November 2015”

MINE SUBSIDENCE BOARD

ABN: 87 445 348 918

NEWCASTLE
Ground Floor
NSW Government Offices
117 Bull Street
Newcastle West 2302
PO Box 488G Newcastle 2300
Telephone: (02) 4908 4300
Facsimile: (02) 4929 1032
DX 4322 Newcastle West

PICTON
100 Argyle Street
Picton 2571
PO Box 40 Picton 2571
Telephone: (02) 4677 1967
Facsimile: (02) 4677 2040
DX 26053 Picton

SINGLETON
The Central Business Centre
Unit 6, 1 Pitt Street
Singleton 2330
PO Box 524 Singleton 2330
Telephone: (02) 6572 4344
Facsimile: (02) 6572 4504

WYONG
Suite 3 Feldwin Court
30 Hely Street
Wyong 2259
PO Box 157 Wyong 2259
Telephone: (02) 4352 1646
Facsimile: (02) 4352 1757
DX 7317 Wyong

HEAD OFFICE
PO Box 488G
Newcastle 2300
Telephone: (02) 4908 4395
Facsimile: (02) 4929 1032

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In reply please send to: Newcastle District Office

Our reference: FN00-01493N0

Your reference: DP Letter : 8/1/2016

Contact: Peter Evans (02) 4908 4391

Douglas Partners Pty Ltd
Attention: Mr Stephen Johns
PO Box 324
Hunter Region Mail Centre
NSW 2310

14 January 2016

Dear Stephen,

ENQUIRY NO. TENQ16-13738N1
NEWCASTLE RAIL CORRIDOR: PART LOT 22 DP 1165985; LOT 1 DP 1192409; PART LOT 1001 DP 1095836; PART LOT 21 DP 1009735; PART LOT 22 DP 1009735; PART LOT 21 DP 1165985; LOT 1000 DP 1095836

I refer to your letter dated 8 January 2016 concerning preliminary plans for development along the Newcastle Rail Corridor, between Worth Place and Watt Street, Newcastle. I understand you are seeking advice from the Board on its likely development requirements.

As you will be aware most of these properties lie within the Newcastle Mine Subsidence District, except for a section at the Watt Street end. The purpose of a District is to prevent damage through surface development controls that take account of the risk of damage by subsidence from old, current and future mining.

Any proposal to subdivide or erect or alter any improvements on land within a Mine Subsidence District will require the Boards approval. So, applicants are encouraged to contact the Board early in the planning and design development process to determine the Boards specific requirements.

For the section of rail corridor within the Newcastle Mine Subsidence District, the Board has nominated a surface development guideline No. 9, which permits the following building development up to 30m long;

1. Single or two storey timber or steel framed improvements clad with weatherboards or other similar materials erected on reinforced concrete footings and/or slabs to comply with AS 2870.
2 Single or two storey brick veneer improvements erected on reinforced concrete footings and/or slabs to comply with AS 2870.
3. Up to three (3) storey brick construction designed in accordance with the relevant codes and standards.

Development which exceeds or doesn't comply with this guideline would need to be considered by the Board on its "merits". This would require an assessment of the mine subsidence risk and likelihood of damage to surface development.

In consideration of a merit assessment, the Board generally requests a geotechnical investigation which provides supporting evidence and a recommendation for one of the following;

a) There is no risk of mine subsidence.
b) The risk of mine subsidence should be eliminated by suitable means such as grouting.
c) The risk of mine subsidence can be mitigated by structural design, adopting recommended mine subsidence design parameters.

The geotechnical investigation should be undertaken by an engineer experienced in mine subsidence and the report should include confirmation of the depth of the coal seam, height of the workings, thickness of competent rock, pillar dimensions used in any analysis, and details of drifts, shafts, and geological anomalies such as faults. The analysis should also include a sensitivity / risk review, and consider potential subsidence scenarios including a worst case.

If grouting of the workings is necessary to eliminate the risk of mine subsidence the Board would likely request for its acceptance a grouting design and verification plan.

Where the Board accepts mine subsidence design parameters, it would likely request an "Impact Statement" of the surface development for acceptance prior to detailed design. This would be expected to;

a) Confirm the 'mine subsidence design parameters
b) List the structures and building elements.
c) Summarise the outcome of a risk assessment.
d) List the design mitigation measures proposed.

For multistorey building developments the Board will likely require exploratory drilling to prove the mine subsidence site parameters used in any analysis, including;

a) Verifying the limit of workings in the Borehole and Yard seams.
b) Verifying the location of workings which crossover the rail corridor.
c) Determining the possibility of unmapped workings above the borehole seam.

Please note this information is provided "without prejudice" based on limited information to enable Douglas Partners and its client Urban Growth, better anticipate the Board's likely requirements for the future development of the Newcastle Rail Corridor.

In respect of your query concerning the Newcastle Mine Grouting Fund, please contact the Hunter Development Corporation who is the administrator.

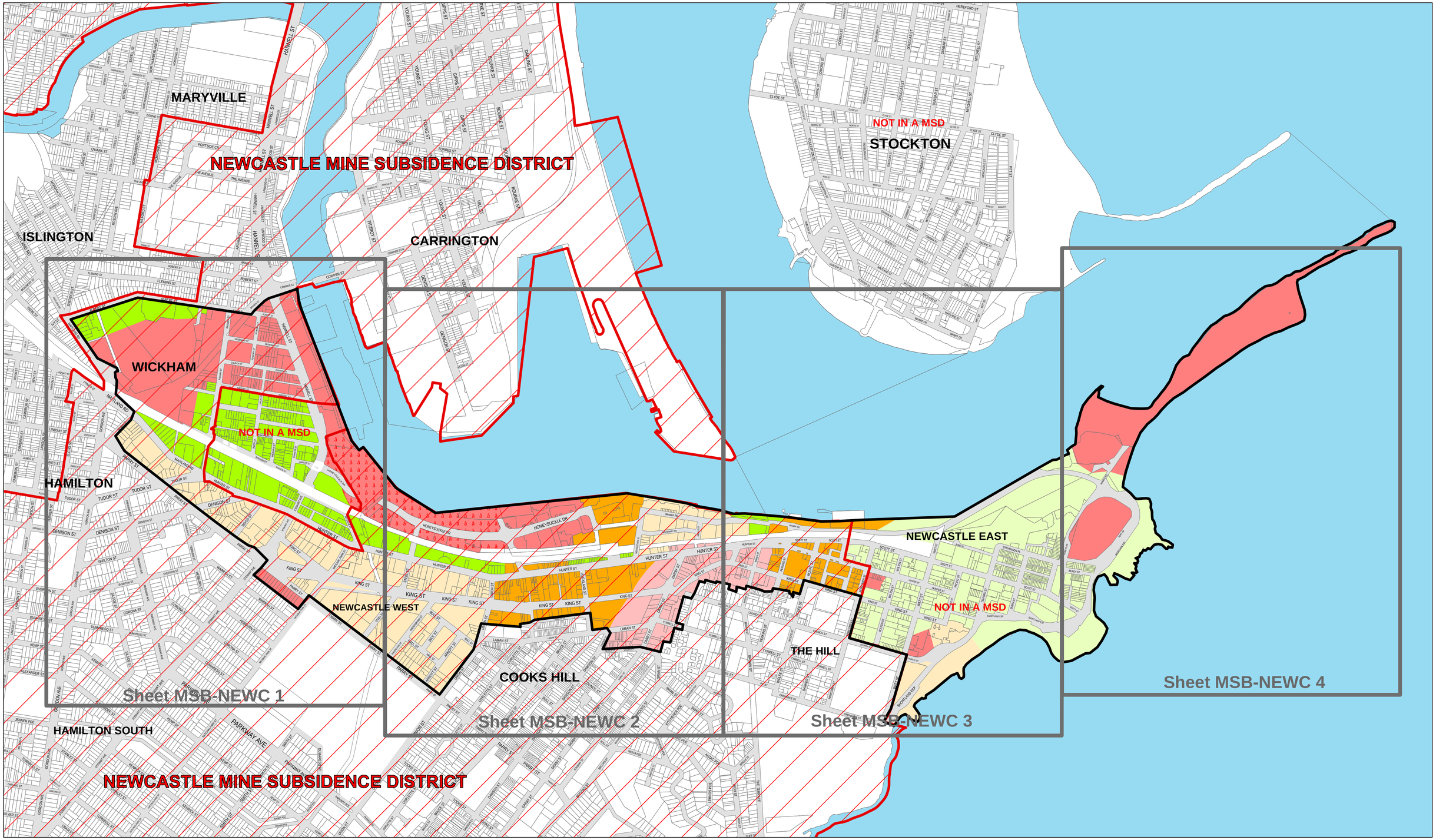
If you have any queries concerning this matter please don't hesitate to contact me.

Yours faithfully

Peter Evans
Subsidence Risk Engineer

Copies:

- CEO (Mine Subsidence Board)
- Newcastle District Manager (Mine Subsidence Board)



WARNING: THIS MAP REFERS TO THE NEWCASTLE CITY CENTRE AREA ONLY
EXTENSIVE MINE WORKINGS EXIST WITHIN AND BEYOND THIS AREA

NEWCASTLE CITY CENTRE AREA MINE SUBSIDENCE CATEGORIES

REVISION DATE
8 June 2012

N
W E
S

0 125 250 500 750 1,000
Meters

LEGEND

- GROUTING STRATEGY(HDC)
- LIMITED RESTRICTIONS
- NO RESTRICTIONS
- CATEGORY A
- CATEGORY B
- CATEGORY C
- CATEGORY D

- EXTENT NEWCASTLE CITY CENTRE AREA
- NEWCASTLE MINE SUBSIDENCE DISTRICT BOUNDARY

DISCLAIMER:

The source data used to compile the maps has been obtained by the Mine Subsidence Board from records held by NSW Trade and Investment - Division of Resources & Energy; mine owners; the Department of Finance & Services - Land and Property Information; and Newcastle City Council. Accordingly, no warranty is expressed or can be implied as to the accuracy of the maps or that the maps are free from any error or omission. The State of New South Wales, the Mine Subsidence Board and their servants and agents expressly disclaim any liability whatsoever for the consequences arising from any act done or omission made in reliance on the maps.

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PLEASE REFER TO THE FULL DISCLAIMER (AGREED TO) ON THE MINE SUBSIDENCE BOARD WEBSITE FOR RESTRICTIONS ON THE USE AND ACCURACY OF THE MAP DATA.

MINE SUBSIDENCE BOARD

Mine Subsidence Board — Newcastle Plan Legend

The plan only shows categories based on the extent of mine workings.

Surface development categories with regard to mine subsidence are available from the Mine Subsidence Board. Please note the plan does not cover development requirements of other organisations.

The Mine Subsidence Board regularly reviews its surface development categories as additional geotechnical information becomes available. As Stage 2 of this project, the Board is assessing whether further detail can be provided to assist in understanding the quantum of grouting that is likely to be required in the categories identified on the plan.

1. Legend

— ***No restriction***. Allotments are not undermined nor within the zone of influence of known mine workings mining. There are no mine subsidence requirements for grouting.

— ***Limited Restrictions.*** The area is not currently in a Mine Subsidence District. Some areas of shallow unchartered workings have been identified. Further geotechnical investigation of some sites, with possible grouting, may be required.

— ***Category A***. Area of larger and relative uniform pillars. Geotechnical investigations required and likely grouting for high-rise and larger footprint structures.

— ***Category B***. Area of smaller dimension and relative uniform pillars. Geotechnical investigations required and high likelihood of coal seam grouting for high-rise and larger footprint structures.

— ***Category C.*** Area underlain by Yard Seam at around 30m depth. Extent of Yard Seam to be determined and mine workings fully grouted. Additional requirements as per Category B.

— ***Category D.*** Area of old and small pillars with a possible history of failure. Detailed geotechnical investigation required and coal seam grouting for high-rise and larger footprint structures if seam has not fully collapsed.

— ***Category E.*** As per Category D with an ‘in principle’ grouting proposal available for this area.

NEWCATLE MINES GROUTING FUND 2015/2016 Area Category Rates – November 2015

The rates below apply to the Newcastle Mines Grouting Fund.

Category	Rate per square metre of site area (excl GST)
No restriction	Not applicable
Limited restriction	$200
A, D & E	$200
B	$300
C	$400

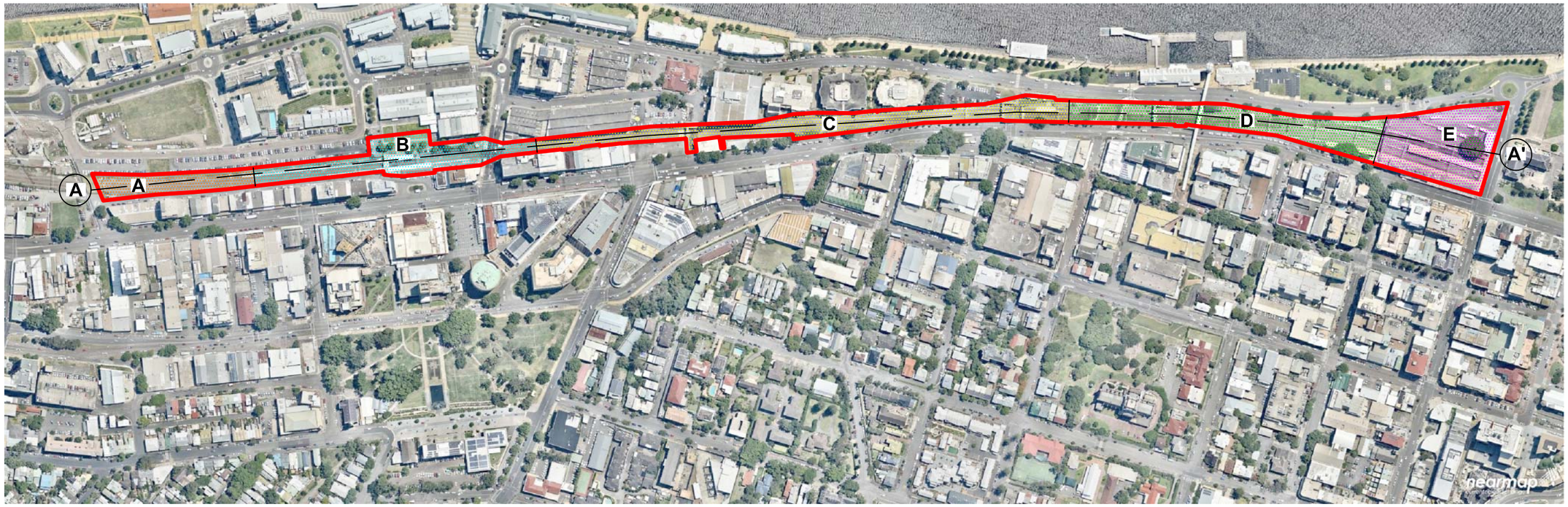
These rates are subject to change at any time. A formal review is scheduled for the end of 2016.

The rates directly correspond to the Newcastle City Centre Area Mine Subsidence Categories mapping published by the Mine Subsidence Board 2012, a link to the mapping is available below.

http://www.minesub.nsw.gov.au/SiteFiles/minesubnswgovau/NEWCASTLE-CITY-CENTRE-A1-map-08-06-2012.pdf

Appendix D

Drawing 1 – Site Plan and Geotechnical Zones
Drawing 2 – Cross-Section A-A' Sheet 1 of 2
Drawing 3 – Cross-Section A-A' Sheet 2 of 2
Drawing 4 – Inferred Layout of Mine Workings in Borehole Seam
Drawing 5 – Preliminary Grout Zones in Borehole Seam



0 50 100 150 200 300 400 500m

1:5,000 @ A3

NOTES

1. Drawing adapted from Nearmap Image dated 20.11.15
2. See Drawings 2 and 3 for Section A-A'

LEGEND

Approximate Rezoning Site Boundary

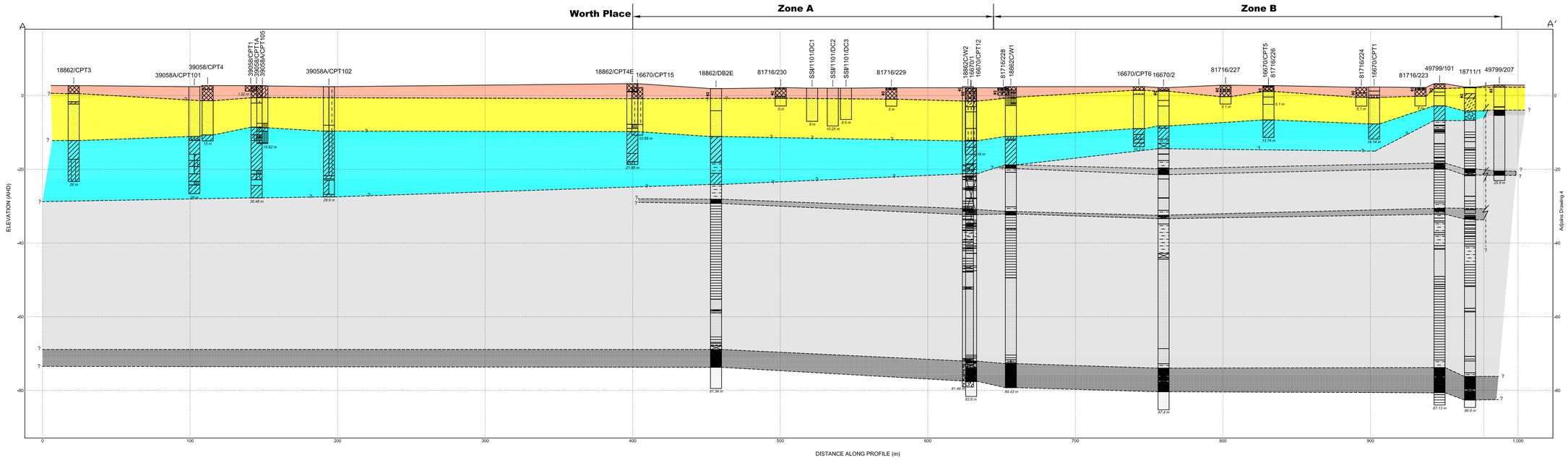
A Geotechnical Zone

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: UrbanGrowth NSW		TITLE: **Site Plan and Geotechnical Zones Surplus Newcastle Rail Corridor Land Newcastle**
OFFICE: Newcastle	DRAWN BY: PLH	
SCALE: 1:5,000@A3 Sheet	DATE: 11.12.2015	

N

PROJECT No:	81716.01
DRAWING No:	1
REVISION:	1



LEGEND

- Carbonaceous Siltstone
- Core Loss
- Void
- Clay
- Clayey Sand
- Clayey Silt
- Coal
- Filling
- Gravel
- Laminite
- Mudstone
- Sand
- Sandstone
- Sandy Clay
- Sandy Silt
- Siltstone
- Unit 1 Fill
- Unit 2 Sand / Silty Sand
- Unit 3 Clay / Sandy Clay / Silty Clay
- Unit 4 Bedrock - Sandstone, Siltstone, Mudstone, Laminite, Coal
- Unit 4.1 Dudley Seam
- Unit 4.2 Yard Seam
- Unit 4.3 Borehole Seam

NOTE: Layer boundaries have been interpolated between test locations and are therefore approximate. Some test data has been projected onto the section from outside the subject site. Actual stratification may vary from that shown.

TESTS / OTHER

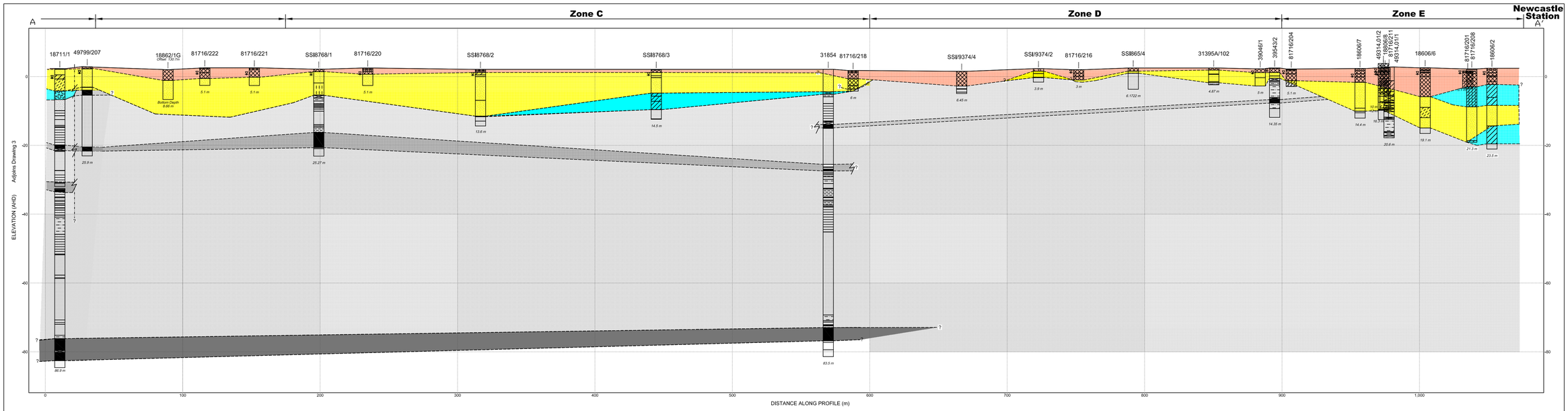
- Water level

Horizontal Scale (metres) 0 30

Vertical Exaggeration = 2.5

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: UrbanGrowth NSW		TITLE: Cross-section A-A' (Sheet 1 of 2)	PROJECT No: 81716.00
OFFICE: Newcastle	DRAWN BY: PLH	Newcastle Rail Corridor	DRAWING No: 2
SCALE: 1:1500 (H) 1:600 (V) @ A1	DATE: 10.12.2015	Newcastle	REVISION: 1



LEGEND

- Core Loss
- Asphaltic Concrete
- Volc
- Clay
- Clayey Sand
- Claystone
- Coal
- Concrete
- Filling
- Laminite
- Mudstone
- Roadbase
- Sand
- Sandstone
- Sandstone coarse grained
- Sandy Clay

- Unit 1 Fill
- Unit 2 Sand / Silty Sand
- Unit 3 Clay / Sandy Clay / Silty Clay
- Unit 4 Bedrock - Sandstone, Siltstone, Mudstone, Laminite, Coal
- Unit 4.1 Dudley Seam
- Unit 4.2 Yard Seam
- Unit 4.3 Borehole Seam

NOTE: Layer boundaries have been interpolated between test locations and are therefore approximate. Some test data has been projected onto the section from outside the subject site. Actual stratification may vary from that shown.

TESTS / OTHER

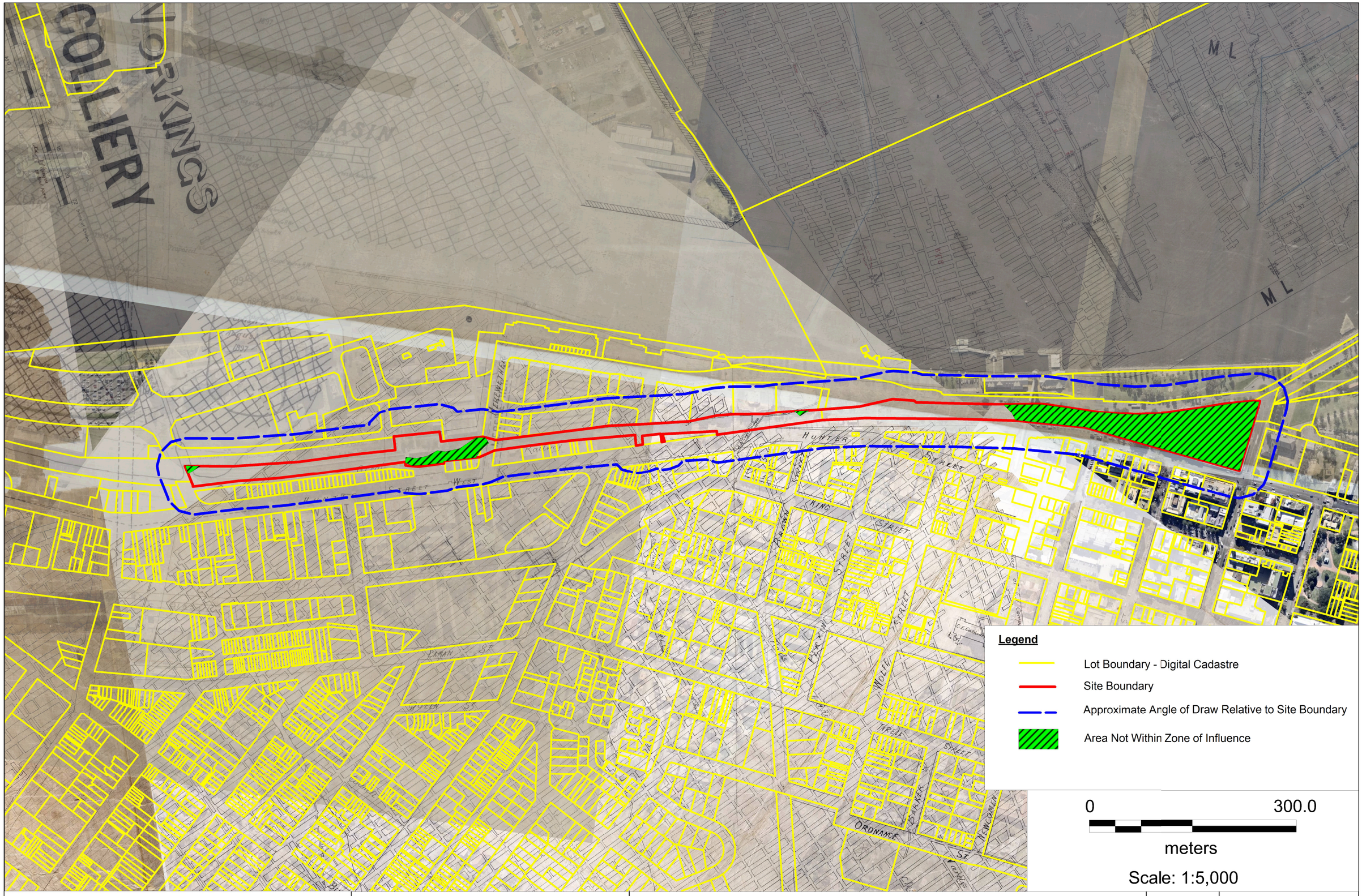
- Water level

Horizontal Scale (metres) 0 30

Vertical Exaggeration = 2.5

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: UrbanGrowth NSW		TITLE: Cross-section A-A' (Sheet 2 of 2)	PROJECT No: 81716.00
OFFICE: Newcastle	DRAWN BY: PLH	Surplus Newcastle Rail Corridor Land	DRAWING No: 3
SCALE: 1:1500 (H) 1:600 (V) @ A1	DATE: 10.12.2015	Newcastle	REVISION: 1

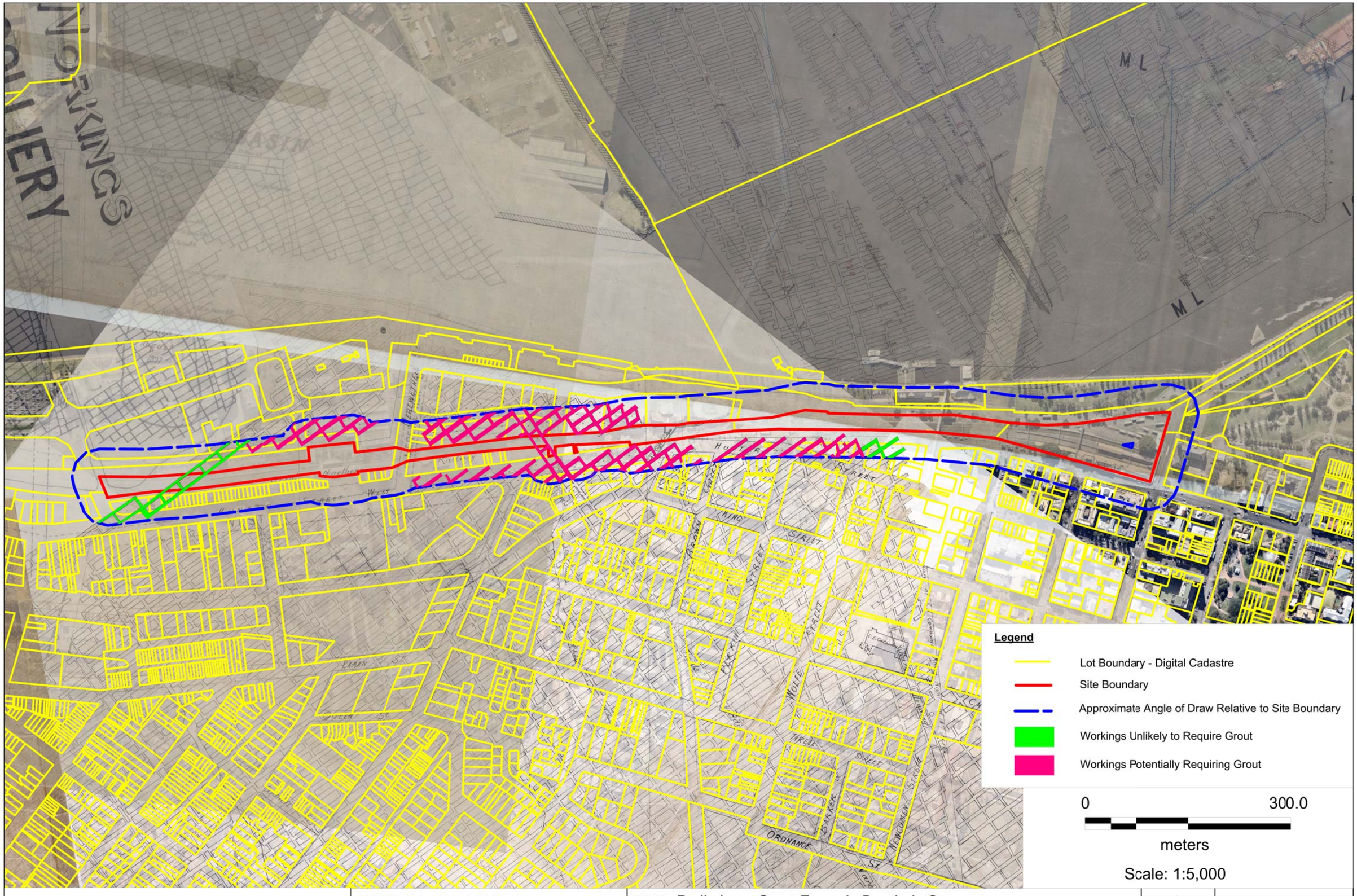


Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: UrbanGrowth NSW		
OFFICE: Newcastle	DRAWN BY: TAC	
SCALE: As shown	DATE: 12.01.16	

TITLE: Inferred Layout of Mine Workings in Borehole Seam
Newcastle Rail Corridor

PROJECT No:	81716.01
DRAWING No:	4
REVISION:	0



Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: UrbanGrowth NSW		TITLE: Preliminary Grout Zones in Borehole Seam Newcastle Rail Corridor
OFFICE: Newcastle	DRAWN BY: TAC	
SCALE: As shown	DATE: 13.01.16	

PROJECT No:	81716.01
DRAWING No:	5
REVISION:	1

Attachment D - Heritage Impact Assessment

By RPS, dated June 2017

Newcastle Urban Transformation and Transport Program – Rezoning of Surplus Corridor Lands

Heritage Assessment Report

Prepared by:

RPS AUSTRALIA EAST PTY LTD

241 Denison Street
Broadmeadow NSW 2292

T: 02 4940 4200
F: 02 4961 6794
E: Tessa.Boer-Mah@rpsgroup.com.au

Prepared for:

URBAN GROWTH NSW

T: 02 9387 2600
M: 0403 414 973
E: jennyr@elton.com.au

Client Manager: Tessa Boer-Mah
Report Number: PR123632
Version / Date: Final June 2017

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Document Status

Version	Purpose of Document	Orig	Review	Review Date	Approval for Issue	Date Issued
Revised Final	Final	GW	TBM	16.03.2017	TBM	16.03.2017
Final	Final	GW + LN	TBM	22.06.2017	TBM	22.06.2017

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Appendices

Appendix 1 AHIMS Results
Appendix 2 Heritage Interpretation Framework

Executive Summary

RPS has been contracted by Elton Consulting on behalf of Urban Growth NSW (UGNSW) to provide an assessment of Aboriginal and historic cultural heritage to support the proposed rezoning of surplus rail corridor lands in central Newcastle for urban purposes. The proposal involves a zoning change from its current zoning SP2 Special Purpose Infrastructure to B4 Mixed Use, SP3 Tourist and RE1 Public Recreation zones. The rezoning would be achieved through an amendment to Newcastle Local Environmental Plan 2012 (NLEP).

A search undertaken of the Aboriginal Heritage Information Management System (AHIMS) identified that no Aboriginal sites are present in the Rezoning Study Area. However, the literature review and previous archaeological work suggests that subsurface Aboriginal heritage may be present in the Rezoning Study Area.

The Rezoning Study Area is in the Newcastle City Centre Heritage Conservation Area. In reference to built heritage there are six heritage places in or abutting the area: the Newcastle Railway Station and the Newcastle Railway Station Additional Group (both on the State Heritage Register); the Civic Railway Workshop; Civic Station; the Remains of AA Co. Bridge and Fence and the former Tramway Substation (on the NLEP 2012 Schedule 5 and of local heritage significance). There are a number of identified archaeological and potential resources in the Rezoning Study Area including archaeological resources associated with Mortuary Station, Civic Railway Station, Civic Railway Workshops curtilage and railway turntable, Newcastle Railway Station and the penal settlement as defined in the Newcastle Archaeological Management Plan (Higginbotham 2013).

The program objective of the proposed rezoning is 'to preserve and enhance culture and heritage' with the aim of respecting, maintaining and enhancing the unique heritage and character of the Newcastle city centre (Newcastle Urban Transformation and Transport Program January 2016). This objective should ensure the retention, maintenance and refurbishment of heritage buildings and preserve the heritage significance of the Newcastle City Centre Heritage Conservation Area. The detailed management plan to support this objective will occur during the planning phase of the Development Application.

Though the proposed rezoning will not physically affect built heritage, development that will follow the rezoning will. It is considered however that the impact will be, in most instances, positive with adaptive re-use of heritage items and in a number of instances improved view corridors. Detailed assessments of archaeological potential will be required prior to development to determine the potential for archaeological resources in specific areas and the potential of a proposed development to affect an identified or potential archaeological resource. The approvals required would be dependent on the significance of the archaeological resource and the potential for the proposed development to affect that significance.

This report provides advice on the planning approval process required and provides recommendations for mitigation against an adverse heritage impact. The heritage aspects within the rezoning Study Area do not prevent the rezoning progressing. Heritage values are to be preserved in the former rail corridor by adhering to the heritage interpretation framework (Appendix 2) and the recommendations in this report.

The heritage interpretation framework for the parcels is provided in Appendix 2. It is intended to provide an overarching framework and guidance for interpretation across the entire rezoning area (Worth Place to Newcastle Railway Station). The aim of the framework is to ensure that the heritage interpretation strategies produced at DA level align with the heritage themes and stories associated with the former rail corridor including celebrating the heritage of Newcastle Rail Corridor as part of the Great Northern Railway.

Abbreviation/ Term	Meaning
Aboriginal Object	"any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains" (DECCW 2010:18).
Aboriginal Place	"a place declared under s.84 of the NPW Act that, in the opinion of the Minister, is or was of special significance to Aboriginal culture" (DECCW 2010:18). Aboriginal places have been gazetted by the minister.
Activity	A Study, development, or work (this term is used in its ordinary meaning and is not restricted to an activity as defined by Part 5 EP&A Act 1979).
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
DECCW	Department of Environment, Climate Change and Water (is now the Office of Environment and Heritage – OEH)
Disturbed Land	"Land is disturbed if it has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable." (DECCW 2010:18).
Due Diligence	"taking reasonable and practical steps to determine whether a person's actions will harm an Aboriginal object and, if so, what measures can be taken to avoid that harm" (DECCW 2010:18
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
GDA	Geodetic Datum Australia
Harm	"destroy, deface, damage an object, move an object from the land on which it is situated, cause or permit an object to be harmed." (DECCW 2010:18)
ICOMOS	International Council for Monuments and Sites
IHO	Interim Heritage Order
LEP	Local Environmental Plan
LGA	Local Government Area
NCCHCA	Newcastle City Centre Heritage Conservation Area
NLEP	Newcastle Local Environment Plan
NPWS	National Parks and Wildlife Service
NPW Act	National Parks and Wildlife Act 1974 (NSW)
NPW Regulation	National Parks and Wildlife Regulation 2009 (NSW)
NURS	Newcastle Urban Renewal Strategy
OEH	Office of Environment and Heritage (formerly DECCW)
PAD	Potential Archaeological Deposit
Program	Newcastle Urban Transformation and Transport Program
Project Area	Project Area is the area subject to the desktop study in this report
Proposal site	Proposal site is the area subject to the desktop study in this report
REF	Review of Environmental Factors
s170 register	Section 170 of the *Heritage Act 1977* requires each State Government agency to keep records of heritage items owned or operated by it and this is commonly referred to as a s170 register
SHI	State Heritage Inventory – inventory of heritage items of local or state significance
SHR	State Heritage Register – register of heritage items of state significance
SoHI	Statement of Heritage Impact
Study Area	Study Area is the area subject to the desktop study in this report
TfNSW	Transport for NSW

1.0 Introduction

1.1 Background

RPS has been contracted by Elton Consulting on behalf of UrbanGrowth NSW to provide an assessment of Aboriginal and historic cultural heritage to support the proposed rezoning of surplus rail corridor lands in central Newcastle for urban purposes through an amendment to Newcastle Local Environmental Plan 2012 (NLEP).

1.2 The proposal

This report has been prepared to support the amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor land ('rail corridor land') between Worth Place and Watt Street in Newcastle city centre (Figure 1).

The Newcastle Urban Transformation and Transport Program ('Program') has been established to deliver on NSW Government's more than $500m commitment to revitalise the city centre through: the truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange; the provision of a new light rail line from Wickham to the Beach; and the delivery of a package of urban transformation initiatives.

The transformation element of the Program aims to bring people back to the city centre by strengthening connections between the city and the waterfront, creating employment opportunities, providing more public space and amenity, and delivering better transport.

The proposed rezoning of the rail corridor land forms a part of the delivery of urban transformation initiatives, comprising a package of transport, built form and public domain improvements.

1.2.1 Vision

The Program vision has been informed by feedback from the community, Council, government agencies and urban renewal experts.

> *Our vision is an activated city centre and waterfront that attracts people, new enterprises and tourism. Over time, we see great opportunities to build on the strengths of the city centre to encourage innovative and enterprising industries to thrive. In the longer term, we see an opportunity to strengthen Newcastle's position on the regional, national and international stage, with a view to stronger ties with the Asia Pacific.*
>
> *UrbanGrowth NSW, 2015*

1.2.2 Newcastle Urban Transformation

The Newcastle Urban Renewal Strategy (NURS) sets out the NSW Government's long term approach and vision for the revitalisation of Newcastle city centre to the year 2036.

The NURS identifies three character precincts in Newcastle city centre (West End, Civic and East End), within which significant housing and employment opportunities, together with built form and public domain changes and improvements exist. The NURS describes these precincts as:

- East End: residential, retail, leisure and entertainment
- Civic: the government, business and cultural hub of the city

- West End: the proposed future business district including the western end of Honeysuckle (Cottage Creek)

UrbanGrowth NSW has been directed by NSW Government to deliver on NURS through the Program, in partnership with Transport for NSW (TfNSW), the Hunter Development Corporation (HDC) and the City of Newcastle Council (Council).

1.2.3 Proposed rezoning

UrbanGrowth NSW seeks to amend the Newcastle Local Environmental Plan 2012 (NLEP) to enable the delivery of the Program and the objectives of NURS planning outcomes.

The Program is underpinned by six objectives which will drive successful urban revitalisation:

1. **Bring people back to the city centre**

   Re-imagine the city centre as an enhanced destination, supported by new employment, educational and housing opportunities and public domain that will attract people.

2. **Connect the city to its waterfront**

   Unite the city centre and the harbour to improve the experience of being in and moving around the city.

3. **Help grow new jobs in the city centre**

   Invest in initiatives that create jobs, with a focus on innovative industries, higher education and initiatives to encourage a range of businesses to the city centre.

4. **Create great places linked to new transport**

   Integrate urban transformation with new, efficient transport to activate Hunter and Scott Streets and return them to thriving main streets.

5. **Creating economically sustainable public domain and community assets**

   Leave a positive legacy for the people of Newcastle. Ensure that new public domain and community facilities can be maintained to a high standard into the future.

6. **Preserve and enhance heritage and culture**

   Respect, maintain and enhance the unique heritage and character of Newcastle city centre through the revitalisation activities.

1.2.4 Urban transformation proposed concept plan

Surplus rail corridor land runs through the East End and Civic city centre precincts as established by NURS.

Based on this vision and the results of extensive stakeholder and community engagement, an overall urban transformation concept plan (the concept plan) has been prepared for the surplus rail corridor (rezoning sites), as well as surrounding areas.

The concept plan considers and integrates with the delivery of light rail. It is also coordinated with the proposed Hunter Street Mall development to create an interactive, synergised and cohesive city centre and foreshore area.

The concept plan includes five ‘key moves’, two that relate to the Civic precinct and three of which relate to the East End.

1. Civic link (Civic)

This area is the civic heart of Newcastle and includes some of the region's most important civic and cultural assets, including Civic Park, City Hall, Civic Theatre and Newcastle Museum. Current investment in the area includes the law courts development and the, soon to be completed, University of Newcastle NeW Space campus.

The focus of this key move is to leverage best value from new investments by creating new open space and walking and cycling connections that link Newcastle's civic buildings to the waterfront and the light rail system.

- **Civic Green.** Creating a new civic focused public space linking Hunter Street to the Newcastle Museum that will provide direct visual and physical connection from Wheeler Place to the harbour, activate light rail on Hunter Street and meet the needs of the incoming legal and student populations
- **Built form improvements.** Sensibly scaled mixed use development that forms part of the Honeysuckle development.

2. Darby Plaza (Civic)

Darby Street is Newcastle's premier 'eat street', offering a mix of shops, cafes, restaurants and night life. At present Darby Street ends at the intersection with Hunter Street, and this key move seeks to create a new node of activity and linkage through to the harbour that complements the delivery of light rail.

- **Darby Plaza** A new community focused public space including provision of new walking and cycling facilities from Hunter Street to the harbour.
- **Built form improvements.** Zoning of rail corridor land between Merewether Street and Argyle Street to allow for future mixed use development in conjunction with surrounding lands in the longer term.

3. Hunter Street Revitalisation (East End)

Hunter Street features some of Newcastle's best heritage buildings and offers a mix of shops, cafes, restaurants and other local business. Hunter Street has experienced decline in recent years, and the opportunity exists to reinstate Hunter Street as the regions premier main street that complements the delivery of light rail.

- **Built form improvements.** Sensibly scaled mixed use development consistent with the adjoining land uses to create an activated street with 'two edges', celebrate heritage and create new linkages from Hunter Street to the waterfront, provide activation around light rail stops and improve walking and cycling facilities.

4. Entertainment Precinct (East End)

This key move aims to create a place where people can come to play, relax and reconnect with the harbour in a new public space stretching from Scott Street to the waterfront incorporating a new connection from Market Street to Queens Wharf. This key move will also assist to activate the area to create an exciting place for the East End.

- **Recreational opportunities.** This precinct will incorporate the adaptive re-use of the signal box and provision of recreation opportunities for all ages and abilities. Public domain will be designed to provide a thoughtful series of character areas and experiences as one traverses its length. The area will also provide opportunities for viewing and interpretation of heritage character that respect the unique qualities of place.

5. Newcastle Station (East End)

Newcastle Railway Station is proposed to be re-purposed into a hallmark destination and focal point for the new East End, accommodating enterprises and activities that attract visitors and stimulate the economy.

Refurbishment would fully respect and celebrate the heritage integrity of the Station, and could accommodate a range of different activities including community, retail, leisure and commercial uses.

1.2.5 Rezoning concept plan

The proposed rezoning of the surplus rail corridor lands is the focus of this report. The rezoning area is indicated in Figure 1.

Amendments to the NLEP are required to deliver part of the concept plan. The proposed amendments are on surplus rail corridor land only.

Necessary amendments to the NLEP 2012 include:

- amending the Land Use Zoning Map to introduce B4 Mixed Use, SP3 Tourism and RE1 Public Recreation zones to sites along the corridor
- amending the Height of Building and Floor Space Ratio maps to apply appropriate development standards to selected parcels of land

The approach taken to the amendments is to support the NURS planning approach and to remain consistent with surrounding planning controls in terms of zones, floor space ratio (FSR) and height.

The concept plan will also form the basis for updates to the Newcastle City Centre Development Control Plan design controls to guide development and public domain works for rezoning sites.

1.2.6 Proposed rezoning

This planning proposal seeks to rezone rail corridor land (rezoning sites) to enable the delivery of the proposed urban uses established in the concept plan. The location of the land affected by the proposed rezoning is identified in Figure 1.

The planning proposal concept plan includes public domain, entertainment, mixed use and commercial and residential development.

In general, the proposed rezoning will provide a mix of uses enabling between 400-500 dwellings which will comprise a variety of styles and types, and around 5,000m^2 of commercial, restaurant and other entertainment uses, as described in Table 1, and excluding any education or associated uses.

Proposed maximum building height and floor space ratio controls respect existing controls that apply to surrounding land.

Table 1 Proposed rezoning

Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 01	3,370m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 02	408m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 03	1,869m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 04	900m^2	B4 Mixed Use	FSR – 3:1	Height - 24m
Parcel 05	2,839m^2	RE1 Public Recreation	N/A	N/A
Parcel 06	1,604m^2	B4 Mixed Use	FSR – 3:1	Height – 18m
Parcel 07	295m^2	B4 Mixed Use	FSR – 2.5:1	Height – 30m
Parcel 08	2,040m^2	B4 Mixed Use	FSR – 2.5:1	Height – 30m
Parcel 09	988m^2	B4 Mixed Use	FSR – 4:1	Height – 24m
Parcel 10	467m^2	RE1 Public Recreation	N/A	N/A
Parcel 11	386m^2	SP2 Infrastructure	N/A	N/A
Parcel 12	4,542m^2	B4 Mixed Use	FSR – 1.5:1	Height – 14m
Parcel 13	659m^2	SP2 Infrastructure	N/A	N/A
Parcel 14	11,151m^2	RE1 Public Recreation	N/A	N/A
Parcel 15	10,698m^2	SP3 Tourist	FSR – 1.5:1	Height – 10-15m

This report has been based upon the proposed zoning under the Planning Proposal as submitted for Gateway determination, with the inclusion of Parcel 13. It is noted that this parcel has been removed from the current Planning Proposal in accordance with the Gateway determination as issued by the NSW Department of Planning and Environment. Nevertheless, for completeness, this report has considered the potential for some development occurring within this parcel in the future (subject to outcomes of a separate Planning Proposal). The recommendations of this report discuss whether there are any specific implications arising from this additional parcel. There are no changes to the zoning of parcels 16-20.

1.3 Methodology

This assessment includes:

- An identification of statutory requirements relevant to the project.
- A brief literature review of relevant documents relating to the history of the study area and its heritage values as well as strategic heritage policies.
- A heritage register search (Aboriginal and historic cultural heritage).
- Heritage advice for the Rezoning.

An extensive literature review has been carried out to inform this assessment including the following area-based and site-specific heritage-related studies and strategic heritage policy documents:

- *Newcastle Archaeological Management Strategy. Newcastle City Council (August 2015)*
- *The City of Newcastle Heritage Strategy 2013-2017 (March 2014)*
- *The City of Newcastle Heritage Policy (June 2013)*
- *Newcastle Archaeological Management Plan Review, Edward Higginbotham et al (April 2013) for the City of Newcastle*
- *Newcastle Railway Station Heritage Fabric Review & Conservation Works (2014), EJE Heritage*
- *Newcastle Urban Renewal Adaptive Reuse Case Studies of Heritage Buildings*
- *Wickham Transport Interchange Heritage Impact Statement, Urbis (July 2014)*

In the provision of heritage advice, this report will follow best practice standards and guidance where appropriate including *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013*.

1.4 Authorship

This report has been prepared by Laraine Nelson and Joanne McAuley, RPS Senior Cultural Heritage Consultants and has been reviewed by Tessa Boer-Mah RPS Newcastle Cultural Heritage Manager.

1.5 Land use

The Rezoning Study Area has previously been used as a rail corridor, road pavement, footpath and contains rail related structures and infrastructure. The rail corridor has associated disturbance in the form of rail ballast, tracks and associated infrastructure and results from the geotechnical assessment show that the subterranean disturbance ranges from 0.7m to over 1.8m in depth (RCA Australia 2015:7). Outside the rail corridor geotechnical testing has shown that road pavements have typical disturbance of 0.4m beneath the ground surface (RCA Australia 2015:7). The amount of ground surface disturbance beneath buildings is likely variable (this has not been subject to geotechnical testing). The geotechnical testing has identified the extent of fill and characteristics of the subsurface soils. The results of the geotechnical testing show that while there are high levels of disturbance in the upper layers, natural sand layers may be present from 0.7m. Depending on the historic sand dune movement, archaeological material may be present in the natural sand layers. Fill layers also have potential to contain Aboriginal and historic archaeological material.



Figure 1 Rezoning Study Area

2.0 Statutory context

The following sections provide information on Federal and State legislation which provides for the protection and management of Aboriginal and historic cultural heritage.

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview, and recommends that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

2.1 Aboriginal cultural heritage

Although there are a number Acts and regulations protecting and managing cultural heritage in New South Wales the primary ones include:

- *National Parks and Wildlife Act 1974* (as amended)
- *National Parks and Wildlife Regulation 2009*
- *Environmental Planning and Assessment Act 1979*

In brief, the *National Parks and Wildlife Act 1974* (as amended) protects Aboriginal heritage (places, sites and objects) within NSW; the *National Parks and Wildlife Regulation 2009* provides a framework for undertaking activities and exercising due diligence.

2.1.1 National Parks & Wildlife Act 1974 (as amended)

The *National Parks and Wildlife Act 1974* (as amended) (NPW Act) protects Aboriginal heritage (places, sites and objects) within NSW. Protection of Aboriginal heritage is outlined in s86 of the NPW Act, as follows:

- "A person must not harm or desecrate an object that the person knows is an Aboriginal object" s86(1),
- "A person must not harm an Aboriginal object" s86(2)
- "A person must not harm or desecrate an Aboriginal place" s86(4).

Penalties apply for harming an Aboriginal object or place. The penalty for knowingly harming an Aboriginal object (s86[1]) and/or an Aboriginal place (s86[4]) is up to $550,000 for an individual and/or imprisonment for 2 years; and in the case of a corporation the penalty is up to $1.1 million. The penalty for a strict liability offence (s86[2]) is up to $110,000 for an individual and $220,000 for a corporation.

Harm under the NPW Act is defined as any act that; destroys defaces or damages the object, moves the object from the land on which it has been situated, causes or permits the object to be harmed. However, it is a defence from prosecution if the proponent can demonstrate 1) that harm was authorised under an Aboriginal Heritage Impact Permit (AHIP) (and the permit was properly followed), or 2) that the proponent exercised due diligence in respect to Aboriginal heritage. The **'due diligence' defence (s87(2))**, states that if a person or company has exercised due diligence to ascertain that no Aboriginal object was likely to be harmed as a result of the activities proposed for the Project Area; then liability from prosecution under the NPW Act will be removed or mitigated if it later transpires that an Aboriginal object was harmed. If any Aboriginal objects are identified during the activity, then works should cease in that area and Office of Environment and Heritage (OEH) notified (DECCW 2010c:13). The due diligence defence does not authorise continuing harm.

Notification of Aboriginal Objects

Under section 89A of the NPW Act Aboriginal objects (and sites) must be reported to the Director-General of OEH within a reasonable time (unless it has previously been recorded and submitted to AHIMS). Penalties of $11,000 for an individual and $22,000 for a corporation may apply for each object not reported.

2.1.2 National Parks and Wildlife Regulation 2009

The *National Parks and Wildlife Regulation 2009* (NPW Regulation) provides a framework for undertaking activities and exercising due diligence in respect to Aboriginal heritage. The NPW Regulation outlines the recognised due diligence codes of practice which are relevant to this report, but it also outlines procedures for Aboriginal Heritage Impact Permit (AHIP) applications and Aboriginal Cultural Heritage Consultation Requirements (ACHCRs) (DECCW 2010a); amongst other regulatory processes.

2.1.3 Aboriginal Community Consultation

OEH acknowledges that Aboriginal people are the primary determinants of the significance of their heritage and that Aboriginal people should be involved in the Aboriginal cultural heritage planning process. Aboriginal people are the primary source of information regarding the value of their heritage and how this is best protected and conserved, and must be afforded control in the way cultural information (particularly sensitive information) is used. Aboriginal consultation is regarded as an integral part of the process of investigating and assessing Aboriginal cultural heritage (OEH 2011:2).

Aboriginal consultation is mandatory for the preparation of an Aboriginal Heritage Impact Permit application (clause 80C of the NP&W Regulation), for undertaking a test excavation (DECCW 2010b) and is usually required as part of the DGRs issued by the Department of Planning and Infrastructure. In cases when Aboriginal consultation is mandatory, the consultation process is stipulated in clause 80C of the NPW Regulation and is further specified in the Aboriginal Cultural Heritage Consultation Requirements (ACHCRs) (DECCW 2010a). As a general principal, OEH encourages consultation with Aboriginal people whenever there is uncertainty that a proposed activity could potentially harm Aboriginal objects or places.

2.1.4 Aboriginal Heritage Impact Permit

Under the NPW Act, a person can apply for an AHIP as a defence to a prosecution for harming Aboriginal objects or Aboriginal places. An Aboriginal Cultural Heritage Assessment Report (ACHAR) is needed to support an AHIP application. The AHIP will be a defence provided that:

- the harm was authorised by the AHIP, and
- the conditions of that AHIP were not contravened.

An AHIP is required where a proposed activity would – directly or indirectly – harm an Aboriginal object or a declared Aboriginal place.

2.1.5 Aboriginal Heritage Information Management System

A search was undertaken of the Aboriginal Heritage Information Management System (AHIMS) for GDA Zone 56, Eastings 382900 to 386600 and Northings 6355700 to 6357200 on 21 June 2017 (Appendix 1).

The AHIMS results show there are 29 Aboriginal sites in the Newcastle area (Table 2, Figure 2), but none of these are in the Rezoning Study Area. However, it should be acknowledged that the AHIMS results are influenced by ground surface visibility and that the subsurface archaeological investigations have been emplaced according to development proposals and, as such, have not systematically tested landforms or archaeological areas in Newcastle.

Thus the AHIMS results need to be interpreted in conjunction with results of the archaeological context review in Table 2**.**

The view shows that some archaeological excavations have identified intact subsurface Aboriginal material underneath previously disturbed areas, which demonstrates that previous land use has not, necessarily, removed Aboriginal objects. The distribution of subsurface Aboriginal material is not spatially uniform and that some areas have contained only disturbed archaeological contexts and other area contained relatively intact deposit. On this basis, there is a high likelihood that subsurface Aboriginal material is present in the Rezoning Study Area, but its distribution would need to be further investigated.

Table 2 Summary of AHIMS site types within the searched coordinates, none are in the Rezoning Project Area

Site type	Count	Percent
Potential Archaeological Deposit (PAD)	11	37.9
Isolated artefact	11	37.9
Artefact scatter (number unspecified)	4	13.9
Shell	1	3.4
Artefact scatter	2	6.9
Total	**29**	**100.00%**

Source: AHIMS search generated 21 June 2017.

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1. This plan was prepared for the sole purposes of the client for the specific purpose of producing a photographic overlay plan. This plan is strictly limited to the Purpose and does not apply directly or indirectly and will not be used for any other application, purpose, use or matter. The plan is presented without the assumption of a duty of care to any other person (other than the Client) ("Third Party") and may not be relied on by Third Party.

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4. The aerial photography used in this plan has not been rectified. This image has been overlaid as a best fit on the boundaries shown and position is approximate only.

Legend

- Land Parcels Proposed for Rezoning
- Watercourse from Historic Maps
- Cottage Creek Modern Channel

AHIMS

- Artefact Scatter (Destroyed)
- Artefact Site (Number Unspecified)
- Isolated Find
- Isolated Find (Destroyed)
- PAD
- PAD (Partially Destroyed)
- Shell

N

0 50 100 200 300 400 m

SCALE: 1:6,000 AT A3 SIZE

TITLE : **FIGURE 2: REZONING STUDY AREA WITH HISTORIC HERITAGE AND AHIMS**	LOCATION : **NEWCASTLE**	DATUM:GDA 1994 PROJECTION: GDA 1994 MGA Zone 56	DATE : **22/6/2017** PURPOSE: **HERITAGE**	VERSION (PLAN BY): E A3 (james.hugo) PATH: J:\JOBS\123k\123632 Heritage Newcastle Rail Corridor\10 - Drafting\Arcgis Map Documents\Report Figures\04 123632 Dec 2016\123632 Figure 2 AHIMS E A3 20170622.mxd

CLIENT: **ELTON CONSULTING**
JOB REF: **PR123632**

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

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2.2 Non-Aboriginal cultural heritage

2.2.1 Heritage Act 1977 and the NSW Heritage Division

Historical archaeological relics, buildings, structures, archaeological deposits and features with State heritage significance are protected under the *Heritage Act 1977* (and subsequent amendments) and may be identified on the State Heritage Register (SHR) or by an active Interim Heritage Order.

The Heritage Council of NSW, constituted under the *Heritage Act 1977*, is appointed by the Minister and supported by the Heritage Division of the Office of Environment and Heritage (OEH). The Council is responsible for heritage in NSW and reflects a cross-section of community, government and conservation expertise. The work of the Heritage Division includes:

- working with communities to help them identify their important places and objects
- providing guidance on how to look after heritage items
- supporting community heritage projects through funding and advice
- maintaining the NSW Heritage Inventory, an online list of all statutory heritage items in NSW.

The 1996 *NSW Heritage Manual*, published by the NSW Heritage Division and the then Department of Urban Affairs and Planning, provides guidelines for conducting assessments of heritage significance. The Manual includes specific criteria for addressing the significance of an item and this assessment has been completed in accordance with those guidelines.

2.2.1.1 State Heritage Register

The State Heritage Register (SHR) was searched for the Rezoning Study Area. Table 3 outlines the state heritage places and their location in relation to the proposed rezoning areas.

There are a number of state heritage places within the townscape surrounding the sites proposed for rezoning. Heritage items in the vicinity of the Rezoning Study Area, that is, across the road or have direct line of sight have been listed in Table 4.

Table 3 Items of State Significance on the State Heritage Register (SHR) intersecting the Rezoning Study Area

Item	Address	Heritage Listing	Significance	Relationship to the Proposed Rezoning
Civic Railway Workshops	Great Northern Railway, Newcastle	SHR No. 00956	State	Within Parcel 5
Newcastle Railway Station	Great Northern Railway, Newcastle	SHR No. 00236	State	Within Parcel 15.
Newcastle Railway Station Additional Group	Great Northern Railway, Newcastle	SHR No. 01212	State	Within Parcel 14 and 15.

Table 4 Items of State Significance on the State Heritage Register (SHR) in close proximity to the Rezoning Study Area

Item	Address	Heritage Listing	Significance	Relationship to the Proposed Rezoning
Former Frederick Ash Building	359-361 Hunter Street, Newcastle	SHR No. 00642	State	Approximately 45 metres south of proposed Parcel 06 and Parcel 07.
Newcastle City Hall and Civic Theatre	289 King Street, Newcastle	SHR No. 01883	State	Approximately 45 metres south of proposed Parcel 04 and Parcel 05.

Item	Address	Heritage Listing	Significance	Relationship to the Proposed Rezoning
Great Northern Hotel	89 Scott Street, Newcastle	SHR No. 00507	State	Approximately 30m southeast of Parcel 15.
Customs House	1 Bond Street, Newcastle	SHR No. 01403	State	Approximately 20 metres east of Parcel 15.

2.2.1.2 Section 170 Heritage and Conservation Register

The following Table 5 identifies heritage places included on the Section 170 Heritage and Conservation Register located within the Rezoning Study Area and an item adjacent to the Rezoning Study Area is listed in Table 6.

Table 5 Items on s170 Heritage Registers in the Rezoning Study Area

Item	Address	State Government Agency	Significance	Relationship to the Proposed Rezoning
Civic Railway Station Group	Hunter Street, Civic	RailCorp	Local	Within Parcel 01, 02, 03 and 04.
Newcastle Railway Station Group	110 Scott Street, Newcastle	RailCorp	State	Within Parcel 14 and 15.

Table 6 Items on s170 Heritage Registers in close proximity to the Rezoning Study Area

Item	Address	State Government Agency	Significance	Relationship to the Proposed Rezoning
Newcastle Port Corporation	Cnr Newcomen and Scott Streets, Newcastle	Newcastle Port Corporation	Local	Approximately 30 metres south of Parcel 14.

2.2.2 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) regulates environmental planning and assessment in NSW. The EP&A Act and its regulations, schedules and associated guidelines require that environmental impacts are considered in land use planning and development assessment. The EP&A Act defines "environment" as "…all aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings." The environment therefore includes cultural heritage.

Heritage items and places are described in local environmental plans (LEPs) and shown on the heritage maps which accompany the LEP. All LEPs contain clauses dealing with heritage conservation. Under this Act all local governments in NSW are required to maintain a register of heritage places as Schedule 5 under their LEP.

2.2.3 Newcastle Local Environmental Plan 2012

The NLEP provides protection for local heritage items and conservation areas. Schedule 5 of the NLEP 2012 lists local heritage items, as well as conservation areas within the Newcastle LGA. The aims of the NLEP 2012 are "to respect, protect and complement the natural and cultural heritage, the identity and image, and the sense of place of the City of Newcastle" and "to conserve and manage the natural and built resources of

the City of Newcastle for present and future generations, and to apply the principles of ecologically sustainable development in the City of Newcastle" (S1.2a,b).

2.2.3.1 Schedule 5 of the NLEP 2012

The Rezoning also falls in part within the Newcastle City Centre Heritage Conservation Area. The following Table 7 lists items located in or abutting the Rezoning Study Area, Table 8 lists items in the vicinity.

Table 7 Local Heritage Items in or abutting the Rezoning Study Area

Item	Address	Heritage Listing	Significance	Relationship to the Proposed Rezoning
Remains of AA Company bridge and fence	280 Hunter Street	I415	Local	Within Parcel 12.
Newcastle Railway Station (note curtilage differs from the SHR item)	110 Scott Street	I455	Local (& State)	Within Parcel 14 and Parcel 15.
Civic Railway Workshops Group	5 Workshop Way, 1 Wright Lane, 6 Workshop Way and 2–4 Merewether Street	I479	Local (& State)	Within Parcel 5
Former Tramway Sub-station	342 Hunter Street	I416	Local	Abuts eastern boundary of proposed rezoning Parcel 10, 11 and 12

Table 8 Local Heritage Items in close proximity to the Rezoning Study Area

Local Heritage Place	Address	Heritage Listing	Significance	Location in relation to Rezoning Study ARea
The Civic Theatre	373 Hunter Street	I418	Local (& State)	Approximately 45 metres south of proposed Parcel 04; Parcel 05 and 06
Former Frederick Ash Building	359-361 Hunter Street	I417	Local (& State)	South side of Hunter Street, approximately 45 metres south of proposed Parcel 06 and 07
The Lucky Country Hotel	237 Hunter Street	I414	Local	South side of Scott Street, approximately 20 metres south of proposed rezoning Parcel 12
Former ANZ Bank	227 Hunter Street	I413	Local	South side of Scott Street, approximately 20 metres south of proposed rezoning Parcel 12
The Crown and Anchor Hotel	189 Hunter Street	I410	Local	South side of Hunter Street, approximately 40 metres south of proposed rezoning Parcel 14
Former School of Arts	182 Hunter Street	I409	Local	South side of Scott Street, approximately 20 metres south of proposed rezoning Parcel 14
Rundles Buildings (former R Hall & Sons buildings)	161 Scott Street	I458	Local	South side of Scott Street, approximately 20 metres south of proposed rezoning Parcel 14
Former Beberfaulds Warehouse	175 Scott Street	I459	Local	South side of Scott Street, approximately 20 metres south of proposed rezoning Parcel 14
The former Commonwealth Bank	220 Hunter Street	I412	Local	South side of Scott Street, approximately 20 metres south of proposed rezoning Parcel 14
The former Johns Building	200–212 Hunter Street	I411	Local	South side of Scott Street, approximately 20 metres south of proposed rezoning Parcel 14
The Air Force Club	129 Scott Street	I457	Local	South side of Scott Street, approximately 20 metres south of proposed rezoning Parcel 14 and Parcel 15
The Centennial Hotel	127 Scott Street and 114 Hunter Street	I456	Local	South side of Scott Street, approximately 20 metres south of proposed rezoning Parcel 14 and Parcel 15
Customs House	1 Bond Street	I372	Local (& State)	East side of Watt Street, 20 metres east of proposed rezoning Parcel 15
Great Northern Hotel	89 Scott Street	I451	Local (& State)	South side of Scott Street, 30 metres south east of Parcel 15

2.2.4 The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance 2013

The *Burra Charter* is a set of best practice principles and procedures for heritage conservation. It was developed by Australia ICOMOS (International Council for Monuments and Sites), the Australian group of the international professional organisation for conservation. Although without statutory weight, the *Burra Charter* underpins heritage management in NSW and Australia. The policies and guidelines of the Heritage Council of NSW and the NSW Heritage Office are consistent with and guided by the *Burra Charter*.

2.3 Statutory requirements in relation to non-Aboriginal built and archaeological heritage

2.3.1 State listed heritage items

Approval must be gained from the NSW Heritage Council when making changes to a place listed on the State Heritage Register or a place covered by an interim heritage order (IHO). That approval is sought through lodgement of a section 57 or a section 60 application prior to commencement of works.

2.3.2 Locally listed heritage items

Under the *State Environmental Planning Policy (Infrastructure) 2007* (Part 2, Division 1, 14) the public authority conducting works with impacts on local heritage must not carry out development unless the authority or the person has:

(a) had an assessment of the impact prepared, and

(b) given written notice of the intention to carry out the development, with a copy of the assessment, to the council for the area in which the heritage item or heritage conservation area (or the relevant part of such an area) is located, and

(c) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.

2.3.3 Archaeological sites

Approval from the NSW Heritage Division is required when excavating any land in NSW where there is potential of disturbing an archaeological relic (of historic origin). The application type required depend on whether the site is of local or state significance.

2.3.3.1 Archaeological Sites of Local Significance

The following approvals may apply to archaeological sites of local significance:

- Section 139 Application (Exception 1B) – This exception can be applied for where the excavation or disturbance of land will have a minor impact on archaeological relics including the testing of land to verify the existence of relics without destroying or removing them.
- Section 139 Application (Exception 1C) – This exception can be applied for where the site has little likelihood of relics or no archaeological research potential.
- Section 140 Application – this is required to excavate or disturb land that will or is likely to result in the discovery, movement and/or destruction of relics (that are not State Heritage).

If during ground disturbing works, substantial intact archaeological relics of State or local significance are identified, then work must cease in the affected area and the Heritage Council must be notified in writing in accordance with section 146 of the Act. Depending on the nature of the discovery, additional assessment and possibly an excavation permit may be required prior to the recommencement of excavation in the affected area.

2.3.3.2 Archaeological Sites of State Significance

The following approvals may apply to archaeological sites of state significance:

Section 57 Application (Standard Exemption) – There are 17 standard exemption types, the one pertaining to the excavation of archaeological sites is detailed under Standard Exemption 4 and may be applied for if it is demonstrated that:

(a) an archaeological assessment, zoning plan or management plan has been prepared in accordance with Guidelines published by the Heritage Council of NSW which indicates that any relics in the land are unlikely to have State or local heritage significance; or

(b) the excavation or disturbance of land will have a minor impact on archaeological relics including the testing of land to verify the existence of relics without destroying or removing them; or

(c) a statement describing the proposed excavation demonstrates that evidence relating to the history or nature of the site, such as its level of disturbance, indicates that the site has little or no archaeological research potential.

Section 60 Application – this is required for items on State heritage listed land where there is a likelihood that identified State heritage significant items/s will be impacted on as a result of the proposal

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I389
I390
I479
956
I479
I479
Honeysuckle Dr
Settlement Ln
Workshop Way
Wharf Rd
Merewether St
Centenary Rd
Wright Ln
Parcel 19
Parcel 18
Parcel 17
Parcel 16
Parcel 5
Civic Railway Station Group
Parcel 6
Parcel 7
Parcel 8
I415
Parcel 4
Parcel 3
Parcel 2
Parcel 1
R13
P01
Worth Pl
Hunter St
Wheeler Pl
I418
I417
Christie St
I433
I434
I435
Burwood St
Darby St
King St
I430

Legend

- Verified Archaeological
- Land Parcels Proposed
- Section 170 Heritage
- State Heritatge Items

Newcastle LEP 2012 Heritage

- Conservation
- Areas of Archaeological
- Item - General

N

Verified Relic	Description
AA Co	AA Co Bridge Abutment and Fence
R01	Second Honeysuckle Station - North Platform
R02	Second Honeysuckle Station - South Platform
R03	Second Honeysuckle Station - Goods Yard
R04	Timber Track and Causew ay
R05	Unidentified Structure - Brick Footing - Worth Place
R06	Unidentified Structure - Brick Wall and Concrete Footing
R07	Cisterns - Crow n Street
R08	Unidentified Structure - Brick Footing - Crow n Street
R09	Boat Harbour Sandstone Wall - Market Street
R10	Sandstone AA Co Bridge abutments (2)
R11	Boat Harbour Sandstone Wall - Perkins Street
R12	Turntable and Cistern - New castle Signal Box
R13	Civic Turntable

Potential Relic	Description
P01	Mortuary Station
P02	Possible Convict Huts (Higginbotham 2013)

0 25 50 100 m

SCALE: 1:1,500 AT A3 SIZE

TITLE : **FIGURE 3: REZONING STUDY AREA WITH HISTORIC HERITAGE ITEMS (WEST)**

LOCATION : **NEWCASTLE**

DATUM:GDA 1994

PROJECTION: GDA 1994 MGA Zone 56

DATE : **20/06/2017**

PURPOSE: **HERITAGE**

VERSION (PLAN BY): H A3 (Natalie.Wood)

PATH: J:\JOBS\123k\123632 Heritage Newcastle Rail Corridor\10 - Drafting\Arcgis Map Documents\Report Figures\04 123632 Dec 2016\123632 Figure 2 Rezoning H 20170620.mxd

CLIENT: **ELTON CONSULTING**

JOB REF: **PR123632**

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Verified Relic	Description
AA Co	AA Co Bridge Abutment and Fence
R01	Second Honeysuckle Station - North Platform
R02	Second Honeysuckle Station - South Platform
R03	Second Honeysuckle Station - Goods Yard
R04	Timber Track and Causew ay
R05	Unidentified Structure - Brick Footing - Worth Place
R06	Unidentified Structure - Brick Wall and Concrete Footing
R07	Cisterns - Crow n Street
R08	Unidentified Structure - Brick Footing - Crow n Street
R09	Boat Harbour Sandstone Wall - Market Street
R10	Sandstone AA Co Bridge abutments (2)
R11	Boat Harbour Sandstone Wall - Perkins Street
R12	Turntable and Cistern - New castle Signal Box
R13	Civic Turntable

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Legend

- Verified Archaeological Relic
- Land Parcels Proposed Rezoning
- Section 170 Heritage Register
- State Heritatge Items

Newcastle LEP 2012 Heritage Items

- Conservation
- Item - General

N

0 25 50 100 m

SCALE: 1:1,500 AT A3 SIZE

TITLE : **FIGURE 4: REZONING STUDY AREA WITH HISTORIC HERITAGE ITEMS (CIVIC)**

LOCATION : **NEWCASTLE**

DATUM:GDA 1994

PROJECTION: GDA 1994 MGA Zone 56

DATE : **10/1/2017**

PURPOSE: **HERITAGE**

VERSION (PLAN BY): D A3 (james.hugo)

PATH: J:\JOBS\123k\123632 Heritage Newcastle Rail Corridor\10 - Drafting\Arcgis Map Documents\Report Figures\04 123632 Dec 2016\123632 Figure 3 Rezoning CIVIC F 20170110.mxd

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Potential Relic	Description
P01	Mortuary Station
P02	Possible Convict Huts (Higginbotham 2013)

Verified Relic	Description
AA Co	AA Co Bridge Abutment and Fence
R01	Second Honeysuckle Station - North Platform
R02	Second Honeysuckle Station - South Platform
R03	Second Honeysuckle Station - Goods Yard
R04	Timber Track and Causeway
R05	Unidentified Structure - Brick Footing - Worth Place
R06	Unidentified Structure - Brick Wall and Concrete Footing
R07	Cisterns - Crown Street
R08	Unidentified Structure - Brick Footing - Crown Street
R09	Boat Harbour Sandstone Wall - Market Street
R10	Sandstone AA Co Bridge abutments (2)
R11	Boat Harbour Sandstone Wall - Perkins Street
R12	Turntable and Cistern - Newcastle Signal Box
R13	Civic Turntable

Legend

- Verified Archaeological Relic
- Section 170 Heritage Register
- Land Parcels Proposed Rezoning
- State Heritage Items

Newcastle LEP 2012 Heritage Items

- Conservation Area
- Item - General
- Areas of Archaeological Potential

N

0 25 50 100 m

SCALE: 1:1,500 AT A3 SIZE

TITLE : **FIGURE 5: REZONING STUDY AREA WITH HISTORIC HERITAGE ITEMS (EAST)**

LOCATION : **NEWCASTLE**

DATUM:GDA 1994

PROJECTION: GDA 1994 MGA Zone 56

DATE : **10/1/2017**

PURPOSE: **HERITAGE**

VERSION (PLAN BY): D A3 (james.hugo)

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3.0 Landscape and Aboriginal archaeological context

3.1 Landscape context

The purpose of reviewing the environmental context and archaeological literature is to assist in identifying whether Aboriginal objects or places are present within the Rezoning Study Area.

3.1.1 Geology and soils

This summary of geology and soils aims to provide an overview of the Rezoning Study Area; however, more specific detail and information is provided in the land-use summary. The Newcastle foreshore is underlain by sandstone, siltstone, claystone, coal and tuff associated with the Nobbys Head formation. Broadly, the Newcastle foreshore falls within the Hamilton Soil Landscape, variation A: Developed Terrain. Topsoils in this landscape are typically brownish black specked loamy sand (A_1) which is 20 to 60 centimetres thick. This is underlain by 15 to 30 centimetres of loose, pale coarse sand (A_2), followed by brown to orange sandy pan (B horizon) and may further be underlain by clay (Matthei 1995:38-40). Although this is the typical soil formation, variations may occur due to previous Aeolian or alluvial events.

3.1.2 Topography and hydrology

The development of Newcastle as a major port has led to the reclamation of land and reworking of the shape of the Hunter River foreshore. The foreshore and environs, from its junction with Throsby Creek to Nobbys Headland, has undergone major modifications since European settlement; the original shore line was characterised by mud flats and sand spits (Melville 2014 p. 22).

Historic records show an unnamed watercourse between Brown and Crown Streets. Archaeological evidence shows that Aboriginal occupation was highly concentrated around creeks in the locality, for example Cottage Creek. Although it is likely that Aboriginal occupation would have occurred adjacent to the Brown and Crown Street watercourse; this has not been tested archaeologically.

3.1.3 Flora and fauna

This section provides an indication of the types of flora and fauna resources which were likely to have been available to Aboriginal people in the past. It is based on broad scale vegetation mapping for NSW (Keith 2006).

Past Aboriginal people are likely to have encountered Hunter-Macleay Dry Sclerophyll Forests in the vicinity of Rezoning Study Area, as well as coastal vegetation. Dry sclerophyll forests have open canopies with trees up to 30 metres tall; common tree species include spotted gums, iron barks, grey gums, boxes and turpentines (Keith 2006:124-125). The understorey of this vegetation community includes shrubs, herbs, ferns and grasses, thus providing habitat for smaller mammal species. The shrubby understorey includes silver-stemmed wattle and forest oak which present as tall shrubs or small trees; smaller shrubs include coffee bush, gorse bitter pea, peach heath, large mock-olive, narrow-leaved geebung and mutton wood (Keith 2006:124-125).

This vegetation community along with the coastal vegetation would have provided habitat for a variety of animals and would have also provided potential food and raw material sources for Aboriginal people. Coastal resources are likely to have included fish and oysters, while typical animals likely to have been hunted in the vicinity include kangaroos, wallabies, sugar gliders, possums, echidnas, a variety of lizards and snakes, birds, as well as rats and mice. The bones of such animals have been recovered from excavations of Aboriginal sites suggesting that they were sources of food (Attenbrow 2010:70-76), although the hides,

bones and teeth of some of the larger mammals may have been used for Aboriginal clothing, ornamentation, or other implements.

3.2 Aboriginal archaeological context

3.2.1 Aboriginal occupation of the Hunter Valley

Archaeological evidence suggests that Aboriginal occupation of the Hunter Valley region began at least 35,000 years ago (Koettig 1987). Additional chronological evidence was recovered from the Hunter Valley's north-east mountains for which the following dates were assigned: 34,580±650 (Beta-17009), >20,000 (Beta-20056) and 13,020±360 years before present (BP) (Beta-17271) (Koettig 1987, as cited in (Koettig 1987, as cited in Attenbrow 2006). In the lower Hunter Valley, excavations at Moffats Swamp (Tomago Coastal Plain) have revealed basal dates of 15,376 calibrated BP.

The majority of Aboriginal sites in the region, however, are dated to the more recent Holocene (<11,000 years ago). This may reflect Aboriginal occupation patterns, but may also be influenced by the inaccessibility of potential coastal Pleistocene sites that may have been inundated when sea levels rose and reached present levels approximately 6,000 years ago (Mulvaney and Kamminga 1999 p.223). Other factors such as post depositional processes that may have obscured sites, or a lack of archaeological research in particular areas, could account for the lack of evidence for Pleistocene or early Holocene occupation (AMBS 2005). At Black Hill excavations revealed a stone lined hearth dated to approximately 2,000 BP calibrated.

Throughout the Hunter Valley, archaeological investigations have provided a basis for the development of predictive models of site distribution within this region. Studies completed by Koettig and Hughes (1983a) and (1983b) have demonstrated that open artefact scatters are common throughout the Hunter Valley. Large open sites were generally located in proximity to large creeks that provided a more reliable source of potable water, with smaller open sites distributed through a variety of landforms including large and small creeks, slopes and crests.

Certain typological temporal markers such as backed blades and eloueras are present within the Hunter Valley assemblages. Whilst these provide only a gross indication of time scale, based on the age of the soils and the presence of backed artefacts, the majority of sites in the Hunter Valley are considered to date to the late Holocene period.

Using colonial records, (Brayshaw 1986) conducted extensive research of the landscape and the known Aboriginal communities in the broader Hunter Valley area. Although the ethnographic literature refers to ceremonial grounds and carved trees, these represent only a small portion of the sites which would have occurred in the Hunter Valley. Camp sites would have occurred more commonly, but little is recorded regarding the locations of such sites. The literature does indicate that in the Hunter Valley, as elsewhere, Aboriginal numbers were quickly and greatly reduced by introduced European diseases.

Brayshaw's research into the ethnographic record also showed the distinction between the material culture and goods manufactured inland compared to coastal areas which were dependent on the resources available. The exchange of goods between inland and coastal inhabitants was also evident. Bark was probably the most commonly utilised raw material, associated with the construction of huts, canoes, nets, drinking vessels, baskets, shields, clubs, boomerangs and spears. Being manufactured from an organic material, very few such artefacts survive today. Scarred trees, carved trees, burial sites, ceremonial or bora grounds, cave paintings, rock engravings, axe grinding grooves, quarries and wells have all been recorded in the Hunter region. The distribution of these sites would generally have been reliant on environmental and cultural factors such as resource availability.

3.2.2 Aboriginal occupation in the Newcastle area

A summary of the land use context has identified that there has been substantial modification to the original landforms in the Newcastle City area. This has included infilling of the harbour in some areas, and the installation of infrastructure and buildings. The presence of archaeological evidence for Aboriginal occupation in the Newcastle area is influenced by the previous land use, although a number of recent excavations have shown that Aboriginal sites are located below historic structures, or intermixed with historic occupation (City of Newcastle 2015:27). In addition, the detection of Aboriginal archaeological evidence can depend on the sample size of areas archaeologically excavated (i.e. dimensions of trenches) and the location of archaeological excavations. The locations of archaeological investigations have been emplaced according to development proposals and, as such, have not systematically tested landforms or archaeological areas in Newcastle. The AHIMS database of Aboriginal sites is also limited by the same factors and many of the AHIMS sites have been identified as a result of archaeological excavation, the extent of some of the subsurface AHIMS sites are unknown, as often only a sample of them were excavated, as such the AHIMS results will be evaluated following the synthesis of the available archaeological and historical literature for Newcastle.

3.2.3 Archaeological and heritage literature review

There are numerous sources of information on the Aboriginal occupation of Newcastle. This section, however, focuses on those studies which are most relevant to understanding the archaeological evidence for the Aboriginal occupation of Newcastle. The studies have been summarised according to the date issued/completed.

3.2.3.1 Convict Lumber Yard (Bairstow 1989)

During the excavation of the Convict Lumber Yard at Scott Street (SHR 00570) small quantities of Aboriginal artefacts were identified (Bairstow 1989). These appeared at the eastern end of the excavation and comprised chert, stone, shell and bone that were recorded at a depth of 1.5 metres, the same depth as the convict era deposit (Bairstow 1989:45-53) which is perhaps evidence of mixed deposits in that location. This site was registered as a potential archaeological deposit (PAD), AHIMS 38-4-1020. The excavation results suggest that the Aboriginal material is unlikely to extend beyond the area investigated and there did not appear to be in-situ deposits associated with the site.

3.2.3.2 Accor Ibis Hotel Site 700 Hunter Street Newcastle (AHMS 2001a, 2001b)

This excavation was undertaken approximately 120 metres east of Cottage Creek and included the investigation of AHIMS 38-4-0544, which was registered as a PAD. The excavation of this site revealed an Aboriginal shell midden with 2,939 whole and fragmentary shells, 326 pieces of animal bone and 5,734 lithics, 4,000 of which on preliminary counts were identified to be stone artefacts (AHMS 2001:12). Local shell species, cockle and mud whelk were the dominant shell types contained in the midden material. Tuff was the dominant raw material for stone artefacts, although silcrete, chert and quartz were also present. The preliminary survey had not identified any Aboriginal objects, however the area was considered to be archeologically sensitive due to its proximity to Cottage Creek (AHMS 2001b).

3.2.3.3 Aboriginal Heritage Study (AMBS 2005)

The Aboriginal Heritage Study for Newcastle Local Government Area (LGA) (AMBS 2005). While the study did not involve subsurface archaeological investigation, it provided archaeological sensitivity modelling and a collation of historic information including documentation of local Aboriginal people making extensive use of the resources of the Hunter River and its environs. An important source of historical information on Aboriginal people in the area was from Reverend Lancelot Threlkeld, who lived in the area of Cottage Creek,

Honeysuckle between 1825 and 1826 (Threlkeld in Gunson 1974). Threlkeld records the procuring of fish by line and net, the gathering of shellfish, the opportune use of beached whales and the hunting of kangaroo, bandicoot, lizards and snakes (AMBS 2005:38).

The landscape model of archaeological sensitivity presented in the AMBS report is useful as a general guide, although more recent excavations have contributed additional information which will be discussed later. The area of central Newcastle and the Hunter River delta are described as being highly disturbed and modified, though it was considered that, in areas where landscape modification has been minimal, there is high potential for archaeological evidence to remain (AMBS 2005:80). In a summary of archaeological sensitivity for industrial Newcastle, the southern estuary shore is described as having moderate archaeological sensitivity (AMBS:93).

3.2.3.4 Palais Royale Site 684 Hunter Street Newcastle (AHMS 2011)

The Aboriginal archaeological salvage of this site entailed digging a trench 16 metres long by three metres wide (48 square metres), which was excavated to one to two metres deep in 10 centimetre spits (arbitrary levels). The excavation recovered 5,534 Aboriginal objects (AHMS 2011:10). Radiocarbon dating of excavated material indicated the site was occupied from approximately 6,700 years ago and three occupation periods were identified: 6,716 to 6,502 years BP, c. 3,500 years BP and 2,480 to 1,933 years BP.

From 3,500 years BP the use of exotic stone raw materials including chert, chalcedony and silcrete were noted. An Aboriginal hearth (fireplace) was dated to 2,188 to 1,933 cal. years BP and this level (2,480-1,933 years BP) appears to have been a focus for occupation with artefacts becoming four times more numerous than previous levels. Nobbys tuff was used as a raw material for stone artefacts throughout the sequence. Backed blades were present throughout all layers of the site with a proliferation of this tool type in the upper layers. Campsite occupation including the consumption of local shell species only appears to have occurred at the site after about 1,933 years BP (AHMS 2011).

3.2.3.5 Wickham Transport Interchange, Newcastle: Aboriginal Heritage Summary Report. (Artefact Heritage 2014)

Artefact Heritage was engaged by Transport for NSW to prepare an Archaeological Survey Report (ASR) for the proposed Wickham Transport Interchange (Artefact Heritage 2014). The report found that the study area had potential for archaeological deposits and that further archaeological investigation would be required where sub-surface impacts had the potential to impact buried Aboriginal archaeological deposits. The study area was registered as a PAD (AHIMS 38-4-1716).

Artefact Heritage also prepared an Aboriginal Cultural Heritage Assessment Report (ACHAR). This ACHAR recommended a program of archaeological test excavation be undertaken to further investigate the archaeological potential of the study area. As a result of this, an AHIP (#C0000892) was issued on the 13 March 2015.

Salvage excavations were undertaken in two stages (Artefact Heritage 2015). Stage I was undertaken between 13 April and 30 April 2015 and identified approximately 391 artefacts. Stage II, undertaken between 11 June and 7 July 2015, was completed in an area adjacent to areas of high artefact concentration identified during Stage I. Approximately 3,912 artefacts were identified during Stage II salvages. It was concluded there was the potential for two main vertical concentrations, possibly representing two occupation layers, of artefacts to be present within the collected assemblage, and as a result the site had high significance and research value.

3.2.4 Summary of Aboriginal archaeological context

The archaeological investigations undertaken have identified subsurface Aboriginal heritage. The types of sites predominately comprise stone artefacts and shellfish remains (middens).

Some excavations have identified intact subsurface Aboriginal material underneath previously disturbed areas, which demonstrates that previous land use has not, necessarily, removed Aboriginal objects. However, it should be acknowledged that the distribution of Aboriginal material is not spatially uniform and that some areas have contained only disturbed archaeological contexts and other area contained relatively intact deposit. There is a high likelihood that subsurface Aboriginal material is present in the rezoning area, but its distribution would need to be further investigated.

4.0 Historical context

This section provides an overview of the historic occupation of Newcastle by European and later settlers. The historic context has been used to identify historic archaeological areas specific to the Rezoning Study Area and will be drawn upon for the impact assessment.

4.1 A convict settlement

The first reference to the area now known as Newcastle was in 1797 when Lieutenant John Shortland, while returning from pursuing escaped convicts, noticed the small island of Nobbys (Goold 1981:4). Drawing into the inlet behind the island, Shortland found the entrance to a large river which he named in honour of Governor Hunter (Newcastle and District Historical Society. n.d.:6). While surveying the area he noticed lumps of coal near present day Fort Scratchley and collected samples before returning to Sydney (Windross and Ralston 1978:7).

In 1801 Governor King sent a small expedition to investigate the resources of what was known as Coal River (now Hunter River). The subsequent report detailed the potential for a salt works, the presence of coal and an abundance of shell for the production of lime. On this advice a small settlement was established but it failed after only six months because of inadequate management. In 1804 Governor King again sought to establish a convict settlement at what he called King's Town (Windross and Ralston 1978:9) with a small party of 20 soldiers and a similar number of convicts. These convicts were part of the Irish Rebellion at Castle Hill with their relocation required because of their perceived danger to the settlement at Sydney (Turner 1997:7).

The new settlement at Newcastle provided an additional location for the housing of convicts and a place for the procurement of timber, coal and lime for Sydney. With the only method of transport by sea, loading facilities and safe anchorages for boats were critical to the success of the settlement.

Records indicate that by 1804 there was a stone wharf, 108 feet long and 13 feet wide being built at the end of present day Watt Street (Goold 1981:12). This wharf is likely to have serviced an early recorded coal yard in the vicinity and later the Convict Lumber Yard constructed in 1817.

In 1812 when Governor Macquarie visited the settlement it was still small with a population of about 100. By 1815 the size of the settlement had swollen with an influx of convicts following the closure of Norfolk Island (Turner 1997:8). This growth continued and by 1821 there were 1,169 people living in what was described as a camp. The convicts were employed predominantly in public works, most importantly the construction of a breakwater to Nobbys to provide better protection for shipping. The remainder of the convicts were employed in timber, lime production and coal mining (Turner 1997:9).

In his investigation of the penal settlement of Newcastle, J T Bigge (1822:282) described the settlement as a camp with 13 houses belonging to the government and 71 occupied by convicts. Bigge also described that prisoners who either could not find accommodation or who could not be trusted at large, were housed in wooden barracks that had been recently built on the order of Major Morisset (Bigge 1822:282).

4.2 Newcastle as a free town

In 1823 Governor Macquarie announced that Newcastle would no longer be a convict settlement, whereby the role would be delegated to Port Macquarie further north. Following this, the population of Newcastle declined and the large barracks that had been constructed to cater for a thousand men now only housed one hundred. Despite the change in the role of Newcastle, convicts were still assigned there until 1848. Works on the breakwater slowed and the stands of timber were no longer readily available (Turner 1987:11).

Despite the loss of Newcastle as a significant penal settlement, the 1820s saw important developments. In 1827 Henry Dangar, a surveyor, drew up a layout for a town plan with 192 leasehold allotments established (Goold 1981:26). Other improvements included the building of a brick flour mill at the present day Obelisk location above King Edward Park; the building of a parsonage; and the construction of the first Court House in Church Street (Goold 1981:22). Importantly, Newcastle developed as a free town following the demise of the penal settlement.

Central to this development was the extraction and shipping of coal. The Australian Agricultural Company (AA Company) with a monopoly on coal extraction, saw a growth in output from 5,000 tons (1831) to 30,500 tons (1840). Linked to the growth of the coal industry was the development of the port and associated activities such as tugs and lighters to facilitate movement of vessels and cargo, disposal of ballast and provisioning of ships (McManus, O'Neill and Loughran 2000:213).

As the town grew, further residential development occurred, including the AA Company as early as 1852 tasking the company surveyor, George Darby, with laying out a town settlement in the area of present day Darby; King and Hunter Streets. This was designed to meet the needs of an influx of diggers from the goldfields who saw Newcastle as an attractive location to settle (Pemberton 1986:31).

The growth in Newcastle was matched by growing regional development linked to the pastoral industry of the Hunter Valley and northern NSW. In 1854, AA Company sold land in the north eastern portion of their estate to the Hunter Valley Railway Company. The construction of the Newcastle to Maitland Railway, the second passenger line in Australia, fostered the continued development of the port of Newcastle. The rail network expanded rapidly and was matched by the growth of Newcastle with industries demonstrated by the establishment of businesses such as the Newcastle Coke and Gas Company; Castlemaine Brewery and Wood Brothers Brewery; Darks Ice and Cold Storage; and Arnott's Biscuits (Pemberton 1986:41).

From the late nineteenth century, output from the Newcastle mines decreased and production from the South Maitland coalfields increased with a resulting diminishing profitability for the Newcastle mines. Linked to this was increasing Municipal taxes on unimproved land that affected the large holdings of the Company in the Newcastle area. The Company countered by subdividing and selling large areas of residential land in Newcastle and Hamilton (Pemberton 1986:41).

4.3 Growth in the twentieth century

In 1916, the last AA Company shaft ceased production and the Company's' operation in Newcastle closed. The staithes associated with the iron bridge were last used in 1920 and in 1923, the steel bridge was removed (NSW Heritage Database: AA Company's Remnant Bridge Pier). In 1922, the waterfront land held by the AA Company was resumed and with it coal mining in Newcastle by the AA Company ceased (Webber and Wylie 1968:63)

The need for new industries to drive the growth of Newcastle resulted in lobbying by the Chamber of Commerce for a diversified industry base. In 1913, the state government announced the construction of State Dockyards in Newcastle and at the same time gave permission for BHP to construct a steelworks on land at Port Waratah. The development of these industries coincided with World War I and by the end of the war other heavy industries, such as Lysaght, Commonwealth Steel and Rylands were also in the process of establishing (Newcastle City Council 2014:8).

Newcastle for the majority of the twentieth century was closely linked to heavy industry, typified by BHP. With the closure of the BHP in 1999 the opportunity arose for the city to re-focus from a heavy industrial base to a more diversified economy based on health, education and services (Newcastle City Council 2014:8).

5.0 Historical archaeological context

This section identifies archaeological resources in the proposal area and the potential for additional archaeological resources to occur. Identified archaeological resources are archaeological resources that are extant and verified through archaeological monitoring or excavation. The assessment of potential archaeological resources is based on a review of documentary records only; detailed assessments of archaeological potential based on a detailed analysis of documentary records and an understanding of the historic context would be required prior to the development of land parcels. The locations of archaeological resources are identified in Figure 3, Figure 4 and Figure 5.

5.1.1 Relics identified under Section 139 exception for removal of rail infrastructure

The removal of rail infrastructure under a Section 139 exception exposed a number of archaeological resources in the proposal area. The archaeological resources are identified Table 9 with reference to the land parcel as appropriate.

5.1.2 Other identified archaeological resources

Other archaeological resources identified in the proposal area include a turntable installed at Honeysuckle Point terminus in 1857 (EJE Architecture 2016) (Table 9).

Table 9 Identified archaeological resources in the proposal area

Parcel	Identified archaeological resource	Description
Parcel 16	Turntable, Honeysuckle Point	Circular brick platform with slight downward slope towards edge. Central concrete block which acted as a mounting base for the central pivot. Near the edge of the platform a 460 millimetre wide brick ledge that supported a running rail. Brick drain at outer edge of platform. Circular brick wall with internal height of 1550 millimetres surrounding platform.
Parcel 12	1862 AA Company abutment	Stone abutment associated with 1862 AA Company Hunter Street overpass at Crown Street.
Parcel 12	Unidentified structure	Unidentified rectilinear brick structure.
Parcel 12	Cisterns	Two brick and mortar lined cisterns associated with the railway.
Parcel 12	Wall	Unidentified stone wall section.
Parcel 14	Wall, Market Street Boat Harbour	Stone wall associated with Market Street Boat Harbour.
Parcel 14	Turntable, Newcastle Station	Two sections of semicircular brick associated with turntable, Newcastle Station.

5.2 Potential archaeological resources

The area demonstrates the potential for archaeological resources associated with the penal settlement and the later development of rail and port infrastructure. The Newcastle Archaeological Management Plan Review 2013 identified the potential for an area between west of Market Street and Pacific Street to contain archaeological resources associated with the penal settlement (Higginbotham 2013). With the later development of rail and port infrastructure, potential archaeological resources in the area include potential archaeological resources associated with the former Honeysuckle Point Station, Mortuary Station and rail and port infrastructure in addition to that identified under a Section 139 exception for the removal of rail infrastructure (Table 10). The potential for additional archaeological resources below the level of excavation required for the removal of rail infrastructure would be dependent on the level of disturbance in that area. Detailed assessments of archaeological potential would be required prior to development to determine the

potential for archaeological resources in specific areas and the potential of a proposed development to affect an identified or potential archaeological resource.

6.0 Inspection

All historic heritage items listed in Table 3 through to Table 8 have been inspected on a number of occasions as part of ongoing works associated with the rezoning project. All structures were seen to be in generally good repair, with the exception of the Great Northern Hotel.

A number of buildings have been the subject of renovation and adaptive re-use (the Lucky Country Hotel; Customs House; Former Tramway Substation; Civic Railway Workshops; the Former ANZ Building; the Former Johns Buildings and the Former Frederick Ash Building). Further investigation of the buildings that are either in, or in an area that intersects with the Project Area was conducted. All items were in good condition, with many of the buildings associated with the Civic Railway Workshops having undergone extensive renovations and refurbishment to suit a range of purposes including as the home of the Newcastle Regional Museum and the headquarters of Australian Wine Selectors. Civic Railway Station, Newcastle Railway Station and the Newcastle Railway Station Additional Group are currently not operational; however they all appear to be well maintained. The Remains of AA Co. Bridge and Fence (also referred to as AA Company Remnant Bridge Pier) comprises remnants piers of a railway bridge and an early railway fence. While they are not maintained they appear to be in a condition that is consistent with their age and material type.

The majority of the buildings listed as in close proximity (Table 4; Table 6; Table 8) are across the street from the proposed Project Area.

7.0 Potential impact and approvals required

7.1 Aboriginal cultural heritage

There are no registered Aboriginal sites in the rezoning area. However, based on previous archaeological investigations subsurface Aboriginal sites have been identified in the surrounding area and it is therefore considered that rezoning area is archaeologically sensitive for Aboriginal heritage.

The Aboriginal objects most likely to occur are stone artefacts and shellfish remains (described as middens). These site types reflect the local environment and the utilisation of the Aborigines of local resources.

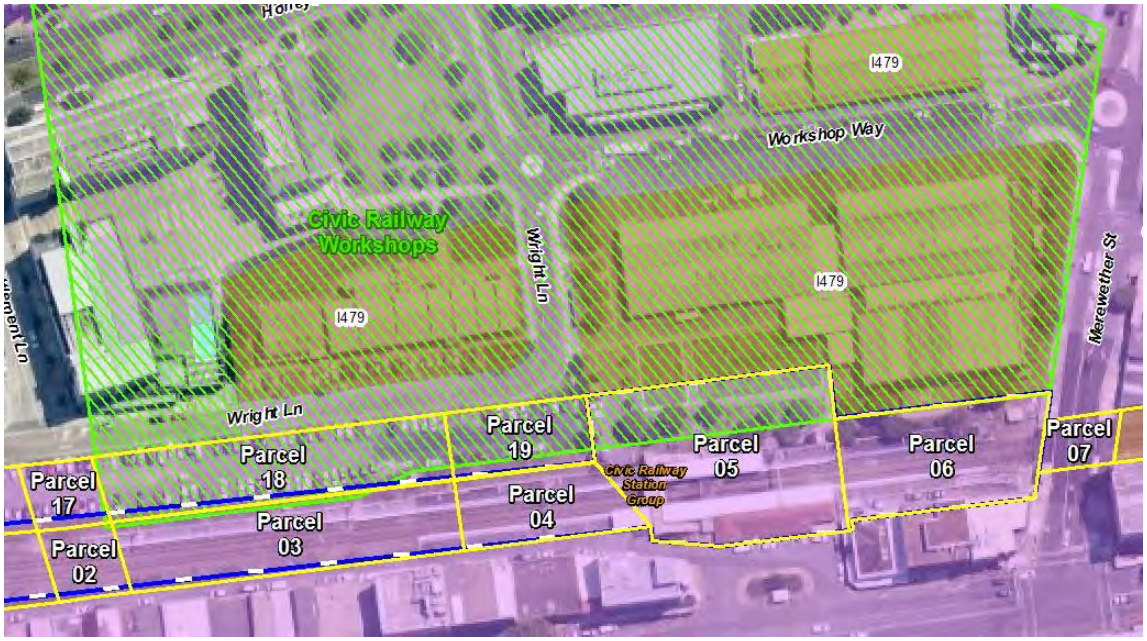
It is recommended that prior to ground disturbance works occurring that:

- The Aboriginal community is consulted through the ACHCR including a survey of the rezoning area ; and
- An Aboriginal Cultural Heritage Assessment Report is prepared.

7.2 Built heritage

There are five built heritage items in the rezoning area: the Newcastle Railway Station and the Newcastle Railway Station Additional Group (both on the State Heritage Register); the Civic Railway Workshop; Civic Station; the Remains of AA Co. Bridge and Fence on the NLEP 2012 Schedule 5 and of local heritage significance). The former Tramway Substation (on the NLEP 2012 Schedule 5 and of local heritage significance) is directly adjacent to parcel 10 and 12.

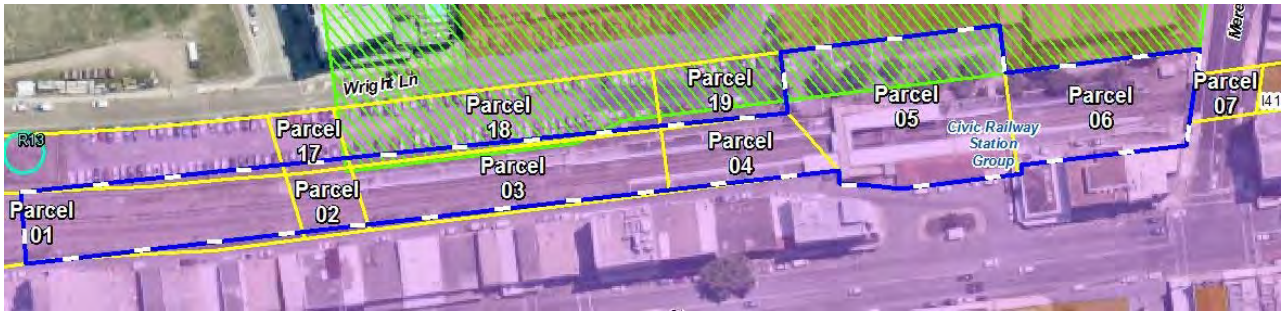
7.2.1 Civic Railway Workshops

<table>
<tr><td>Listing</td><td colspan="2">NSW Heritage Register (SHR956); Newcastle City Council LEP (Item I479)</td></tr>
<tr><td>Address</td><td colspan="2">Great Northern Railway Newcastle</td></tr>
<tr><td>Ownership</td><td colspan="2">Honeysuckle Development Corporation (state government)</td></tr>
<tr><td>Description</td><td colspan="2">Civic Railway Workshops is an outstanding industrial Victorian workshop group. The whole group is of highest significance in the State. Construction of workshops in Newcastle was brought about for two reasons: separation of the Great Northern lines from the main system from 1857 to 1889; and in recognition of the exclusive facilities and rolling stock required to handle coal traffic.
The Lee Wharf site has the potential to contain historical archaeological remains, including remains of State significance. These remains may lie both within the boundary of the State Heritage Register and outside (SHI database 5044977).</td></tr>
<tr><td>Impact</td><td colspan="2">Potential impact on archaeological site/s through excavations for works however no proposed physical impact on the built structures (workshops).
Potential visual impact to the workshops particularly 2-4 Merewether Street (Newcastle Museum).</td></tr>
<tr><td rowspan="2">Approvals
NSW Heritage Act 1977</td><td>Major alterations or demolition:
Application under S60 supported by a Conservation Management Plan and Heritage Impact Assessment.
Minor alterations, maintenance or repair:
Application for Exemption under S57(2) to carry out works.
Subsurface disturbance:
In addition if proposed works are likely to disturb subsurface relics under the:
S57(2) Excavation Exception Application
If relics are uncovered lodgement of S60 Application for an Excavation Permit</td><td>Background to requirement for approvals:
The Civic Railway Workshops is listed on the State Heritage Register with approval required from the NSW Heritage Council for any works.
Subsurface disturbance:
Existence of archaeological relics is unknown; if relics are uncovered an Excavation Methodology will be required and lodged to support the S60 Application for an Excavation Permit.</td></tr>
<tr><td colspan="2">  </td></tr>
<tr><td colspan="3"> 
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7.2.2 Civic Railway Station Group

Listing	S170 State government agency (SRA623)	
Address	Hunter Street, Civic Station	
Ownership	Sydney Trains. State Government	
Description	Civic Railway Station opened in 1935, is the location of the original Honeysuckle Railway Station (1857). The current station is described as modest single storey, Inter-War Functionalist in style. The footbridge is described as the only known example constructed on brick piers (SHI Database 4801623).	
Impact	Potential impact on item, however, the future use is subject to negotiation with Newcastle City Council.	
Approvals ***NSW Heritage Act 1977***	*NSW Heritage Act 1977:* **Major alterations or demolition:** Internal Approval Process for state owned Asset. Supported by Heritage Impact Assessment. **Minor alterations, maintenance or repair;** All changes must be lodged on the Heritage Division's Heritage Data Form *NSW Heritage Act 1977:* In addition if proposed works are likely to disturb subsurface relics under the: S139(4) Excavation Exception Application ***If*** relics are uncovered lodgement of S140 Application for an Excavation Permit	**Background to requirement for approvals:** This parcel contains the Civic Railway Station buildings including the Overhead Footbridge. **Subsurface disturbance**: Existence of archaeological relics is unknown, if relics are uncovered a Excavation Methodology will be required and lodged to support the S140 Application for an Excavation Permit





7.2.3 Remains of the AA Company Bridge and Fence

<table>
<tr><td>Listing</td><td colspan="2">Newcastle City Council LEP (I145)</td></tr>
<tr><td>Address</td><td colspan="2">280 Hunter Street, Newcastle</td></tr>
<tr><td>Ownership</td><td colspan="2">Unknown</td></tr>
<tr><td>Description</td><td colspan="2">The remnant AA Company bridge pier and railway fence form a tangible link to the Australian Agricultural Company coal mining operation. The bridge remnants mark what was both a bottleneck and a vital connection for the Company the bridge was constructed to allow an easier relationship between the Company's coal transport activities and the transport needs of the growing town of Newcastle (SHI 2172035).</td></tr>
<tr><td>Impact</td><td colspan="2">Area zoned public recreation, low to nil impact as a result of rezoning, but potential impacts arising from future development of the parcel, as well as from the Newcastle Light Rail Project, subject to negotiation with Newcastle City Council.</td></tr>
<tr><td>Approvals
NSW Heritage Act 1977
&
NSW Environmental Planning and Assessment Act 1979</td><td>NSW Environmental Planning and Assessment Act 1979:
If the footings and fence are on Newcastle City Council land -
Statement of Heritage Impact must be lodged with Council prior to any works in proximity to the heritage items.
NSW Heritage Act 1977:
If the Remains are on state owned land -
Major alterations or demolition:
Internal Approval Process for state owned Asset. Supported by Heritage Impact Assessment.
Minor alterations, maintenance or repair;
All changes must be lodged on the Heritage Division’s Heritage Data Form.
In addition under the NSW Heritage Act 1977:
Removal of the existing Remains of AA Company Bridge and Fence, if approved would require a S140 Application for an Excavation Permit.</td><td>The Remains of AA Company Bridge and Fence are in evidence and are likely to include in addition, archaeological relics.
  </td></tr>
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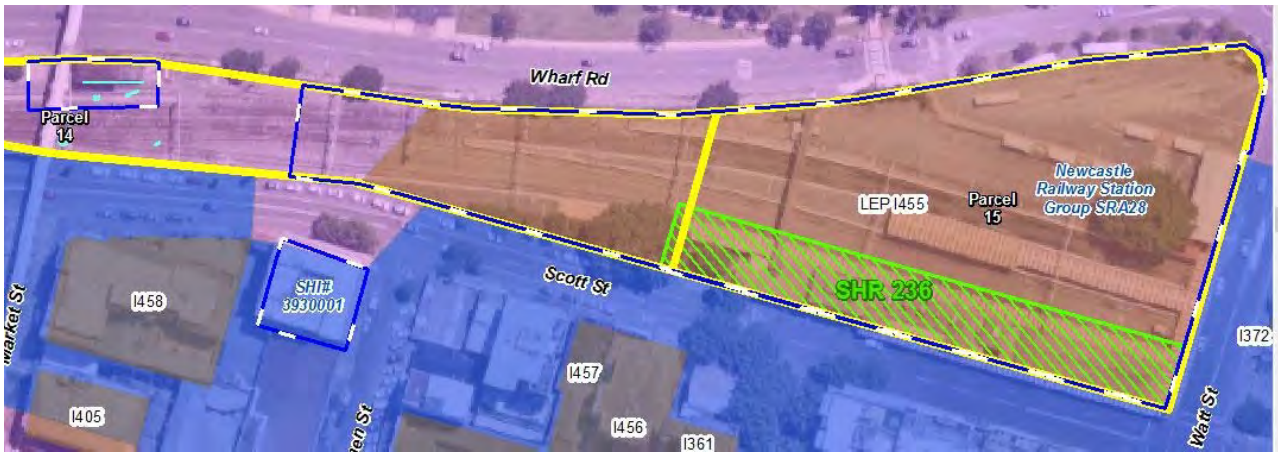
7.2.4 Newcastle Railway Station Additional Group

Listing	NSW Heritage Register (SHR01212) : S170 State government agency (SRA28)	
Address	Great Northern Railway	
Ownership	Sydney Trains. State Government	
Description	The Newcastle Signal Box built in 1936 a major technical achievement at the time, it was the only Type O signal box provided with an electro-pneumatic miniature lever power interlocking machine. One of the few signal boxes in the State to retain the original signalling frame, it was decommissioned sometime after 2012 (SHI Database 5012122).	
Impact	Proposed heritage building remains with adaptive reuse.	
Approvals ***NSW Heritage Act 1977***	**Major alterations or demolition:** Application under S60 supported by a Conservation Management Plan and Heritage Impact Assessment. **Minor alterations, maintenance or repair:** Application for Exemption under S57(2) to carry out works. **Subsurface disturbance**: In addition if proposed works are likely to disturb subsurface relics under the: S57(2) Excavation Exception Application ***If*** relics are uncovered lodgement of S60 Application for an Excavation Permit	**Background to requirement for approvals:** The Newcastle Railway Station Additional Group is listed on the State Heritage Register with approval required from the NSW Heritage Council for any works. **Subsurface disturbance**: Existence of archaeological relics is unknown; if relics are uncovered an Excavation Methodology will be required and lodged to support the S60 Application for an Excavation Permit.





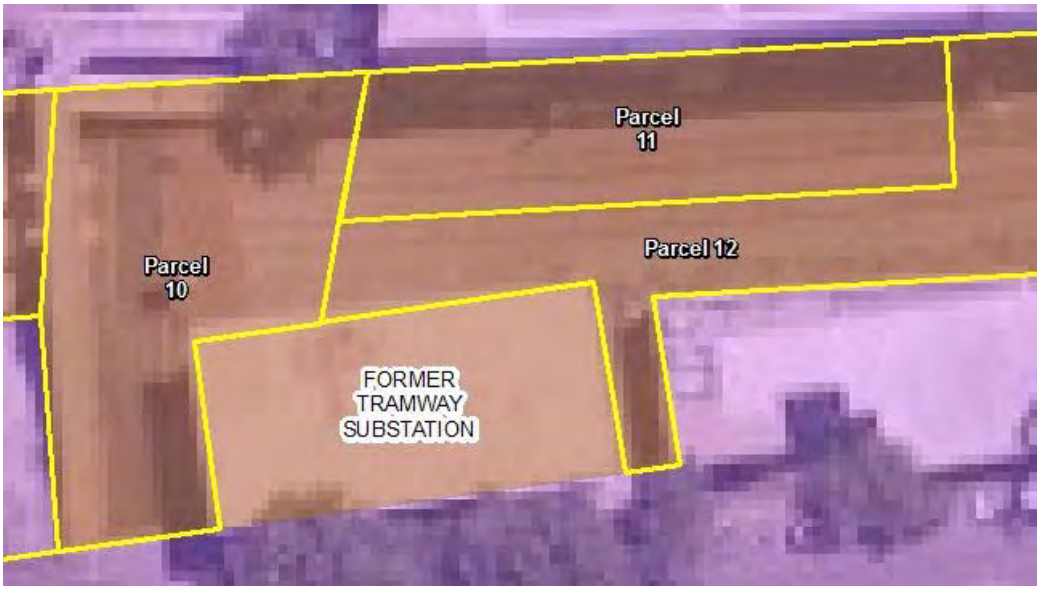
7.2.5 Newcastle Railway Station

Listing	NSW Heritage Register (SHR00236 & 1212) : S170 State government agency (SRA28); Newcastle City Council LEP (Item I455)	
Address	LOT 22 DP 1009735	
Ownership	Sydney Trains. State Government	
Description	Building phases from 1878 to 1929. The station is a fine example of Victorian Station architecture and is an important heritage feature in the Newcastle city centre (SHI Database 5044973).	
Impact	Heritage buildings are to remain with proposed adaptive reuse	
Approvals ***NSW Heritage Act 1977***	**Major alterations or demolition:** Application under S60 supported by a Conservation Management Plan and Heritage Impact Assessment. **Minor alterations, maintenance or repair:** Application for Exemption under S57(2) to carry out works. **Subsurface disturbance**: In addition if proposed works are likely to disturb subsurface relics under the: S57(2) Excavation Exception Application ***If*** relics are uncovered lodgement of S60 Application for an Excavation Permit	**Background to requirement for approvals:** The Newcastle Railway Station is listed on the State Heritage Register with approval required from the NSW Heritage Council for any works. **Subsurface disturbance**: Existence of archaeological relics is unknown; if relics are uncovered a Excavation Methodology will be required and lodged to support the S60 Application for an Excavation Permit. 
		

7.2.6 Tramway Substation (Former) adjacent to rezoning area

Listing	Newcastle City Council LEP (Item I416)	
Address	342 Hunter Street, Newcastle	
Ownership	Unknown	
Description	Historically important due to tramway. Probably constructed when tramway was electrified in 1923. , Important townscape element being one of few on north side of street in this vicinity. The interiors are of significance (SHI 2170183)	
Impact	Potential for construction of buildings to affect Tramway Substation (Former) remains.	
Approvals ***NSW Heritage Act 1977*** ***&*** ***NSW Environmental Planning and Assessment Act 1979***	*NSW Environmental Planning and Assessment Act 1979* Newcastle City Council requires a Statement of Heritage Impact be lodged with Council prior to any works.	The Tramway Substation (Former) abuts Parcel 10 and 12. The construction of buildings to a height 14m on the northern boundary (Parcel 11). A Statement of Heritage Impact is required if there is development in the vicinity of a heritage item.





7.2.7 Newcastle City Centre Heritage Conservation Area

Listing	Newcastle City Council LEP – Conservation Area C4	
Address	Hunter, Scott, Watt, Newcomen, King, Perkins, Brown, Crown, Wolfe and Keightley Lane	
Ownership	Various	
Description	The assemblage of commercial and civic buildings is a powerful reminder of the city's rich history and its many phase of development (SHI 2173904).	
Impact	The development of proposed rezoning area will affect Newcastle City Centre Heritage Conservation Area (NCCHCA). Following removal of the heavy rail it is intended the rezoning will assist in the retention, maintenance and refurbishment of heritage buildings therefore enhancing the NCCHCA, though new development will affect the setting and character of the NCCHCA. New development may also affect archaeological resources, which also contribute to the significance of the NCCAHCA. However, the improved public domain and adaptive re-use of heritage buildings and interpretation of the archaeological resources will enhance the NCCHCA.	
Approvals ***NSW Heritage Act 1977*** ***&*** ***NSW Environmental Planning and Assessment Act 1979***	*NSW Environmental Planning and Assessment Act 1979* Newcastle City Council requires a Statement of Heritage Impact be lodged with Council prior to any works.	**Background to requirement for approvals:** New Development adjacent to a heritage item requires a Statement of Heritage Impact: *All new development in the conservation area should be treated as 'infill', that is, it should respect the design of its neighbours and the character of the area generally. Similar principles are applied to infill development as are applied to alterations and additions, and must begin with an understanding of the design and heritage significance of the buildings to which it relates.* *Infill development should not copy or replicate its neighbouring traditional buildings. Rather, it is appropriate to interpret the features of the neighbouring buildings and design them in a way that reflects and respects them (*Newcastle Heritage Conservation Areas Section 5.07.07).



7.2.8 Heritage items in the vicinity of the proposed rezoning

Table 3; Table 5 and Table 7 identify heritage buildings that are in the NCCHCA and in the vicinity of the area designated for the proposed rezoning.

It is considered those heritage buildings will be not be physically impacted on by works resulting from the rezoning, however there is potential impact for visual impact from the placement of new buildings. Under the *NSW Environmental Planning and Assessment Act 1979*, Newcastle City Council requires a Statement of Heritage Impact be lodged with Council prior to any works in a heritage conservation area. New development in a conservation area is considered as infill development and as described in Section 7.2.7.

7.3 Historical archaeological heritage

There are a number of identified and potential archaeological resources in the area proposed for rezoning. The rezoning would not directly affect identified or potential archaeological resources. Detailed assessments of archaeological potential would be required prior to development to determine the potential for archaeological resources in specific areas and the potential of a proposed development to affect an identified or potential archaeological resource. The approvals required would be dependent on the significance of the archaeological resource and the potential for the proposed development to affect that significance.

7.4 Summary of approvals required

Table 10 details each Parcel that contains heritage items and provides advice on the approvals required, dependent on the developments proposed.

Table 10 Heritage Items in proposed rezoning parcels

Parcel Number and proposed rezoning	Heritage Item:	Approvals under the *NSW Heritage Act 1977* or *the NSW Environmental Planning and Assessment Act 1979; NPW Act 1974 (as Amended)*
Parcel 01 B4 – Mixed Use	- Mortuary Station (Archaeological) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Heritage Act 1977* ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ *NPW Act 1974 (as Amended):* **AHIP** for ground disturbance works
Parcel 02 B4 – Mixed Use	- Civic Railway Workshops Group and railway turntable (Archaeological) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Heritage Act 1977* ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ *NPW Act 1974 (as Amended):* **AHIP** for ground disturbance works
Parcel 03 B4 – Mixed Use	- Civic Railway Workshops Group and railway turntable (Archaeological) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Heritage Act 1977* ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ *NPW Act 1974 (as Amended):* **AHIP** for ground disturbance works

Parcel Number and proposed rezoning	Heritage Item:	Approvals under the *NSW Heritage Act 1977* or *the NSW Environmental Planning and Assessment Act 1979; NPW Act 1974 (as Amended)*
	- Civic Railway Station Group (Built) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Heritage Act 1977* ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ *NPW Act 1974 (as Amended):* **AHIP** for ground disturbance works
Parcel 04 B4 – Mixed Use	- Civic Railway Station Group (Built) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Heritage Act 1977* ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works
Parcel 05 RE1 – Public Recreation	- Civic Railway Station Group (Built) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Heritage Act 1977* ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works
Parcel 06 SP2 – Mixed use	- Civic Railway Station Group (Built) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Heritage Act 1977* ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works
Parcel 07 B4 – Mixed Use	- Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ NSW Heritage Act ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ *NPW Act 1974 (as Amended):* **AHIP** for ground disturbance works
Parcel 08 B4 – Mixed Use	- Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ NSW Heritage Act ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ *NPW Act 1974 (as Amended):* **AHIP** for ground disturbance works
Parcel 09 B4 – Mixed Use	- Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works
	- Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ NSW Heritage Act ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works

Parcel Number and proposed rezoning	Heritage Item:	Approvals under the *NSW Heritage Act 1977* or *the NSW Environmental Planning and Assessment Act 1979; NPW Act 1974 (as Amended)*
Parcel 10 RE1 – Public Recreation	- Tramway Substation (Former) (Built) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ NSW Heritage Act ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works
Parcel 11 SP2 - Electricity Generating Works Facility	- Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ NSW Heritage Act ▪ *NSW Environmental Planning and Assessment Act 1979* NPW Act 1974 (as Amended): **AHIP** for ground disturbance works
Parcel 12 B4 – Mixed Use	- Remains of AA Company Bridge and Fence (Built) - AA Co sandstone abutment (Archaeological) - Unidentified structure – brick footing (Archaeological) - Cisterns (Archaeological) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Heritage Act 1977* ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ *NPW Act 1974 (as Amended):* **AHIP** for ground disturbance works
Parcel 13 SP2 - Infrastructure	- Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Heritage Act 1977* ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ *NPW Act 1974 (as Amended):* **AHIP** for ground disturbance works
Parcel 14 RE1 - Public Recreation	- Newcastle Railway Station Additional Group (Built) - Perkins Street Boat Harbour (Archaeological) - Market Street Boat Harbour (Archaeological) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Heritage Act 1977* ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ *NPW Act 1974 (as Amended):* **AHIP** for ground disturbance works
Parcel 15 SP3 - Tourist	- Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ NSW Heritage Act 1977 ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works

For reference the heritage items in adjacent parcels outside the rezoning area are provided in Table 11 along with their required approvals.

Table 11 Heritage Items in adjacent parcels to the rezoning

Parcel Number	Heritage Item:	Approvals under the *NSW Heritage Act 1977* or *the NSW Environmental Planning and Assessment Act 1979; NPW Act 1974 (as Amended)*
Parcel 16 B4 – Mixed Use	- Civic Turntable - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ NSW Heritage Act 1977 ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works
Parcel 17 B4 – Mixed Use	- Civic Railway Workshops Group and railway turntable (Archaeological) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ NSW Heritage Act 1977 ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works
Parcel 18 B4 – Mixed Use	- Civic Railway Workshops Group and railway turntable (Archaeological) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ NSW Heritage Act 1977 ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works
Parcel 19 B4 – Mixed Use	- Civic Railway Workshops Group and railway turntable (Archaeological) - Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ NSW Heritage Act 1977 ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works
Parcel 20 B4 – Mixed Use	- Newcastle City Centre Heritage Conservation Area - Potential Aboriginal site	▪ *NSW Heritage Act 1977* ▪ *NSW Environmental Planning and Assessment Act 1979* ▪ NPW Act 1974 (as Amended): **AHIP** for ground disturbance works

8.0 Recommendations

The recommendations relating to the management of built and archaeological resources are presented below.

8.1 Aboriginal archaeological sites

Aboriginal archaeological sites will need to be assessed, investigated and if necessary, salvaged and interpreted and will require Aboriginal consultation where there is potential to impact Aboriginal objects. The impact assessment will identify the levels of Aboriginal consultation and investigation required, which will then provide an indication of Aboriginal objects in the area and if salvage and interpretation are necessary. As each of these stages are

8.1.1 Impact Assessment

The potential impact on Aboriginal heritage for each Development Application must be assessed. Previous Aboriginal heritage assessments may be used to supplement the impact assessment, where relevant, but the level of assessment required should identified by a qualified heritage professional. The impact assessment can be undertaken as a Due Diligence Aboriginal Heritage Assessment under the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010c). However, where known Aboriginal sites have been identified and are likely to be impacted by the proposed development, impact assessment should be in the form of an Aboriginal Cultural Heritage Assessment Report (ACHAR) and produced in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b).

8.1.2 Aboriginal Consultation

The Aboriginal Cultural Heritage Consultation Requirements (ACHCRs) for proponents process is a regulatory requirement when there is potential for impact on Aboriginal objects it is also valuable method of ensuring that the Aboriginal community is fully involved in the decision making process. Proponents should engage with the Aboriginal community through the ACHCR process as part of the development application process. The developer must inform the Aboriginal community of the scale of the proposed development and consult with the Aboriginal community in relation to the cultural significance of the area and the potential for the development to affect Aboriginal objects.

8.1.3 Investigation

Subsurface archaeological investigation may be required, dependent on the outcome of the impact assessment. This may be implemented as *Code of Practice Test Excavation* under the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b) or as an Aboriginal Heritage Impact Permit (AHIP), as directed by a qualified heritage professional.

8.1.4 Salvage

The salvage of Aboriginal objects, surface or subsurface, needs to be undertaken in accordance with an AHIP from the Office of Environment and Heritage (OEH). The methodology for undertaking salvage will be determined by the results of the investigation and/or the ACHAR.

8.1.5 Interpretation

A heritage interpretation strategy should be developed with the local Aboriginal community to ensure that the Aboriginal heritage of the area is reflected in an appropriate way. The heritage interpretation strategy should be developed as soon as practicable and prior to development within the Rezoning Study Area.

8.2 Historic heritage

A well-developed heritage interpretation strategy should be developed to ensure that the portion of the Great Northern Railway between Wickham and its place in the NSW rail network remains part of the city's memory. The heritage interpretation strategy should be developed as soon as practicable and prior to development within the Rezoning Study Area.

8.2.1 Built heritage

In general, assessing potential strategies for mitigating against adverse impact, it is considered critical that buildings in the Rezoning Study Area are adequately maintained and protected until a new role is devised and implemented.

8.2.1.1 Visual impact

There will be impact or potential impact on structures in the vicinity of Parcels where new buildings will be constructed to varying heights. Any new buildings should be designed in accordance with the requirements of the Newcastle City Council requirements for the NCCHCA.

8.2.1.2 Construction in the vicinity of heritage items

The Tramway Substation (Former) is in close physical proximity to potential works in Parcel 10 and Parcel 12. During works, protective barriers, designated as no-go zone, should be installed under advice from cultural heritage consultant to mitigate against impact.

8.2.1.3 Adaptive reuse plan for heritage items

The conservation of a heritage building is often best served by sympathetic adaptive reuse. Adaptive reuse needs to be compatible with the building, retain its historic character and conserve significant fabric. This however does not negate the introduction of new services, modifications and additions. Proposals for adaptive reuse of any buildings should be considered in conjunction with the appropriate regulatory authorities. An adaptive reuse plan / conservation management plan should accompany the Development Application and for State Heritage Items will require approval by the NSW Heritage Council.

Newcastle Railway Station (SHR0036) and Newcastle Railway Station Additional Group (SHR1212) are proposed for adaptive reuse.

8.2.1.4 Demolition or removal of structures

Where items are proposed for removal, the impact will be substantial. A full investigation should be made of all options other than removal to ensure that the heritage item is not removed without just cause. If removal is the only option, processes to ensure the heritage value is not lost should be instigated. Those processes should be informed by a heritage interpretation strategy, developed by a suitably qualified heritage consultant.

8.2.1.5 Interpretation

A heritage interpretation strategy should be prepared for as part of the adaptive reuse plan for heritage items being adaptively reused and/or in instances where structures are to be removed or demolished..

8.2.2 Management of archaeological resources

While it is recognised there are known or potential archaeological resources in the area of proposed rezoning, the entire area has potential for archaeological relics to be present.

8.2.2.1 Conservation principles

The archaeological resources needs to be first investigated and their significance assessed, the management of the resource is to aspire to the highest levels of conservation outcomes. The following conservation principles are to guide the consideration of conservation management options, but must consider the significance of the relic in selecting the most appropriate option. The management options are listed in order of preference:

- Conserve relic in-situ
- Remove relic and conserve – with interpretation
- Remove relic and discard – with interpretation

Option A: In situ conservation

Impact to archaeological relics should be avoided. Relics should be conserved in situ either through reburial or as a permanent display. If reburied, relics should be covered with a protective layer, such as geofabric and covered with fill. The relic should be documented and information provided for the interpretation. If exposed, protective structures should be erected around the relic to ensure conservation, allowing for sufficient set back to allow the relic to be interpreted by the public.

Option B: Remove relic and conserve – with interpretation

If impact to the relic cannot be avoided by the proposed works, then options for its removal may be considered. If the relic is of local or state significance then it should be conserved and transferred to an appropriate institution such as a museum or other appropriate storage facility. This transferal is to be accompanied by interpretative documentation. If appropriate, and in line with the significance of the relic, signage or a plaque should also erected at the location of its discovery.

Option C: Remove relic and discard

If impact to the relic cannot be avoided by the proposed works, then options for its removal may be considered, but is the least preferred outcome and all other options must be rigorously explored prior to this option being selected. This option may need to be implemented where the significance assessment demonstrates that the relic does not meet local or state significance criteria, the item is contaminated or partial removal of a relic is required to conserve the rest of the relic in-situ. In the case of discard, the relic must be exposed, investigated and documented, interpretative material prepared, prior to the discard of the item. Appropriate disposal of the relic must be implemented, particularly if contamination is identified.

Interpretation

The interpretation of the archaeological resources is a key conservation outcome. All conservation management principles are to be implemented with the aim of providing high quality interpretation.

8.2.2.2 Roles and responsibilities

The developer would be responsible for managing archaeological resources. The developer should consult with a qualified archaeologist, and where appropriate the Heritage Division of the Office of Environment and Heritage (OEH).

Contractors involved in ground disturbance of areas with archaeological resources or the potential for archaeological resources should be informed of their obligations in relation to archaeological issues. Contractors would be responsible for reporting all unexpected archaeological resources to the proponent. Unexpected archaeological relics must be reported to the Heritage Division of the OEH in accordance with Section 146 of the Act.

8.2.2.3 Impact assessment

Impact to archaeological resources and areas of archaeological potential must be assessed as part of the development application process. The impact to archaeological resources and areas of archaeological potential should be assessed as early as possible to minimise the potential for impact and also potential delays associated with obtaining approval under Section 140 of the *Heritage Act 1977*, or Section 60 for SHR areas. Where ever possible, impact to archaeological resources should be avoided or minimised.

8.2.2.4 Investigation / Salvage

The preliminary investigation of archaeological resources may require an exception under s139 of the *Heritage Act 1977*, or s57 for State significant relics, but this will need to be determined by a qualified heritage professional and is dependent upon the nature of proposed works and archaeological significance.

Where archaeological relics are unable to be avoided, approval must be obtained under Section 60 for archaeological resources of State significance and Section 140 of the Act for archaeological relics of local significance. Ground disturbance proposed in areas of archaeological potential must be proceeded by, or carried out in conjunction with, archaeological investigation, which may include ground penetrating radar, excavation and detailed recording. The archaeological research design that would be prepared to support a Section 140 or Section 60 application would set out the research questions and archaeological methods as appropriate to impact associated with each development.

8.2.2.5 Remediation

Contamination is considered a significant constraint to the conservation of archaeological resources within the rezoning area. The level of contamination varies, but may include hydrocarbons and asbestos and require remediation prior to adaptive reuse and potential new development. Remediation should be monitored with archaeological resources investigated as far as safe and practicable, and in accordance with relevant approvals under the *Heritage Act 1977*.

8.2.2.6 Utilities

In general, ground disturbance for the purpose of exposing or accessing underground utilities is appropriate where the disturbance would occur within that of the existing service or the disturbance would not affect known or potential archaeological resources.

8.2.2.7 Interpretation

The archaeological resources within each land parcel should be interpreted as part of the development process. Interpretative options should be considered at the development application stage and should be framed within a heritage interpretation strategy and consistent with the heritage interpretation framework.

8.3 Implementation and Indicative Timing

Implementation of the recommendations will need to be undertaken at different stages. An indicative timeline is provided in Table 11. It should be noted that some components are dependent of the results of previous investigations/impact assessments and that not all components will be required for each development proposal.

Table 12 Implementation and Indicative Timing

Component	Indicative Timing for Implementation
Aboriginal Heritage	
Impact Assessment	Prior to DA lodgement
Aboriginal Consultation	Prior to investigation or salvage, if Aboriginal objects are to be impacted
Investigation	Post DA approval, but only if the need for investigation is identified in the impact assessment.
Salvage	Post DA approval, but only if the need for salvage is identified in the impact assessment or investigation.
Interpretation	Post DA approval, but only if the need for interpretation is identified in the impact assessment or investigation
Built Heritage	
Adaptive Reuse plan / Conservation Management Plan	Prior to DA lodgement and additional approval under the *Heritage Act 1977*, if necessary.
Heritage Interpretation Strategy	Post DA approval, but prior to construction works. Strategy must address key themes in heritage interpretation framework (Appendix 2): celebrating the Newcastle Branch Line
Archaeological Resources	
Impact Assessment	Prior to DA lodgement
Investigation / Salvage	Post DA approval, but prior to, or concurrent with construction works as stipulated in the archaeological research design, or monitoring methodology and in accordance with approvals under the *Heritage Act 1977*.
Heritage Interpretation Strategy	Post DA approval. Strategy must address key theme in heritage interpretation framework (Appendix 2): celebrating the Newcastle Branch Line, with subthemes or additional themes dictated by the archaeological evidence on the land parcel.

9.0 References

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Appendix 1

AHIMS Results

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : PR123632

Client Service ID : 287448

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
38-4-1716	Wickham Transport Interchange PAD	GDA	56	383426	6356757	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Ms.Alyce Howard					**Permits**	3809,4025	
38-4-1795	38 Hannell St Newcastle PAD	GDA	56	384090	6356541	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Extent Heritage Pty Ltd ,Doctor.Tessa Bryant					**Permits**	4122	
38-4-1804	Isolated Find 1-Rail	GDA	56	384145	6356435	Open site	Valid	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton,Mr.Ben Slack					**Permits**	4025	
38-4-1223	Wickham UFCCALE OS1	GDA	56	384166	6356333	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Streat Archaeological Services					**Permits**	4025	
38-4-1222	Cottage Creek OSI	GDA	56	384250	6356324	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Streat Archaeological Services					**Permits**	3970,4025	
38-4-1816	Isolated Find 4 -Rail	GDA	56	384514	6356211	Open site	Destroyed	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton,Ms.Cheng-Yen Loo					**Permits**		
38-4-1815	Isolated Find 5 - Rail	GDA	56	384520	6356214	Open site	Destroyed	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton,Ms.Cheng-Yen Loo					**Permits**		
38-4-1803	Isolated Find 3-Rail	GDA	56	384525	6356208	Open site	Valid	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton,Ms.Cheng-Yen Loo					**Permits**	3970	
38-4-1805	Isolated Find 2-Rail	GDA	56	384525	6356208	Open site	Valid	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton,Mr.Ben Slack					**Permits**	3970	
38-4-1812	Isolated Find 6 - Rail	GDA	56	384542	6356203	Open site	Valid	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton,Ms.Cheng-Yen Loo					**Permits**		
38-4-1814	Isolated Find 8 -Rail	GDA	56	384545	6356199	Open site	Destroyed	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton,Ms.Cheng-Yen Loo					**Permits**		
38-4-1813	Isolated Find 7 - Rail	GDA	56	384549	6356205	Open site	Destroyed	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton,Ms.Cheng-Yen Loo					**Permits**		
38-4-1817	Artefact Scatter 1 –Rail	GDA	56	384553	6356198	Open site	Destroyed	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton,Ms.Cheng-Yen Loo					**Permits**		
38-4-1818	Isolated Find 9 - Rail	GDA	56	384565	6356195	Open site	Destroyed	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton,Ms.Cheng-Yen Loo					**Permits**		
38-4-1642	409 Hunter Street Newcastle Fill duplicate of 409 Hunter Street Newcastle Insitu	GDA	56	385099	6356088	Open site	Valid	Artefact : -, Shell : -		
	Contact	**Recorders**	Mr.Benjamin Streat					**Permits**	3920	
38-4-1632	TA1 Newcastle	GDA	56	386378	6356088	Open site	Destroyed	Artefact : -		

Report generated by AHIMS Web Service on 21/06/2017 for Tessa Boer-Mah for the following area at Datum :GDA, Zone : 56, Eastings : 382900 - 386600, Northings : 6355700 - 6357200 with a Buffer of 0 meters. Additional Info : assessment. Number of Aboriginal sites and Aboriginal objects found is 29

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : PR123632

Client Service ID : 287448

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Umwelt (Australia) Pty Limited,Miss.Nicola Roche					**Permits**	3683	
38-4-0544	700 Hunter Street	AGD	56	384250	6356020	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Dominic Steele Archaeological Consulting					**Permits**		
38-4-0952	Bellevue Hotel PAD	AGD	56	384250	6356200	Open site	Valid	Potential Archaeological Deposit (PAD) : -		99845,99874
	Contact Searle	**Recorders**	Mr.Dominic Steele					**Permits**	2382	
38-4-0832	Empire Hotel PAD	AGD	56	384300	6356000	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact T Russell	**Recorders**	Jim Wheeler					**Permits**	2128	
38-4-0831	Palais Royale	AGD	56	384300	6356100	Open site	Partially Destroyed	Potential Archaeological Deposit (PAD) : -, Artefact : 5534, Shell : -		102256
	Contact T Russell	**Recorders**	University of Newcastle,Jim Wheeler					**Permits**	2127,2593,3098,3502	
38-4-0772	710 Hunter Street Newcastle PAD	AGD	56	384350	6356250	Open site	Valid	Shell : -, Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Jim Wheeler					**Permits**	1981	
38-4-0851	710 Hunter St Newcastle, PAD	AGD	56	384350	6356250	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact S Scanlon	**Recorders**	Jim Wheeler					**Permits**		
38-4-0559	The Broadwalk- Newcastle 1	AGD	56	385000	6356250	Open site	Valid	Potential Archaeological Deposit (PAD) : 0		98887
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists					**Permits**	1298,2043,2453	
38-4-0525	Catholic Education Site	AGD	56	385680	6355710	Open site	Valid	Artefact : -	Open Camp Site	100771
	Contact	**Recorders**	Margrit Koettig					**Permits**		
38-4-0796	200 Hunter Street PAD	AGD	56	385787	6356006	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact T Russell	**Recorders**	Mrs.Angela Besant					**Permits**	2045,2049	
38-4-1084	Newcastle CBD PAD	AGD	56	385850	6355900	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Ms.Meaghan Russell					**Permits**	3008	

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : PR123632

Client Service ID : 287448

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
38-4-1020	Coutts Sailors Home PAD1	AGD	56	386358	6355971	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact T Russell	**Recorders**	Extent Heritage Pty Ltd					**Permits**	2734	
38-4-1695	11-15 Watt St IF 1	AGD	56	386381	6356080	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.Benjamin Streat					**Permits**	3814,3966	
38-4-0957	NCL 931	AGD	56	386400	6356000	Open site	Valid	Artefact : -		
	Contact T Russell	**Recorders**	Noeleen Curran					**Permits**		

Report generated by AHIMS Web Service on 21/06/2017 for Tessa Boer-Mah for the following area at Datum :GDA, Zone : 56, Eastings : 382900 - 386600, Northings : 6355700 - 6357200 with a Buffer of 0 meters. Additional Info : assessment. Number of Aboriginal sites and Aboriginal objects found is 29

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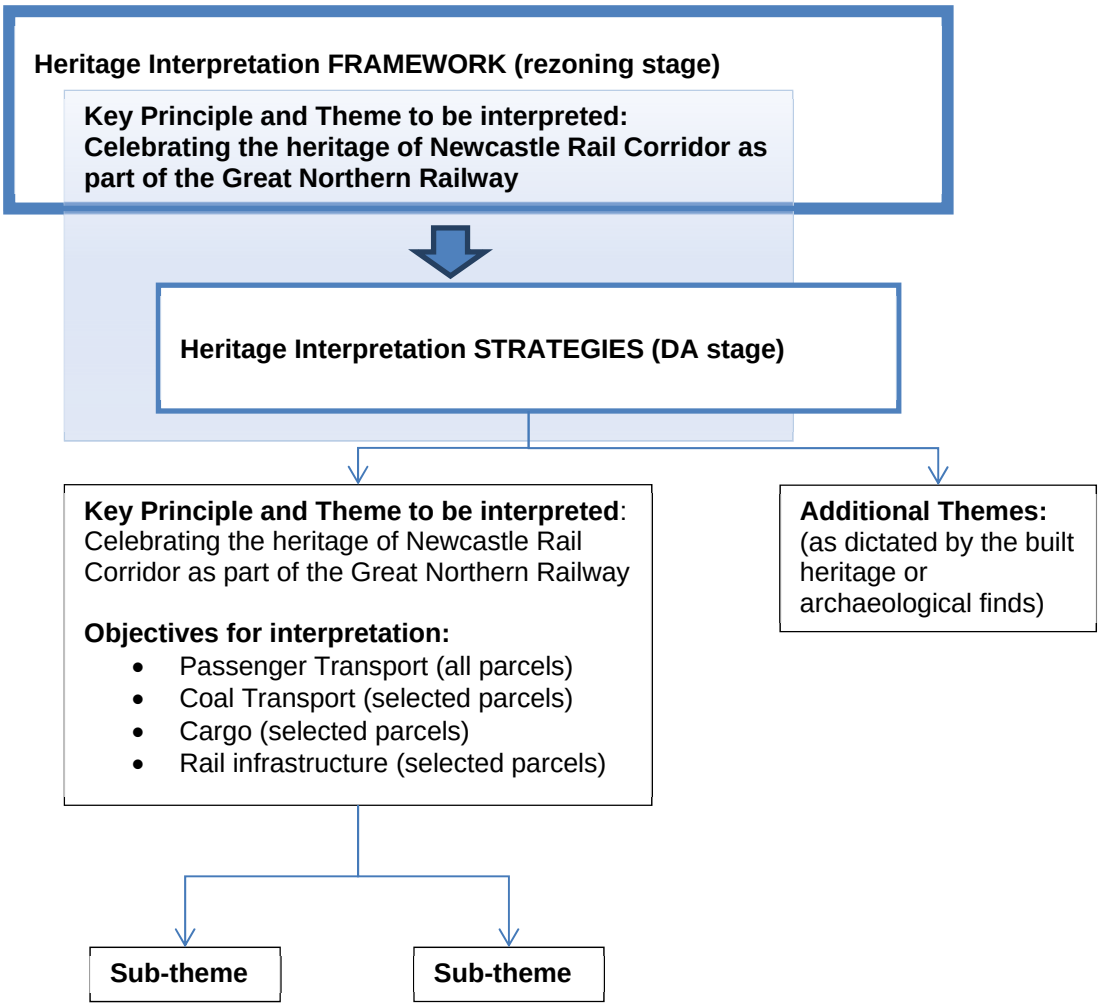
Appendix 2

Heritage Interpretation Framework

Introduction

The individual land parcels that form part of the Newcastle Urban Transformation and Transport Program (NUTTP) will be subject to individual development applications (DAs). The likely impact on specific built or archaeological heritage items in these parcels will depend on the scale and nature of the development proposal at DA stage; however, the overall impact will be transforming the rail corridor to urban development and open space. Thus it is important that the rail corridor between Worth Place and Newcastle Railway Station is celebrated as part of the former Great Northern Railway and that its place and importance in the NSW rail network remains part of the city's memory such that it is appropriately interpreted.

This heritage interpretation framework is intended to provide an overarching framework and guidance for interpretation across the entire rezoning area (Worth Place to Newcastle Railway Station). The aim of the framework is to ensure that the heritage interpretation strategies produced at DA level align with the heritage themes and stories associated with the former rail corridor, with sub-themes or additional themes employed as determined by the built or archaeological evidence in that parcel, as per illustration below.



The heritage interpretation strategies developed at the DA stage will require the addition of sub-themes depending on the heritage (built and archaeological) associated with the particular parcel and the associated archaeological impacts which will be varied, as the depth of excavation (ground disturbing works) will have a bearing on the level of archaeological impact. For instance, the inclusion of basements in a development has a greater potential to impact archaeology, than shallower installations or no ground disturbing works. As a result, the nature of archaeological relics exposed will be variable and will need to be interpreted accordingly.

History of the Rail Corridor

Below is a summary timeline of the major developments in the rail corridor between Worth Place and Newcastle Railway Station. This timeline can be split into two phases, coal transport 1831-1858 and passenger and coal transport 1858-2014 (highlighted in blue on the table). Associated with the rail corridor is the Port Facilities which included wharves, coal staithes and shoots from the 1830s, with expansion in the mid 1800s. In addition, boat harbours were also constructed for the general loading of cargo including fresh produce, as evidenced by the Market Street Boat Harbour, which was later replaced by Perkins Street Boat Harbour.

The rail lines were originally oriented north-south for the shipment of coal from the AA Company pits to the foreshore to enable loading onto the transport ships. From the late 1840s, additional rail lines were constructed east-west for coal haulage from other mines in the region, this culminated in the construction of four staithes to the east of the AA Company Bridge. From 1858, the construction of Newcastle Railway Station east-west rail line, as part of the Great Northern Railway carried passenger and coal traffic.

Summary Timeline of the History of the Rail Corridor

Date/s	Event Summary	Event Detail
1831	AA Company Railway Bridge (First) constructed	Original rail way constructed from A pit to the foreshore
1841	AA Company Railway Bridge (Second) constructed	AA Company railway from B Pit with second bridge (timber) across Hunter Street
1849	Four staithes to east of AA Company shoots - constructed	Four staithes built by the Newcastle Coal and Copper Company to east of AA Company shoots
1851	AA Company monopoly on coal officially broken	Supreme Court ruled in 1851 that monopoly on coal by the AA Company was illegal (Kingswell 1890:6) and allowed additional mines by Brown, Donaldson and Nott (which had been established previously) which had already started by that date to compete more effectively in the coal trade.
1853	Wharves	In addition to the AA Company wharf, a Donaldson Mine wharf is identified north of the current alignment of Brown Street, to the east of the AA Company Wharf (1853 Crown Plan)
1853-1854	Hunter Valley Rail Company (formed and failed following year)	The Hunter Valley Railway Company was formed to facilitate the movement of produce from the Hunter Valley to the docks of Newcastle for shipping
1854	Select Committee on Roads and Railways formed	Legislative Council formed the Select Committee on Roads and Railways. The Committee determined that private companies could not construct railways under local conditions without assistance and recommended that the Government purchase controlling interest of these companies. This triggered the commencement of construction on the Great Northern Railway.
1857	Great Northern Railway opened and included the Honeysuckle Point Railway Station as its terminus.	Opened on 30 March 1857 with a terminus at Honeysuckle Point (near current Civic Railway Station) to the East Maitland Line. The rail had to terminate at Honeysuckle Point, as the further to the east AA Company bridge was too low to allow the operation of trains under it.
1860	Market Street Boat Harbour	Boat harbour north of Market and Hunter Streets.
1889-1890	Four staithes to east of AA Company shoots – demolished,	Four staithes to east of AA Company shoots – demolished by government along with steam cranes, as coal was being loaded

Date/s	Event Summary	Event Detail
	replaced by boat harbour	on Bullock Island (Carrington). Boat harbour is constructed (appears on 1916 Town Plan of Newcastle)
1857	First Locomotive used on AA Company Railway	First Locomotive used on AA Company Railway, however, the second bridge made from timber was not sturdy enough to accommodate the locomotive, so horse drawn carts were used for this section.
1858	Newcastle Railway Station (first) constructed & bypass	Newcastle Railway Station constructed, the line had to be diverted under the highest span of the AA Company overhead rail, the rail had to be lowered 2 feet and the chimney of the locomotives was cut to ensure adequate clearance.
1860	Newcastle Wallsend Company	Newcastle Wallsend Company, erected first steam cranes at Newcastle wharves [Kings Wharf] (c.1862) (9)
1862-5	AA Company Railway Bridge (Third) constructed	The third bridge was constructed from iron and brick.
1878	Newcastle Railway Station (second) constructed	Second Newcastle Railway Station completed on top of the first Newcastle Railway Station; it was the terminus for the passenger line, although rail lines extended along the foreshore to the north towards the boatshed.
1885-1888	Linking of Newcastle to Sydney via rail	Hawkesbury Rail Bridge was completed in these years which then linked Sydney with Newcastle by train.
c1887	Market Street Boat Harbour	Market Street Boat Harbour
1897	Perkins Street Boat Harbour	The Perkins Street Boat Harbour replaced the Market Street Boat Harbour
1923	AA Company Railway Bridge (Third) demolished	AA Company Railway Bridge (third) demolished in 1923 having not been in use since 1920. The waterfront land held by the AA Company north of the bridge had been resumed in 1922.
1915	Zaara Power station constructed	Zaara Power station utilised the rail line which extended past Newcastle Railway Station
1935	Civic Railway Station	Civic Railway Station was built over the location of the original Honeysuckle Railway Station which was the terminus of the Great Northern Railway in 1857.
1978	Zaara Street Power Station demolished	The demolition of the Zaara Street Power Station in 1978 also led the resumption of rail lines in the area which were transformed into Foreshore Park.
2014	Linkage between Newcastle Railway Station and Sydney severed	Linkage between Newcastle Railway Station and Sydney severed with truncation of the line at Hamilton Railway Station

Coal transport 1831-1858

Coal transport in Newcastle began with the Australian Agricultural Company (AA Company) who had a monopoly coal extraction and transport through the 1830s; in the 1840s additional companies were formed including the Newcastle Coal and Copper Company which unofficially competed with the AA Company until the monopoly clause was officially repealed in 1851.

The AA Company was formed in London in 1824 to seek pastoral opportunities in the colony of New South Wales. The initial focus was on wool however, following the J T Bigge Report (1822) that criticised the operation of Government coal mining in Newcastle, the Report recommendation that the fledgling industry be privatised was acted on. The AA Company was granted 890 hectares of coal bearing land to foster the development of a private coal industry (Campbell, Brougham and and Caldwell 2009:1). Included in that grant was harbour front land that stretched from present day Brown Street to Merewether Street; this land was intended for access to the foreshore and shipping facilities (Webber and Wylie 1968:55). In 1831 the Company opened its first pit, the A Pit, at the corner of present day Brown and Church Streets, Newcastle. This mine was the first privately owned and appropriately equipped coal mine in Australia (Campbell, Brougham and and Caldwell 2009:2). The privatisation of coal mining in Newcastle was at a time of increased demand. This demand based on an increasing use of steam in shipping and a domestic need for coal as a source of fuel became scarcer, was met by an expansion in the number of AA Company Pits (Pemberton1986: 31).

From its earliest operation the AA Company recognised a need for an efficient method of transporting the coal to the harbour for shipping. The result was the construction of Australia's first railway, using a gravitational system that relied on the hillside location of the Pit (Campbell, Brougham and and Caldwell 2009:3). Described as a funicular, the railway ran along an inclined plane of timber planking to a loading staithe and wharves constructed on the harbour front. Using wooden skips that operated in pairs, the two laden skips would draw up the two empty skips from the waterfront. (Webber and Wylie 1968:56). That railway crossed present day Hunter Street via a wooden bridge in the vicinity of Brown Street (**Plate** 3).

In 1841, the opening of the B Pit led to the construction of another gravitational railway. A new bridge, to replace the earlier bridge, was constructed over Hunter Street, near present day Crown Street (**Plate** 3). The second bridge, also of timber, is described as accommodating a single track, 12 feet 6 inches wide supported by timber trestles. The AA Company had been required to provide 18 feet headway over Hunter Street for traffic but this directive was ignored. The coal skips used gravity to descend the hill but were horse drawn up slope.

The AA Company continued to open further pits and by 1850s, the potential for the use of steam locomotives was recognised with new rail lines that linked the pits being built to the required standard. In 1851 the Supreme Court ruled that monopoly on coal by the AA Company was illegal (Kingswell 1890:6) and this allowed additional mines by Brown, Donaldson and Nott (which had been established previously) which had already started by that date to compete more effectively in the coal trade. The Newcastle Coal and Copper Company in 1949 had already built four staithes to the east of the AA Coal staithes and thus had already been unofficially competing with the AA Company.

In addition, Donaldson's operation had a coal wharf to the east of the AA Company which is marked on an 1853 plan, but presumably was built earlier, until the lift of the AA Company monopoly clause Donaldson had been transporting their coal by dray to the wharf.

In April 1857 AA Company introduced its the first locomotive to the original rail line; however the bridge over Hunter Street was not sturdy enough with horse drawn carts continuing to be used for that section (Webber and Wylie 1968:60).

The increase in coal production, the continuing disquiet about the restrictive height of the timber bridge and flooding of the area below the bridge during high tide led to construction of a third more substantial bridge (Webber and Wylie 1968:60).

In 1862, the Newcastle Chronicle reported that a new Hunter Street bridge, ordered from and fabricated by Robert Stephenson & Company in the UK, was ready for construction. It is described as a wrought iron girder bridge supported by stone buttresses (Andrews 2009:45). The bridge was constructed on a skew of approximately 54º, with the supporting piers described as 42 feet x 5 feet (Plate 1 and Plate 2). The old timber bridge was removed in April 1865 (Webber and Wylie 1968:62).

One issue with the new bridge was that the shoots or off ramps were in an area of shallow water, providing issues for the loading of boats. As a result, the AA Company organised the construction of a rail junction near Hamilton to provide access to the NSW Government Railway and the Newcastle (Queen Street) wharves (Webber and Wylie 1968:62).

From the late nineteenth century, output from the Newcastle mines decreased and production from the South Maitland coalfields increased with a resulting diminishing profitability for the Newcastle mines. Linked to this was increasing Municipal taxes on unimproved land that affected the large holdings of the Company in the Newcastle area. The Company countered by subdividing and selling large areas of residential land in Newcastle and Hamilton (Pemberton1986: 41).

In 1916, the last AA Company shaft ceased production and the Company's' operation in Newcastle closed. The staithes associated with the iron bridge were last used in 1920 and in 1923, the steel bridge was removed (NSW Heritage Database: AA Company's Remnant Bridge Pier). In 1922, the waterfront land held by the AA Company was resumed and with it coal mining in Newcastle by the Company ceased (Webber and Wylie 1968:63).

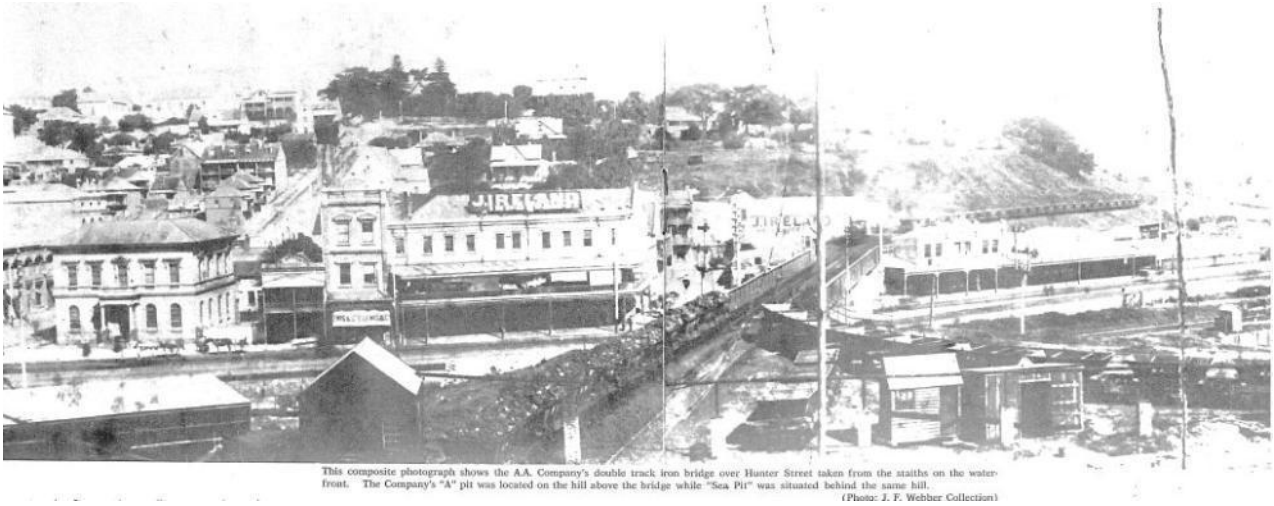


Plate 1 AA Company Iron Bridge over Hunter Street, Crown Street centre plate (Extract from (Webber and Wylie 1968:50)

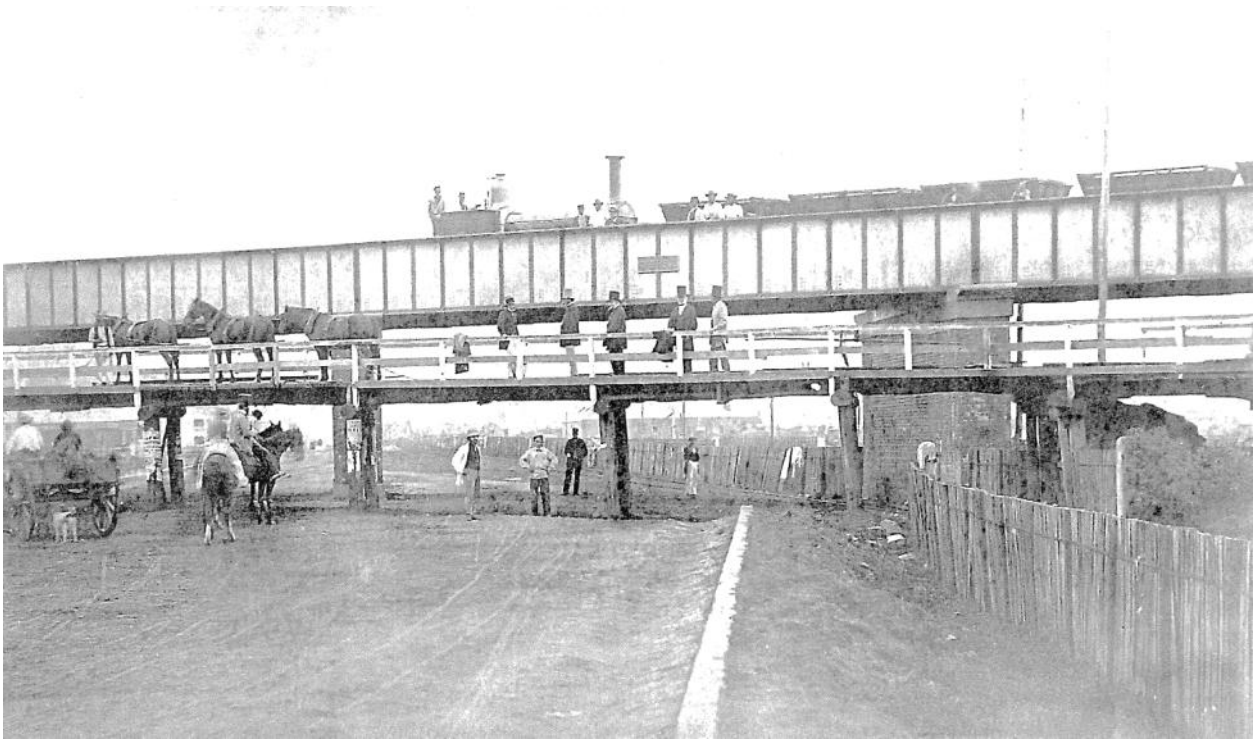


Plate 2 Historic Plate showing AA Company timber bridge with later iron bridge behind Source: (Source:Andrews 2009:44)

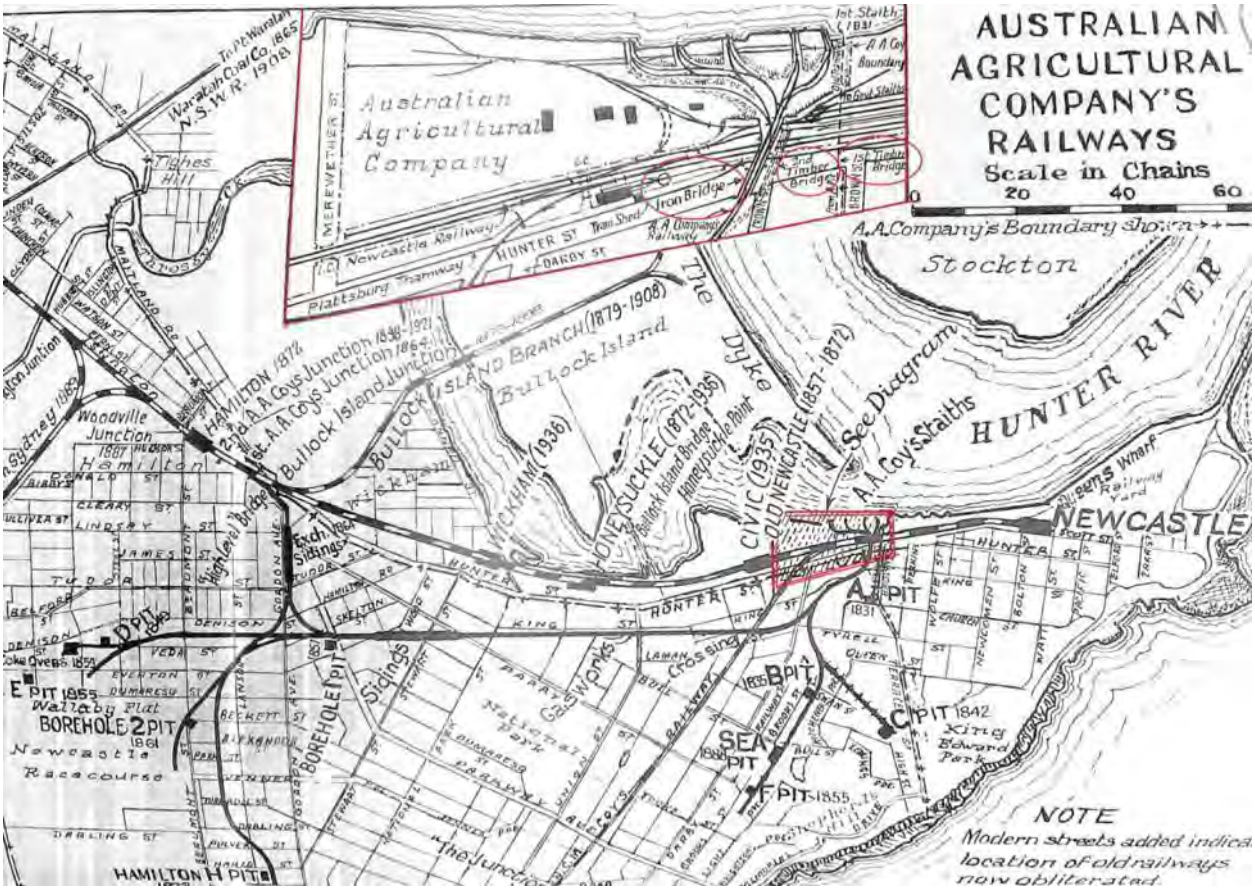


Plate 3 AA Company Railways showing location of 1st , 2nd bridge and Iron Bridge in highlight box (Source: Webber and Wylie 1968)

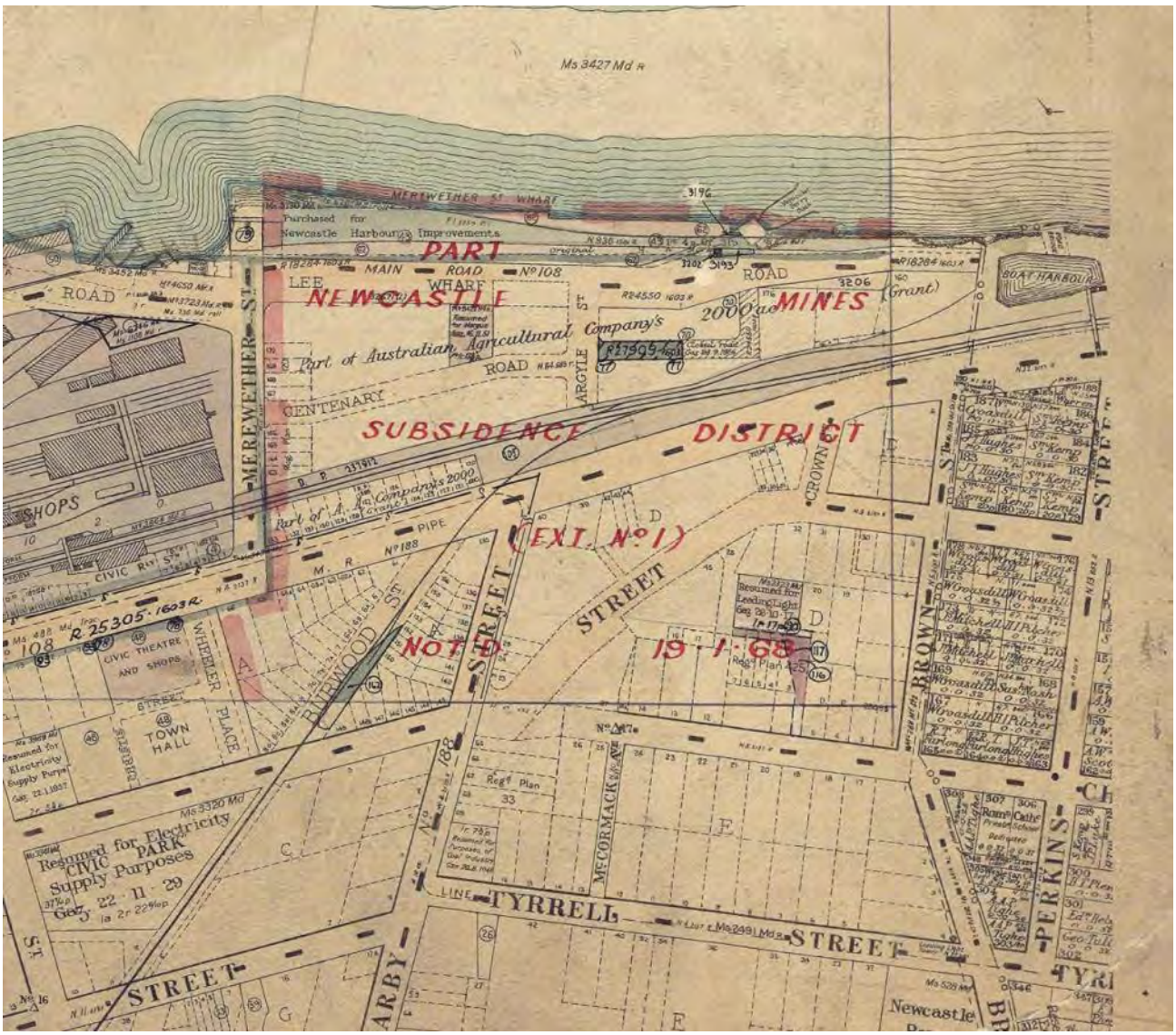


Plate 4 Perkins Street – note the boat harbour at the northern end of Perkins Street. Status Branch Charting Map Town of Newcastle n.d. (Source: NSW Land and Property Information)

Passenger Transport and other uses c1858-2014

It took some time for passenger rail lines to be developed into Newcastle and Newcastle Railway Station did not open until 1858 due to a number of factors.

The Hunter River Railway Company (HRRC) was formed on 30 September 1853 to construct a railway between Newcastle and Maitland. The HRRC experienced considerable difficulties obtaining the required capital of £100,000.

In July 1854, the Legislative Council formed the Select Committee on Roads and Railways. The Committee determined that private companies could not construct railways under local conditions without assistance and recommended that the Government purchase controlling interest in the Sydney and HRRC. The contract for the construction of the first section from Newcastle to Hexham was awarded to William Wright of Newcastle on 31 October 1854 for £82,620 (EJE 2016:17-18).

The Great Northern Railway opened on 30 March 1857 with a terminus at Honeysuckle Point as the AA Company Bridge was too low to allow the operation of trains under it. In 1857 a Parliamentary Committee considered the whether the terminus should be located closer to Newcastle Town centre. The Committee

recommended that a single line for goods and passenger traffic be laid from Honeysuckle Point to the wharf at Watt Street, with all associated infrastructure at the terminus to be of the most inexpensive description (EJE 2016:19).

In November 1857, William Wright was awarded the contract for the extension to Circular Wharf at the cost of £6,347. Though completed in January 1858, the line was not used due to the restricted access at the AA Company Hunter Street overpass. In 1858 the line was diverted to pass under the highest span of the overpass and lower the line to two feet below ground level, with the height of the locomotives also reduced to improve clearance (EJE 2016:19-20).

In 1881, Sandgate Cemetery opened to facilitate the closure of cemeteries in the Newcastle town area. With the new cemetery some distance from Newcastle, a branch railway line was constructed to assist in the conduct of funerals. A centrally placed platform was placed in the cemetery and at Honeysuckle, in Newcastle, a Mortuary Station was constructed. Purpose-built trams were used to convey the deceased and the mourners from the suburbs to the station, from here they changed to special funeral trains for the trip to Sandgate cemetery (History of Sandgate). The Mortuary Station Signal Box was constructed around 1895 with the date of demolition unknown. The Mortuary Station constructed in 1883 and demolished around 1933 was described as a small weatherboard building in rustic style (C & M.J. Doring 1991: Sheet 6).



Plate 5 Newcastle Mortuary Station and Fire Bell 1896 (Source: Norm Barney Photographic Collection, held by Cultural Collections at the University of Newcastle, NSW, Australia).

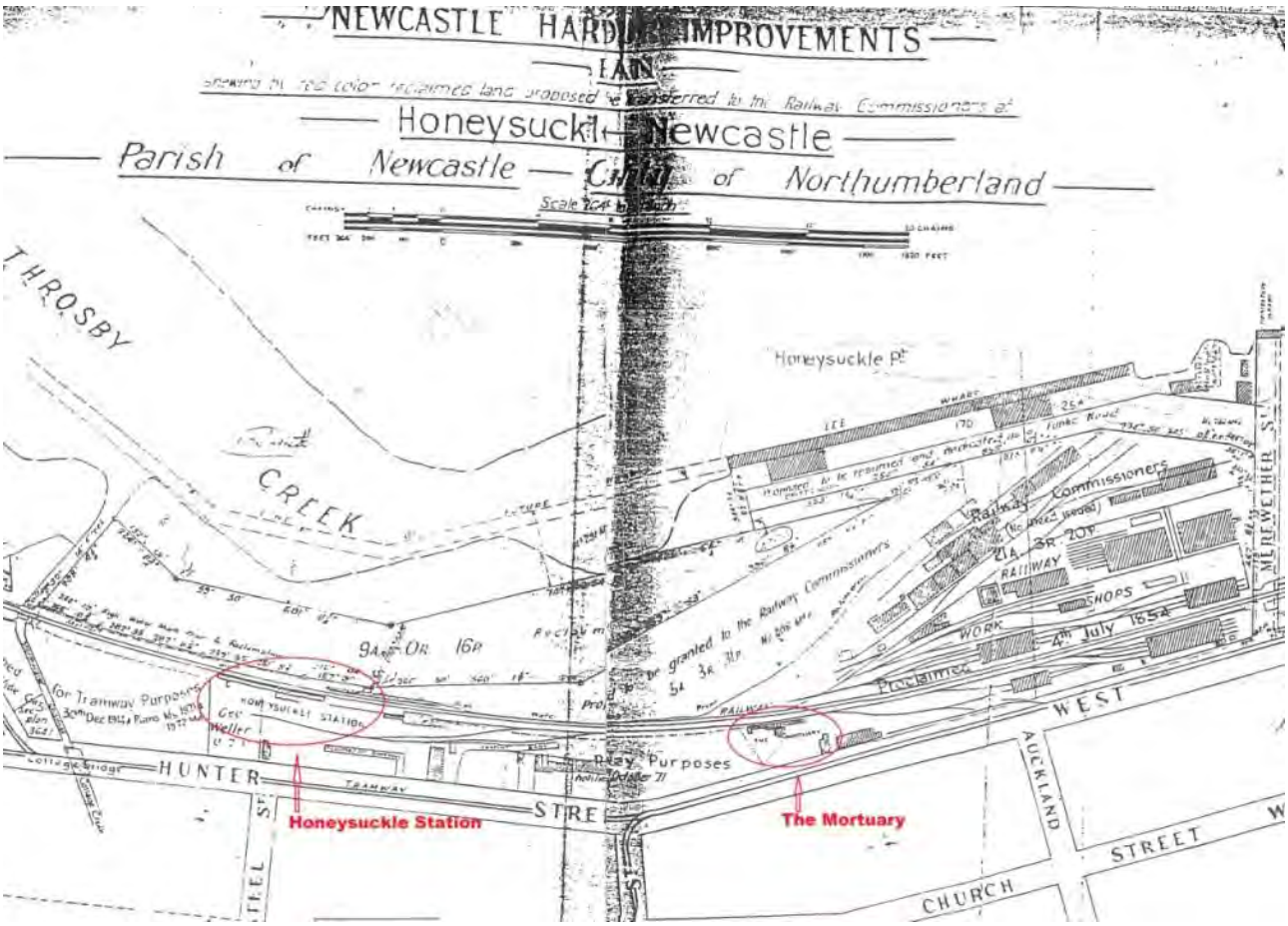


Plate 6 Honeysuckle Newcastle showing the second Honeysuckle Station and Mortuary Station (Source: C & M.J. Doring 1991 from State Rail Survey Map 11 February 1916)

The rail line also had adjacent harbour functions, which were later demolished and resumed for the rail corridor. This included the Market Street and Perkins Street Boat Harbours.

In 1887 *The Newcastle Nautical Almanac* described the Market Street Boat Harbour:

> *The Newcastle Boat Harbour, in connection with the Market, is situated at the northern extremity of Market-street, and has been enlarged and improved, and now provides frontage of 510 feet, of which 250 feet is reserved for the use of settlers for landing produce, 160 feet for accommodation for watermen's boats, and 100 feet for slips and sheds, to contain boats belonging to the various Government Departments. A market for the accommodation of settlers to vend their produce has been erected close to this frontage (The Newcastle Nautical Almanac 1887:181).*

In 1913 the Department of Railways resumed control of all coal handling facilities in Newcastle and a record of 5.2 million tons was shipped from Newcastle harbour that year (Cockbain 2015). In 1921 the Government reintroduced a number system relating to port management. Discontent with the system, which raised £10,000 per month with no corresponding investment in improvements, increased in 1921 and led to a Royal Commission in 1923 to enquire into "all matters relating to the Port of Newcastle" (Newcastle Chamber of Commerce Annual Report 1922). The recommendation for a local trust to control the port failed to eventuate at that time.

Due to increasing passenger usage of the rail line and the developing civic precinct of Newcastle, Civic Railway Station was planned from 1929 to accommodate passenger needs and was opened in 1935.

Key Themes

The key theme for the rail corridor between Worth Place and Newcastle Railway Station is interpreting the former rail usage so that it remains part of the city's memory. There are four themes associated with the Newcastle Rail Corridor:

- Passenger transport (1858-2014)
- Coal Transport (1831-1978)
- Cargo (boat harbours associated with transport of cargo including produce 1860s-early 1900s)
- Rail infrastructure (1831-2014)

The passenger use of the rail line is most prominent in the city's recent memory of the rail corridor. The passenger use of the rail line should be the overarching theme to be adopted in any interpretation of rezoned parcels across the whole Project Area (Figure A). The themes to be interpreted are indicated by parcel in the table below.

The use of the rail corridor for coal is also important, but best illustrated by parcels which encapsulated the coal infrastructure as identified on Figure A. Parcels 9 and 10 contain the junction between the Burwood Colliery rail and the main line, Parcel 12 contains the AA Company Bridge, Parcel 14 contains portions of the government coal staithes and Parcel 15 contains the coal extension line which was later used for Zaara Street Power Station (Figure B).

The theme of cargo and boat harbours was prominent in a small selection of parcels and this theme is to be illustrated for these parcels, as identified on Figure C.

The theme of rail infrastructure has been identified in a number of parcels (Figure A), but there is potential for additional rail infrastructure to be uncovered during development.

Summary of Themes

	Theme			
Parcel	**Passenger transport (1858-2014)**	**Coal Transport (1831-1978)**	**Cargo (1860s-early 1900s)**	**Rail Infrastructure (1831-2014)**
1	√			√
2	√			
3	√			√
4	√			
5	√			
6	√			√
7	√			
8	√			
9	√	√		
10	√	√		
11	√			
12	√	√		√
13	√		√	
14	√	√	√	√
15	√	√		

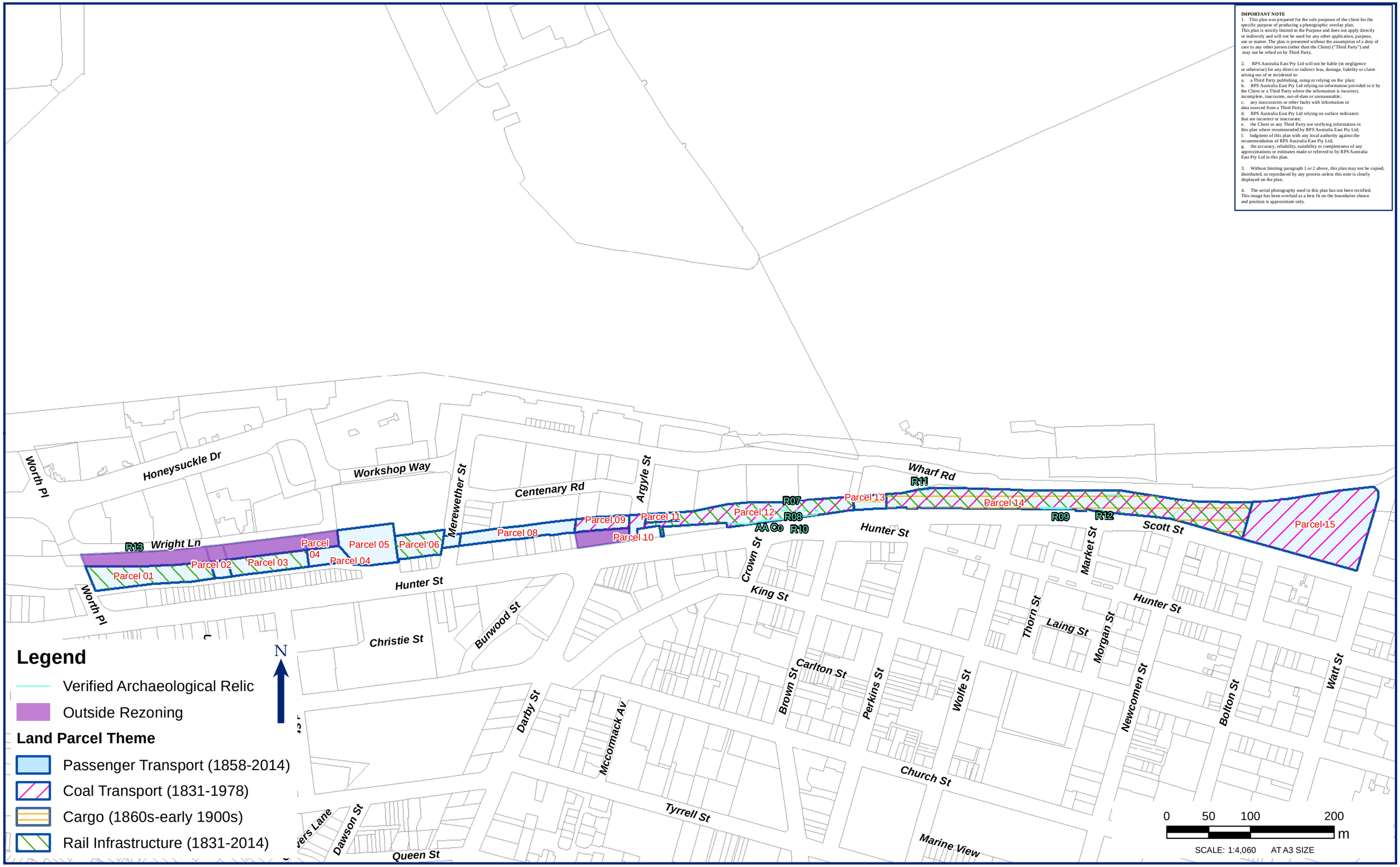
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TITLE : **FIGURE A: LAND PARCEL THEMES**

LOCATION : **NEWCASTLE**

DATUM:GDA 1994

PROJECTION: GDA 1994 MGA Zone 56

DATE : **8/6/2017**

PURPOSE: **HERITAGE**

VERSION (PLAN BY): D A3 (james.hugo)

PATH: J:\JOBS\123k\123632 Heritage Newcastle Rail Corridor\10 - Drafting\Arcgis Map Documents\Report Figures\05 123632 additional figure 2017\123632 Appendix 2 Figure A v2.mxd

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Now being dredged

Pile

Buoy

Boat Harbour

Drain

COAL SHOOTS

No 4 No 3 No 2 No 1

COAL

Australian Agricultural Company

Centenary Rd

Argyle St

Wharf Rd

Hunter St

Crown St

Theatre Lane

Brown St

King St

Wolfe St

Thorn St

Laing St

Morgan St

Newcomen St

Bolton St

Watt St

Market St

Scott St

Carlton St

Lee Tce

Market

HUNTER STREET

SCOTT

Parcel 08

Parcel 09

Parcel 10

Parcel 11

Parcel 12

Parcel 13

Parcel 14

Parcel 15

R07

R08

R09

R10

R11

R12

Legend

N

Verified Archaeological Relic

Outside Rezoning

Land Parcel Theme

Passenger Transport (1858-2014)

Coal Transport (1831-1978)

Cargo (1860s-early 1900s)

Rail Infrastructure (1831-2014)

0 50 100 200 m

SCALE: 1:2,500 AT A3 SIZE

TITLE : **FIGURE B: LAND PARCEL WITH COAL TRANSPORT (1886 PLAN OF THE PORT OF NEWCASTLE, RC NAGGS)**

LOCATION : **NEWCASTLE**

DATUM:GDA 1994

PROJECTION: GDA 1994 MGA Zone 56

DATE : **8/6/2017**

PURPOSE: **HERITAGE**

VERSION (PLAN BY): D A3 (james.hugo)

PATH: J:\JOBS\123k\123632 Heritage Newcastle Rail Corridor\10 - Drafting\Arcgis Map Documents\Report Figures\05 123632 additional figure 2017\123632 Appendix 2 Figure B v2.mxd

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Perkins Street Boat Harbour
(1916 Town of Newcaslte)

Market Street Boat Harbour
(1896 Hunter District Water Board Plan)

R11 R07 R12 R09

Parcel 12 Parcel 13 Parcel 14

Hunter St Scott St Wolfe St Perkins St Market St Newcomen St Thorn St

Legend

N

Verified Archaeological

Land Parcel Theme

- Passenger Transport (1858-2014)
- Coal Transport (1831-1978)
- Cargo (1860s-early 1900s)
- Rail Infrastructure (1831-2014)

0 25 50 100 m

SCALE: 1:1,269 AT A3 SIZE

TITLE : **FIGURE C: LAND PARCELS WITH CARGO THEME (BOAT HARBOURS)**

LOCATION : **NEWCASTLE**

DATUM:GDA 1994

PROJECTION: GDA 1994 MGA Zone 56

DATE : **8/6/2017**

PURPOSE: **HERITAGE**

VERSION (PLAN BY): D A3 (james.hugo)

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Key Principles and Objectives for Interpretation of the Newcastle Rail Corridor

The NUTTP will involve the delivery of urban development and public spaces on land which was primarily used as a rail corridor. As such, in order to conserve and celebrate an important part of the city's heritage values and significance, key principles and objectives for parcel interpretation plans have been identified.

The principle and objectives set out below should be addressed in heritage interpretation strategies prepared for the development of each land parcel, or land parcels if more than one parcel is subject to a Development Application to Council.

Principle

To celebrate the history and Heritage of the Newcastle Rail Corridor as part of the Great Northern Railway through heritage interpretation

Objectives

Passenger Transport

The passenger use of the rail line is most prominent in the city's recent memory of the rail corridor. The passenger use of the rail line should be the overarching theme adopted in any interpretation of rezoned parcels across the whole Project Area

a) To reflect the former use of the land for passenger trains by installing heritage interpretation (physical and/or digital media) in association with the land parcel/s subject to a Development Application to Council (applicable to all parcels).

Coal Transport

The use of the rail corridor for coal transport applies broadly to the whole corridor. However, this objective is best illustrated by particular parcels which are associated with certain aspects of coal transport. For example, coal staithes and loading of coal on to ships around the Crown and Brown Street area.

b) To reflect the former use of the land for coal transport by installing heritage interpretation physical and/or digital media in association with the land parcel/s subject to a Development Application to Council (applicable to parcels 9, 12, 14, and 15).

Cargo

Portions of the rail corridor was used as boat harbours for the loading of cargo (other than coal) and comprised fresh produce, as well as the import of goods.

c) To reflect the former use of the land for boat harbours by installing heritage interpretation physical and/or digital media in association with the land parcel/s subject to a Development Application to Council (applicable to parcels 13 and 14).

Rail Infrastructure

This objective is to ensure that that the old rail infrastructure uncovered during archaeological investigations is appreciated and interpreted. This objective applies to relics previously identified, as well as relics which may be identified in future.

d) To reflect the former use of the land as a rail corridor by installing heritage interpretation of rail infrastructure physical and/or digital media in association with the land parcel/s subject to a Development Application to Council (applicable to parcels 1, 3, 6, 12 and 14 and other depending on archaeological investigation results).

Interpretation Options

The following has been developed in accordance with the objectives of The ICOMOS Charter for the Interpretation and Presentation of Cultural Heritage Sites.

The following potential interpretative measures are provided for the former Newcastle rail corridor (rezoning area). These interpretative measures are designed to make connections with the history of the area. The intention is to ensure that people gain an understanding of the context of their surroundings and develop an appreciation of the role the former rail corridor played in the Newcastle story.

The information should be presented in a format that reflects the nature of the rail corridor and associated functions. The measures presented below are considered to be practical, relevant and understandable. They have been assessed as the most relevant measures to the identified audience and allow for the longevity of the interpretation material and the development of the area.

Interpretative Resources

To interpret the heritage significance of the rezoning area, it is essential to identify resource materials; actual and documented with the capacity to inform the potential audience about their significance values.

Available interpretative resources for the rezoning area include:

- Historic maps, plans and photographs;
- Heritage structures;
- Historical resources in library and archival collections including photographic collections, publications, newspaper articles and websites;
- Moving images, interview and sound recordings;
- Previous historical research and heritage reports;
- Research collections compiled by historical societies; and
- Archaeological data in reports.

Interpretative Media Locations

A thematic approach has determined the most relevant themes, they are:

- Theme 1 - Passenger transport
- Theme 2 – Coal transport
- Theme 3 – Cargo
- Theme 4 – Rail infrastructure

The themes are developed through stories with the connecting thread provided by the rail lines and the rail corridor. This section outlines the types of interpretative actions or tools that may be used to convey the stories of the former rail corridor.

The interpretation will adapt to differing physical locations: internal and external. Design consideration must be given to the robustness, installation, longevity and maintenance of any proposed measures. Locations need to be considered in terms of their effectiveness of communication, accuracy, relationships, visibility and constraints of the location and space. As such, the appropriate interpretation on each parcel will be

determined through the process of developing the detailed design to ensure that it reads as an integrated part of the development.

The aim of the interpretation is to inform and engender interest in the rezoning area and consequently it is important to alert people to the presence of the nearby Newcastle Museum and Newcastle Maritime Centre.

Multimedia (Newcastle Smart City)

In an increasingly digital economy and technology driven age, cities need to look towards new approaches, innovative technologies and smart infrastructure to create an environment that supports community and economic growth (Draft Smart City Strategy 2017-2021:7). In recognition of this Newcastle City Council has released a Draft Smart City Strategy 2017-2021. The vision seeks to ensure:

Newcastle Smart city is an open, collaborative, and connected city that uses technology to makes things easier, more liveable and sustainable for all people (*Draft Smart City at a Glance 2017-2021:13*).

There are many forms of multimedia, most utilising smartphones and tablets that could be used for interpretation they include:

Smartphone App: This media is suitable for the user's smartphone or tablets. Tracked by GPS technology the user can move along a path or environment and activate the story at a given location. The benefit is the delivery of quality sound bites such as oral histories (workers, passengers and residents) and evocative sounds (steam engines). An example of a smartphone app tailored to local heritage is Soundtrails.

Another potentially useful app Heritage Near Me is being developed by the NSW Office of Environment and Heritage. The Heritage Near Me app will seek to highlight and share local heritage stories. These stories will relate to items of local and state heritage significance recorded on the NSW State Heritage Inventory.

Light and sound projections: Large scale video projection of historic images that can include sound. It may not be appropriate to have always available, however consideration should be given to allowing provision for the technology so projections can be professionally produced during night festivals, special events etc.

Quick Response (QR) Code: The use of QR permits the display of historic image/map interpretative data without the need for extensive on location text. This media could be used to provide greater depth to the historic and heritage themes of the rezoning area. QR codes accessed via Smartphones or tablets would link to a website that provides text and images.

Augmented Reality (AR): This can be used to view past images within modern landscapes. The technology generally uses GPS coordinates to overlay' historic images on modern streetscapes it can also be used to overlay interpretative 3D images over existing archaeological remains.

Virtual Reality (VR): this allows for an interactive appreciation of history. An example of the potential of this technology for tourism is The Blue Mountains Heritage Centre Virtual Reality Experience, this allows visitors to travel through a spectacular local canyon from the comfort of the heritage centre. This type of experience could allow users, for example, to experience the sights and sounds of the Newcastle rail and dock area in the nineteenth century.



Plate 7 Smartphone App: Uralla Soundtrail map



Plate 8 Example of light and sound projection (Montreal 2016)



Plate 9 Example of augmented reality

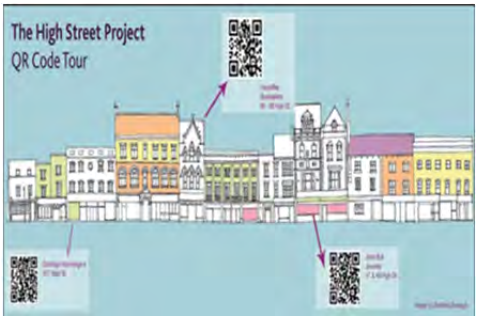


Plate 10 Examples of Quick Response (QR) Code



Plate 11 Virtual reality headset



Plate 12 Virtual reality of Blue Mountains canyon



Plate 13 Virtual reality with potential topic Merewether Street traffic 1950 (Source: Newcastle City Photobank)



Plate 14 Light and sound projection (Tin Dragon Interpretation Centre, Tasmania)

Panels and Signage

Panels and signage are a traditional and successful method of interpreting heritage to the wider audience. These can incorporate information such as archaeological plans, newspaper reports, architectural and engineering drawings, images, quotations and relevant design features.

Consideration should be given to developing panels and signage in keeping with concepts currently used in the Newcastle area. The proposed signage and panels should complement existing heritage signage (following images show a series of styles, currently in use).

A clear hierarchy of signage should be developed, using a consistent palette of materials and design aesthetic. Careful siting and design is important to ensure signs do not disrupt the views or aspect. The adherence to the policy of 'less is more' is critical with ambience and authenticity important criteria.

Incorporated into the signage could be multimedia applications such as QR codes, these would allow for people with a greater level of interest to access additional information.

The nature of outdoor signage and panels makes them susceptible to weathering and damage. A program should be put in place for regular inspection and maintenance of signs and panels to ensure the information remains presented in an optimum way.

Signs as pavement inserts can be used to encourage people to walk a route that illustrates the past uses and highlights remaining elements. The inserts could describe past structures and site uses.



Plate 15 Newcastle foreshore - Plaques utilising a variety of source materials, such as maps, building plans, newspaper excerpts.



Plate 16 Newcastle foreshore - Foreshore pylons have been used as interpretative infrastructure.



Plate 17 Newcastle foreshore - Plaque with simple visual illustration and information panel



Plate 18 Newcastle foreshore - Interpretative infrastructure incorporates abstract concept of sails and masts



Plate 19 Newcastle foreshore - Simple narrative plaque



Plate 20 Newcastle foreshore - heritage item and narrative plaque



Plate 21 Sydney - Footpath signage – Clarence Street Sydney (Karlee Bannon Graphics)



Plate 22 Victoria - Signage - Old Beechy Rail trail, Victoria (Rail Trails Australia)

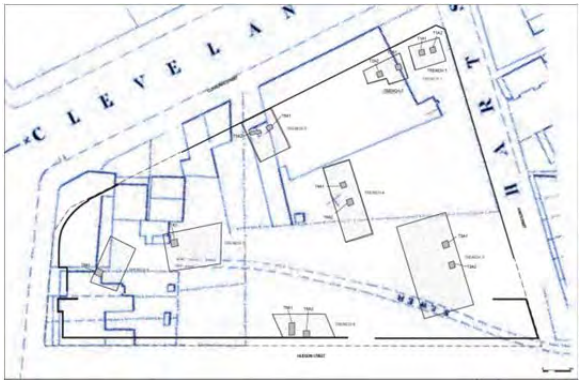


Plate 23 Example of overlay of modern structures over older building footprint



Plate 24 Reconstructing the past signage detailing archaeological excavations (Arrowtown, New Zealand)



Plate 25 Sign with QR code: Fremantle Heritage Cemetery Walk Brochure. (Metropolitan Cemetery Board)

Landscape Design

The utilisation of plantings and landscaping should be considered as a method of introducing heritage elements linked to the environment.

Planned landscapes can draw the target audience to heritage features in the landscape. Wind breaks, shade and fixed seating in close proximity to information plaques would encourage readership. Fixed seating should incorporate materials such as timber sleepers that reflect the railway heritage.

Landscape materials (precast concrete, gravel, asphalt) should reference the ground surfaces and building materials that would have been evident in the former rail corridor.

In Australia and overseas former rail corridors have been widely used as cycle ways and walking paths and acknowledged as an important resource in promoting healthy lifestyles and attracting tourists and visitors.

The intention is that the former rail corridor will be rezoned. If cycle or pathways are incorporated in to the areas zoned RE1 (recreation purposes) consideration should be given to constructing connecting pathways in a similar linear alignment to the former railway corridor. While the use of steel rail lines may raise safety issues an insert of similar size and colour may prove effective.

Turfed areas should incorporate previous structures on the site while gabion walls could incorporate rail ballast and reclaimed site materials.



Plate 26 Rail line incorporated into paving (Newcastle foreshore)



Plate 27 Railway tracks linked to Goods Shed



Plate 28 Use of turf that reflects previous structures on site (Source: NSW Harbour Trust)



Plate 29 Example of reclaimed material incorporated into gabion wall (Source: NSW Harbour Trust)



Plate 30 Use of reclaimed sandstone for landscaping



Plate 31 Use of reclaimed timbers for seating




Plate 32 Examples of archaeological and remnant heritage items in RE1 (Parcel 14)




Plate 33 Remnant AA fence in vicinity of RE1 (Parcel 10) and SP2 Infrastructure (Parcel 13)

Application of Theme 1 – Passenger Transport

The passenger use of the rail line is most prominent in the city's recent memory of the rail corridor. The passenger use of the rail line should be the overarching theme adopted in any interpretation of rezoned parcels across the whole Project Area

a. To reflect the former use of the land for passenger trains by installing heritage interpretation (physical and/or digital media) in association with the land parcel/s subject to a Development Application to Council (applicable to all parcels).

The Story

- Area of Civic Railway Station - this was the location of the first Honeysuckle Railway Station, the terminus for the Great Northern Railway (1857)
- Civic Railway Station was built to meet passenger needs in the 1930s and paralleled the establishment of Newcastle City Council and the development of the Civic Precinct.
- Newcastle Railway Station, opened in 1872 was centred in the commercial heart of the town. Since construction the railway line played an integral part in the Newcastle public transport system.
- Mortuary Station was constructed to convey the deceased, their relatives and friends to Sandgate Cemetery. This reflects a time when private transport was unavailable to the majority of the population.

Potential Content

The potential content relating to passenger transport:

- Historic moving images of passenger rail transport
- Interviews with rail employees and passengers (historic and recent)
- Images of passengers; rail cars; locomotives
- Historic audio recordings (steam trains, sound of the carriages on the track, etc.)
- Excerpts of newspaper articles

Potential Method

- Multimedia tailored to the space. (e.g. QR on signs; smartphone app; light and sound projection on suitable wall space)
- Panels and signage (use of materials and designs associated with passenger rail)
- Landscape design

Potential Location

All parcels with the media used appropriate to the space with specific areas for consideration:

- Civic Station (Parcels 5 and 6)
- Newcastle Station (Parcel 14 and 15)
- General area of the former Mortuary Station (Parcel 1)

Application of Theme 2 – Coal Transport

The use of the rail corridor for coal transport applies broadly to the whole corridor. However, this objective is best illustrated by particular parcels which are associated with certain aspects of coal transport. For example, coal staithes and loading of coal on to ships around the Crown and Brown Street area.

b. To reflect the former use of the land for coal transport by installing heritage interpretation physical and/or digital media in association with the land parcel/s subject to a Development Application to Council (applicable to parcels 9, 12, 14 and 15).

The Story

- AA Company and its role in early coal industry
- AA railway bridge and coal staithes that influenced the development of rail in Newcastle
- Importance of coal in development of Newcastle
- Shipping coal

Potential Content

- Historic photographs of coal staithes; bridges; trains; associated ships; evolution of coal wagons; locomotives
- Maps of coal lines and coal mines
- AA Company bridge abutment and fence
- Reference to the former AA Company Office (corner nearby Wharf Road and Argyle Street)
- Images of R07 Cisterns-Crown Street
- Images of R08 Unidentified structure –brick footing-Crown Street

Potential Method

- Multimedia tailored to the space. (e.g. QR on signs; smartphone app; light and sound projection on suitable wall space)
- Panels and signage (use of materials and design associated with coal and its transport)
- Landscape design

Potential Location

Parcels 9, 10, 12, 14 and 15 with the media used appropriate to the space with specific areas for consideration:

- AA Company (Parcels 9;12)
- AA Company bridge abutment and fence (Parcel 12)
- Government coal staithes (Parcel 14)

Application of Theme 3 – Cargo

Portions of the rail corridor was used as boat harbours for the loading of cargo (other than coal) and comprised fresh produce, as well as the import of goods.

c. To reflect the former use of the land for boat harbours by installing heritage interpretation physical and/or digital media in association with the land parcel/s subject to a Development Application to Council (applicable to parcels 13 and 14).

The Story

- Shipping in the development of Newcastle
- Warehouses
- Role of small boat harbours
- Markets
- People (shipping agents, chandlers, wholesalers, carters, dock workers, etc.)

Potential Content

- Historic photographs of buildings, markets; boat harbour; ships, people
- Lists of cargoes; tonnage
- Advertising signs
- Warehouses
- Perkins Street and Market Street boat harbours
- Municipal Markets
- Railway infrastructure

Potential Method

- Multimedia tailored to the space. (e.g. QR on signs; smartphone app; light and sound projection on suitable wall space)
- Panels and signage (use of materials and design associated with commerce and the waterfront)
- Landscape design (incorporate footprint of original items such as the boat harbour)

Potential Location

Parcels 13 and 14 with the media used appropriate to the space with specific areas for consideration:

- Perkins Street and Market Street boat harbours; Municipal Markets; remnant brick fence of railway corridor (Parcels 13 and 14)

Application of Theme 4 – Rail Infrastructure

This objective is to ensure that that the old rail infrastructure uncovered during archaeological investigations is appreciated and interpreted. This objective applies to relics previously identified, as well as relics which may be identified in future.

d. To reflect the former use of the land as a rail corridor by installing heritage interpretation of rail infrastructure physical and/or digital media in association with the land parcel/s subject to a Development Application to Council (applicable to parcels 1, 3, 6, 12 and 14 and other depending on archaeological investigation results).

The Story

- The development of the railway in Newcastle
- Honeysuckle railway workshops
- The rail corridor

Potential Content

- Rail lines
- Rail turntables (description, images and ground plans)
- Newcastle Signal Box
- AA Company bridge abutment and fence
- Images and plans of Honeysuckle workshops
- Advertising hoarding used along rail fencing
- Brick fence of railway corridor (Scott Street)

Potential Method

- Multimedia tailored to the space. (e.g. QR on signs; smartphone app; light and sound projection on suitable wall space)
- Panels and signage (use of materials and design should complement the current installations in the Honeysuckle area)
- Landscape design (e.g. rail lines that intersected the road pavement at Merewether Street; footprint of buildings of the Honeysuckle Railway Workshops)

Potential Location

Parcels 1, 3, 6, 12 and 14 with the media used appropriate to the space with specific areas for consideration:

- Merewether Street rail crossing.(Parcel 8)
- AA Company bridge abutment and fence (Parcel 12)
- Newcastle Signal Box (Parcel 14)
- Brick fence of railway corridor (Scott St) (Parcel 14)
- Location of former Honeysuckle Railway Workshops buildings (Parcels 1;3 and 6)

Proposed Interpretation for Specific Parcels

The following three tables list the parcels, identify features in those parcels and provide advice of potential interpretation medium and stories.

The following identifies the theme with relevant interpretation theme:

- Theme 1: Passenger transport (1858-2014)
- Theme 2: Coal Transport (1831-1978)
- Theme 3: Cargo (1860s-early 1900s)
- Theme 4: Rail Infrastructure (1831-2014)

R1 Recreation Area Parcels

R1 Recreation Area and SP3 Tourist – Proposed Interpretation

Parcel	Theme	Remaining features	Story	Potential Interpretation mediums	All interpretation mediums
5 R1 Recreation Area	1	■ Civic Station	■ Location of the first Honeysuckle Railway Station – the terminus station for the Great Northern railway (1857) ■ Civic Railway Station built to meet passenger needs in the 1930s and the development of Civic Precinct	Panels and signage	■ Multimedia ■ Panels and signage ■ Landscape design
10 R1 Recreation Area	1:2	■ AA Company - Argyle House (nearby) ■ Tramway Substation (nearby)	■ AA Company and its role in early coal industry ■ Role of tramway in passenger transport	Panels and signage	
14 R1 Recreation Area	1;2;3;4	■ Former Beberfaulds warehouse (not in the parcel, but adjacent to it and related to Port commerce)	■ Warehouses and their role in commerce. The original warehouse on the Beberfaulds site burnt down - images of the aftermath exist.	Use of light/sound projections on former Beberfaulds warehouse.	
		■ Boat harbour (stone wall)	■ Early boat harbours and the their role in commerce	Archaeological footprint	

Parcel	Theme	Remaining features	Story	Potential Interpretation mediums	All interpretation mediums
		■ Turntable and cistern	■ Railway infrastructure	Archaeological footprint	
		■ Newcastle signal box	■ Investigate use of early movie footage of steam locomotive and railways in Newcastle.	Virtual reality installation	
		■ Railway infrastructure, including brick fence along Scott St	■ -Importance of rail in developing the inner city – bringing passengers and goods	Multimedia Panels and signage Landscape design	
15 SP3 Tourist	1;2	■ Newcastle Railway Station ■ Newcastle Railway Station Additional Group	■ Role passenger transport in development of the city	Multimedia Panels and signage Landscape design	

B4 Mixed Use Parcels

The following table considers the Parcels B4 Mixed Use and provides potential interpretation mediums and stories.

Parcel B4 Mixed Use – Proposed Interpretation

Parcel B4 Mixed Use	Theme	Remaining features and known heritage locations	Story	Potential interpretation mediums	All interpretation Methods
1	**1:4**	■ Mortuary station	■ Mortuary Station how it operated, why it was required and its links to Sandgate Cemetery.	■ Archaeological footprint of Mortuary Station. ■ Panels and signage incorporated into building design.	■ Multimedia ■ Panels and signage ■ Landscape design
3	**4**	■ Railway workshops	■ Development of the Honeysuckle Railway Workshops – interpretation mediums should complement the current installations.	■ Panels and signage	

Parcel B4 Mixed Use	Theme	Remaining features and known heritage locations	Story	Potential interpretation mediums	All interpretation Methods
4	1	■ Civic Railway Station	■ Location of the first Honeysuckle Railway Station – the terminus station for the Great Northern railway (1857) ■ Civic Railway Station built to meet passenger needs in the 1930s and the development of Civic Precinct	■ Multimedia that best suits the space. ■ Panels and signage incorporated into building design. ■ Landscape design incorporated into greenspace.	
5					
6	1	■ Civic Railway Station	■ Location of the first Honeysuckle Railway Station – the terminus station for the Great Northern railway (1857) ■ Civic Railway Station built to meet passenger needs in the 1930s and the development of Civic Precinct	■ Multimedia that best suits the space. ■ Panels and signage incorporated into building design. ■ Landscape design incorporated into greenspace.	
		■ Railway workshops (if additional archaeological materials are identified)	■ Development of the Honeysuckle Railway Workshops – interpretation mediums should complement the current installations.	■ Panels and signage	
7	1		■ Replicating the rail lines would provide a tangible link to the Merewether Street rail crossing.	■ Rail lines that intersected the road pavement	
9	1:2	■ AA Company bridge abutment /fence	■ AA Company and its role in early coal industry.	■ Archaeological footprint ■ Incorporate features into building design.	
12	1:2;4	■ R10 AA Company bridge abutment /fence ■ R07 Cisterns-Crown Street ■ R08 – brick footing-Crown Street	■ AA Company and its role in early coal industry. ■ The AA railway bridge and coal staithes that once dominated the area. ■ Importance of coal in development of Newcastle.	■ Archaeological footprint. ■ Incorporate features into building design.	

SP2 Infrastructure Parcels

SP2 Infrastructure Parcels

Parcel	Theme	Features	Story	Potential interpretation mediums	Interpretation Methods
11	1:2	■ AA Company - Argyle House (nearby) ■ Tramway Substation (nearby)	■ AA Company and its role in early coal industry ■ Role of tramway in passenger transport	■ No public access, so physical installations not applicable (Multi-media only, or display in adjacent parcels)	■ Multimedia ■ Panels and signage ■ Landscape design
13	1:2		■ The story of coal in the development of Newcastle ■ The role of rail in passenger transport	■ Panels and signage	

Attachment E - Flood Risk Assessment

By BMT WBM, dated March 2017

BMT WBM

"Where will our knowledge take you?"







Newcastle Urban Transformation and Transport Program: Rezoning of Surplus Rail Corridor Lands

Flood Risk Assessment

Final Report

March 2017

UrbanGrowth NSW

Newcastle Rail Corridor Rezoning - Flooding

Prepared for:	UrbanGrowth NSW
Prepared by:	BMT WBM Pty Ltd (Member of the BMT group of companies)

Offices

Brisbane
Denver
London
Mackay
Melbourne
Newcastle
Perth
Sydney
Vancouver

Document Control Sheet

BMT WBM Pty Ltd
126 Belford Street
Broadmeadow NSW 2292
Australia
PO Box 266
Broadmeadow NSW 2292

Tel: +61 2 4940 8882
Fax: +61 2 4940 8887

ABN 54 010 830 421

www.bmtwbm.com.au

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1 Introduction

1.1 General

This report has been prepared to support the amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor land ('rail corridor land') between Worth Place and Watt Street in Newcastle city centre (Figure 1-1).



Source: Hassell

Figure 1-1 Rezoning Study Area

The Newcastle Urban Transformation and Transport Program ('Program') has been established to deliver on NSW Government's more than $500m commitment to revitalise the city centre through: the truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange; the provision of a new light rail line from Wickham to the Beach; and the delivery of a package of urban transformation initiatives.

The transformation element of the Program aims to bring people back to the city centre by strengthening connections between the city and the waterfront, creating employment opportunities, providing more public space and amenity, and delivering better transport.

The proposed rezoning of the rail corridor land forms a part of the delivery of urban transformation initiatives, comprising a package of transport, built form and public domain improvements.

1.2 Newcastle Urban Transformation

The Newcastle Urban Renewal Strategy (NURS) sets out the NSW Government's long term approach and vision for the revitalisation of Newcastle city centre to the year 2036.

The NURS identifies three character precincts in Newcastle city centre (West End, Civic and East End), within which significant housing and employment opportunities, together with built form and public domain changes and improvements exist. The NURS describes these precincts as:

- East End: residential, retail, leisure and entertainment
- Civic: the government, business and cultural hub of the city

- West End: the proposed future business district including the western end of Honeysuckle (Cottage Creek)

UrbanGrowth NSW has been directed by NSW Government to deliver on NURS through the Program, in partnership with Transport for NSW (TfNSW), the Hunter Development Corporation (HDC) and the City of Newcastle Council (Council).

1.3 Proposed rezoning

UrbanGrowth NSW seeks to amend the Newcastle Local Environmental Plan 2012 (NLEP) to enable the delivery of the Program and the objectives of NURS planning outcomes.

Vision

Our vision for the Program has been informed by feedback from the community, Council, government agencies and urban renewal experts.

Our vision is an activated city centre and waterfront that attracts people, new enterprises and tourism. Overtime, we see great opportunities to build on the strengths of the city centre to encourage innovative and enterprising industries to survive. In the longer term, we see an opportunity to strengthen Newcastle's position on the regional, national and international stage, with a view to stronger ties with Asia Pacific.

UrbanGrowth NSW, 2015

Program objectives

The Program is underpinned by five objectives which will drive successful urban revitalisation:

- **Bring people back to the city centre.** Reimagining the city centre as an enhanced destination, supported by new employment, educational and housing opportunities and public domain that will attract people
- **Connect the city to its waterfront.** Unite the city centre and the harbour to improve the experience of being in and moving around the city
- **Help grow new jobs in the city centre.** Invest in initiatives that create jobs, with a focus on innovative industries, higher education initiatives to encourage a range of businesses to the city centre
- **Create great places linked to new transport.** Integrate urban transformation with new, efficient transport to activate Hunter and Scott's Streets and return them to thriving main streets
- **Creating economically sustainable public domain and community assets.** Leave a positive legacy for the people of Newcastle. Ensure that new public domain and community facilities can be maintained to a high standard into the future
- **Preserve and enhance heritage and culture.** Respect, maintain and enhance the unique heritage and character of Newcastle city centre through the revitalisation activities.

Urban transformation proposed concept plan

Surplus rail corridor land runs through the East End and Civic city centre precincts as established by NURS.

Based on this vision and the results of extensive stakeholder and community engagement, an overall urban transformation concept plan (the concept plan) has been prepared for the surplus rail corridor (rezoning sites), as well as surrounding areas.

The concept plan considers and integrates with the delivery of light rail. It is also coordinated with the proposed Hunter Street Mall development to create an interactive, synergised and cohesive city centre and foreshore area.

The concept plan (as shown in Figure 1-2) includes five 'key moves', two that relate to the Civic precinct and three of which relate to the East End.

1. **Civic link (Civic)**

This area is the civic heart of Newcastle and includes some of the region's most important civic and cultural assets, including Civic Park, City Hall, Civic Theatre and Newcastle Museum. Current investment in the area includes the law courts development and the, soon to be completed, University of Newcastle NeW Space campus.

The focus of this key move is to leverage best value from new investments by creating new open space and walking and cycling connections that link Newcastle's civic buildings to the waterfront and the light rail system.

- **Civic Green.** Creating a new civic focused public space linking Hunter Street to the Newcastle Museum that will provide direct visual and physical connection from Wheeler Place to the harbour, activate light rail on Hunter Street and meet the needs of the incoming legal and student populations
- **Built form improvements.** Sensibly scaled mixed use development that forms part of the Honeysuckle development.

2. **Darby Plaza (Civic)**

Darby Street is Newcastle's premier 'eat street', offering a mix of shops, cafes, restaurants and night life. At present Darby Street ends at the intersection with Hunter Street, and this key move seeks to create a new node of activity and linkage through to the harbour that complements the delivery of light rail.

- **Darby Plaza.** A new community focused public space including provision of new walking and cycling facilities from Hunter Street to the harbour.
- **Built form improvements.** Zoning of rail corridor land between Merewether Street and Argyle Street to allow for future mixed use development in conjunction with surrounding lands in the longer term.

3. **Hunter Street Revitalisation (East End)**

Hunter Street features some of Newcastle's best heritage buildings and offers a mix of shops, cafes, restaurants and other local business. Hunter Street has experienced decline in recent years, and the opportunity exists to reinstate Hunter Street as the regions premier main street that complements the delivery of light rail.

- **Built form improvements.** Sensibly scaled mixed use development consistent with the adjoining land uses to create an activated street with 'two edges', celebrate heritage and create

new linkages from Hunter Street to the waterfront, provide activation around light rail stops and improve walking and cycling facilities.

4. Entertainment Precinct (East End)

This key move aims to create a place where people can come to play, relax and reconnect with the harbour in a new public space stretching from Scott Street to the waterfront incorporating a new connection from Market Street to Queens Wharf. This key move will also assist to activate the area to create an exciting place for the East End.

- **Recreational opportunities.** This precinct will incorporate the adaptive re-use of the signal box and provision of recreation opportunities for all ages and abilities. Public domain will be designed to provide a thoughtful series of character areas and experiences as one traverses its length. The area will also provide opportunities for viewing and interpretation of heritage character that respect the unique qualities of place.

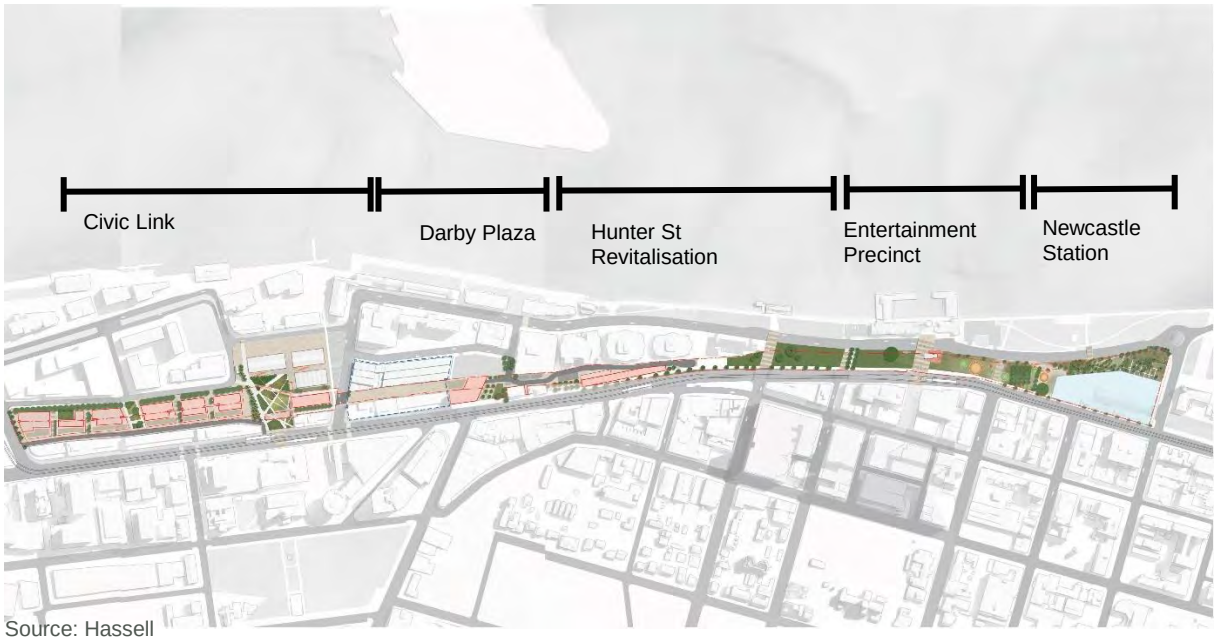
5. Newcastle Station (East End)

Newcastle Railway Station is proposed to be re-purposed into a hallmark destination and focal point for the new East End, accommodating enterprises and activities that attract visitors and stimulate the economy.

Refurbishment would fully respect and celebrate the heritage integrity of the Station, and could accommodate a range of different activities including community, retail, leisure and commercial uses.

1.4 Rezoning Concept Plan

The proposed rezoning of the surplus rail corridor lands is the focus of this report. The rezoning area is indicated in Figure 1-2 by a red dotted line, with the plan also indicating the general precinct areas and the indicative built form for the parcels.



Source: Hassell

Figure 1-2 Rezoning Concept Plan

Amendments to the NLEP are required to deliver part of the concept plan. The proposed amendments are on surplus rail corridor land only.

Necessary amendments to the NLEP 2012 include:

- amending the Land Use Zoning Map to introduce B4 Mixed Use, SP3 Tourism and RE1 Public Recreation zones to sites along the corridor
- amending the Height of Building and Floor Space Ratio maps to apply appropriate development standards to selected parcels of land

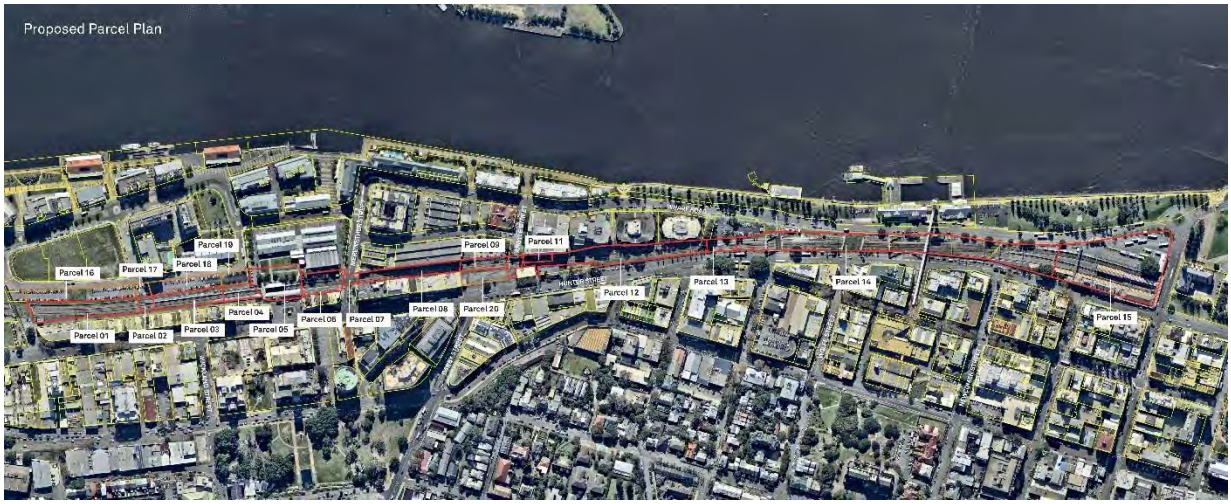
The approach taken to the amendments is to support the NURS planning approach and to remain consistent with surrounding planning controls in terms of zones, floor space ratio (FSR) and height.

The concept plan will also form the basis for updates to the Newcastle City Centre Development Control Plan design controls to guide development and public domain works for rezoning sites.

1.5 Proposed Rezoning

This planning proposal seeks to rezone rail corridor land (rezoning sites) to enable the delivery of the proposed urban uses established in the concept plan.

The location of the land affected by the proposed rezoning is identified in the map in Figure 1-3.



Source: Hassell

Figure 1-3 Rezoning explanatory map – Parcels

The planning proposal concept plan includes public domain, entertainment, mixed use and commercial and residential development.

In general, the proposed rezoning will provide a mix of uses enabling between 400-500 dwellings which will comprise a variety of styles and types, and around 5,000m2 of commercial, restaurant and other entertainment uses, as described in Table 1-1, and excluding any education or associated uses.

Proposed maximum building height and floor space ratio controls respect existing controls that apply to surrounding land.

This report has been based upon the proposed zoning under the Planning Proposal as submitted for Gateway determination, with the inclusion of Parcel 13. It is noted that this parcel has been removed from the current Planning Proposal in accordance with the Gateway determination as issued by the NSW Department of Planning and Environment. Nevertheless, for completeness, this report has considered the potential for some development occurring within this parcel in the future (subject to outcomes of a separate Planning Proposal). The recommendations of this report discuss whether there are any specific implications arising from this additional parcel.

Table 1-1 Sites for Rezoning – Proposed development summary

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 01 B4 Mixed Use 3,370m^2	Parcel 01	3,370m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 02 B4 Mixed Use 408m^2	Parcel 02	408m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 03 B4 Mixed Use 3,146m^2	Parcel 03	1,869m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
	Parcel 04	900m^2	B4 Mixed Use	FSR – 3:1	Height - 24m
Parcel 04 RE1 Public Recreation 2,464m^2	Now parcel 05 (and small corner of old 03 where western boundary of park realigned)	2,839m^2	RE1 Public Recreation	N/A	N/A
Parcel 05 B4 Mixed Use 1,603m^2	Now parcel 06	1,604m^2	B4 Mixed Use	FSR – 3:1	Height – 18m
Parcel 06 B4 Mixed Use 295m^2	Now parcel 07	295m^2	B4 Mixed Use (Road)	FSR – 2.5:1	Height – 30m
Parcel 07 B4 Mixed Use 2,040m^2	Now parcel 08	2,040m^2	B4 Mixed Use	FSR – 2.5:1	Height – 30m
Parcel 08 B4 Mixed Use 988m^2	Now parcel 09	988m^2	B4 Mixed Use	FSR – 4:1	Height – 24m
Parcel 09 B4 Mixed Use	Now parcel 10	467m^2	RE1 Public Recreation	N/A	N/A

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
467m^2					
Parcel 10 SP2 Infrastructure 386m^2	Now parcel 11	386m^2	SP2 Infrastructure	N/A	N/A
Parcel 11 B4 Mixed Use 4,542m^2	Now parcel 12	4,542m^2	B4 Mixed Use	FSR – 1.5:1	Height – 14m
Parcel 12 B4 Mixed Use 1,544m^2	Now parcel 13 (and has been reduced in size)	659m^2	SP2 Infrastructure	N/A	N/A
Parcel 13 RE1 Public Recreation 303m^2	Now parcel 14 (new parcel 14 encompasses part of old parcel 12, and the whole of old parcel 13, 14 and 15)	11,151m^2	RE1 Public Recreation	N/A	N/A
Parcel 14 B4 Mixed Use 2,251m^2					
Parcel 15 RE1 Public Recreation 7,713m^2					
Parcel 16 SP3 Tourist 10,698m^2	Now parcel 15	10,698m^2	SP3 Tourist	FSR – 1.5:1	Height – 10-15m

2 Existing Flood Risk Environment

2.1 Background

2.1.1 Site Location and Flooding Mechanisms

The development area largely occupies the low-lying floodplain area of the Hunter River and Throsby Creek. The Hunter River Estuary is a large riverine estuary system at the downstream end of the extensive Hunter River catchment (size ~ 22,000km^2), which flows into the Tasman Sea through the Port of Newcastle.

The ocean entrance to the Hunter River Estuary is fixed by twin rock breakwaters constructed in the late 19th century. The entrance is approximately 400 metres wide and 16 metres deep, allowing full ocean tides to penetrate into the Harbour. Prior to training of the entrance, it is understood that the Hunter River mouth and lower estuary contained dynamic sediment shoals, which would have been subject to significant and rapid change from periodic floods and coastal processes.

The majority of urban development is concentrated around Newcastle in the lower reaches of the estuary. The main urban catchments at the eastern end of the City drains to Cottage Creek, which has been extensively modified from natural conditions with large sections converted to hydraulically efficient concrete lined trapezoid shaped drains to reduce flooding.

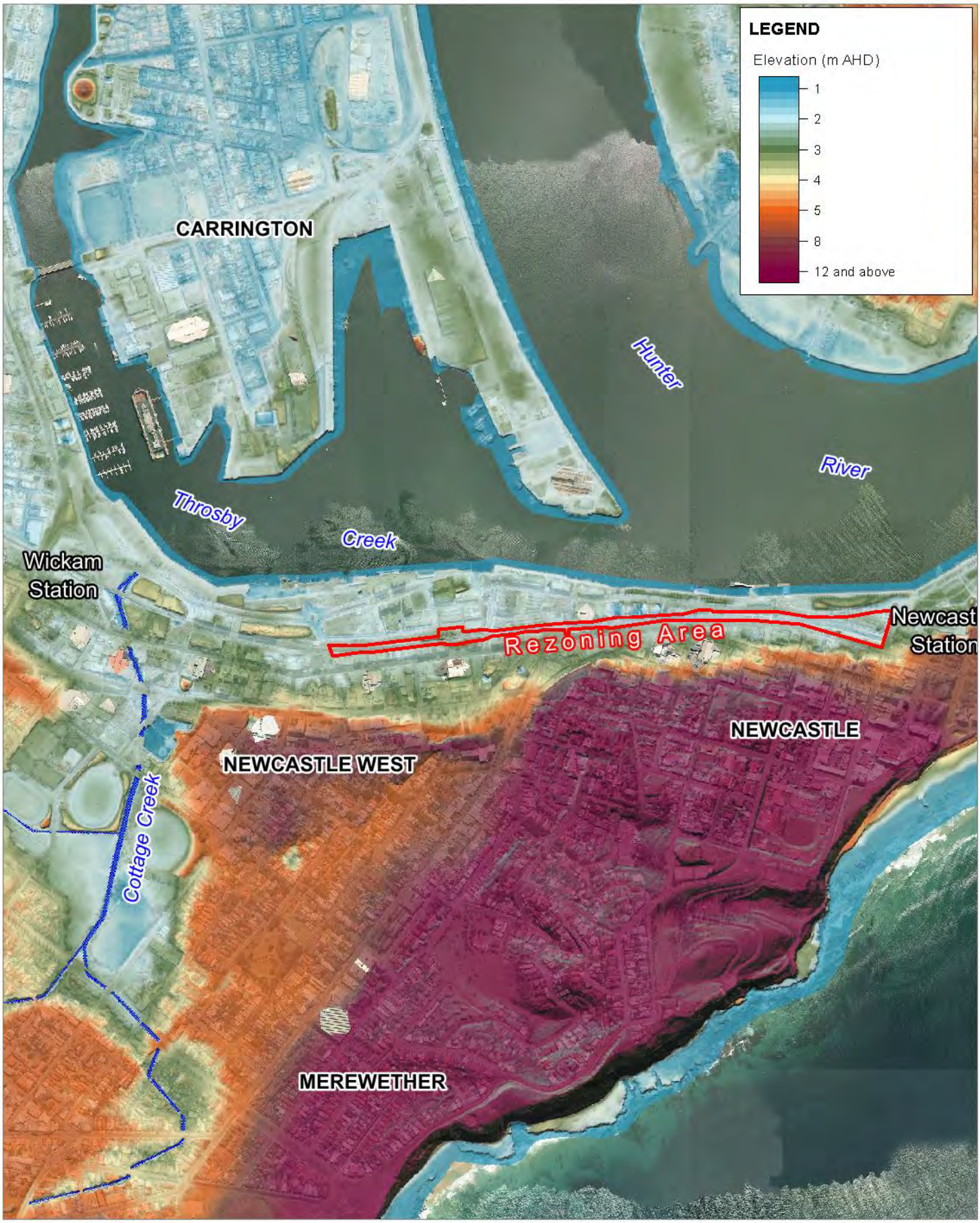
The low-lying nature of the study area is evident in Figure 2-1 showing the local topography. The topography shown is based on a Digital Elevation Model (DEM) derived from LiDAR data (NSW LPI data). The general ground levels around the rail corridor are 2-3m AHD. Some parts of the rail corridor were within cutting with rail line elevations down to around 1.7m AHD.

Flooding of the study area can occur from three mechanisms (and combinations thereof):

- Oceanic inundation, as a result of high ocean tides, storm surge, wave penetration;
- Local catchment flooding, as a result of intense rainfall within the local catchment of Throsby/Cottage Creek and small local overland flow catchments draining directly to the Hunter River; and
- Hunter River flooding, as a result of major flooding within the broader river system.

The low-lying topography of the study area and the proximity to the major waterways of Hunter River and Throsby Creek provide for significant flood inundation risks. These risks are expected to further increase in the future considering the potential for increases in mean sea level conditions associated with climate change

Risks associated with these forms of flooding in the study area are primarily a legacy of historical floodplain development. There has been extensive development on relatively low-lying foreshore area established before the current awareness and understanding of potential flooding extent and likelihood.



Title:

Local Topography

Figure: 2-1

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2.1.2 Climate Change Considerations

Climate change is expected to have adverse impacts upon sea levels and rainfall intensities, both of which may have significant influence on flood behaviour at specific locations. The primary impacts of climate change in coastal areas are likely to result from sea level rise, which, coupled with a potential increase in the frequency and severity of storm events, may lead to increased coastal erosion, tidal inundation and flooding.

In 2009 the NSW State Government announced the NSW Sea Level Rise Policy Statement (DECCW, 2009) that adopted sea level rise planning benchmarks to ensure consistent consideration of sea level rise in coastal areas of NSW. These planning benchmarks adopted increases (above 1990 mean sea level) of 40 cm by 2050 and 90 cm by 2100. However, on 8 September 2012 the NSW Government announced its Stage One Coastal Management Reforms which no longer recommend state-wide sea level rise benchmarks for use by local councils. Instead councils have the flexibility to consider local conditions when determining future hazards of potential sea level rise.

Accordingly, it is recommended by the NSW Government that councils should consider information on historical and projected future sea level rise that is widely accepted by scientific opinion. This may include information in the NSW Chief Scientist and Engineer's Report entitled 'Assessment of the Science behind the NSW Government's Sea Level Rise Planning Benchmarks' (2012).

The NSW Chief Scientist and Engineer's Report (2012) acknowledges the evolving nature of climate science, which is expected to provide a clearer picture of the changing sea levels into the future. The report identified that:

- The science behind sea level rise benchmarks from the 2009 NSW Sea level Rise Policy Statement was adequate;
- Historically, sea levels have been rising since the early 1880's;
- There is considerable variability in the projections for future sea level rise; and
- The science behind the future sea level rise projections is continually evolving and improving.

As the majority of the analysis and modelling tasks associated with Councils Flood Study and Floodplain Risk Management Study were completed prior to the announcement of the NSW Government's Coastal Management Reforms in September 2012, the potential impacts of sea level rise have been based on sea level rise projections from the 2009 NSW Sea Level Rise Policy Statement. Nevertheless, the Chief Scientist and Engineer's Report identifies the science behind these sea level rise projections as adequate, and accordingly is expected to provide a reasonable basis for the assessment.

In 2007 the NSW Government released a guideline for practical consideration of climate change in the floodplain management process that advocates consideration of increased design rainfall intensities of up to 30%. Accordingly, this increase in design rainfall intensity will translate into increased flood inundation in the local catchment. Future planning and floodplain management in the catchment will need to take due consideration of this increased flood risk.

2.1.3 Previous Studies

The following collection of studies provides the most comprehensive description and assessment of the natural hydrologic and hydraulic regimes for the Hunter River, Throsby Creek, Cottage Creek and local catchments.

- Lower Hunter River Flood Study (PWD, 1994) - this study included the construction of a one-dimensional hydraulic model (MIKE11 software) and has been used as the basis for subsequent Floodplain Risk Management applications in the Lower Hunter. The developed model was further refined to incorporate a two-dimensional representation of the Hexham Swamp floodplain area (DHI, 2009). The peak design flood conditions derived from these studies form the adopted conditions for riverine flooding in the Lower Hunter Estuary, including the study area.
- Throsby Creek and Cottage Creek Flood Study (WBM, 2006) – the flood study incorporated detailed modelling of the urban catchments of Throsby Creek, Cottage Creek and the Newcastle CBD area , encompassing an area of some 42km^2. The principle objectives of the study were to define the flood behaviour of the catchments through the establishment of appropriate numerical models, producing information on flood flows, velocities, levels and extents for a range of flood event magnitudes. The models incorporate the extensive trunk drainage network throughout the study area. The results of the study have been adopted by Council for flood planning purposes and form the basis for the flood risk assessment and formulation of appropriate floodplain risk management options.
- Newcastle City-wide Floodplain Risk Management Study and Plan (BMT WBM, 2012) - The City-wide Flood Plan has been developed to direct and co-ordinate the future management of flood prone lands across the City of Newcastle. It also aims to educate the community about flood risks across Newcastle, so that they can make more appropriate and informed decisions regarding their individual exposure and responses to flood risks. The City-wide Flood Plan sets out a strategy of short term and long term actions and initiatives that are to be pursued by agencies and the community in order to adequately address the risks posed by flooding.

The Newcastle City-wide Floodplain Risk Management Study provides an extensive mapping compendium that provides a comprehensive description of the flood inundation risks in the study area. The mapping provided incorporates the potential flooding from a number of sources including Hunter River flooding, local flooding in the Throsby/Cottage Creek catchment and tidal inundation including major storm surge events. Mapped scenarios include a range of magnitude events as well as the influence of potential sea level rise on future flooding conditions.

2.2 Existing Inundation Scenarios

Flooding of the study area can occur from three mechanisms (and combinations thereof):

- Oceanic inundation, as a result of high ocean tides, storm surge, wave penetration;
- Local catchment flooding, as a result of intense rainfall within the local catchment of Throsby/Cottage Creek and small overland flow catchments draining directly to the Hunter River; and

- Hunter River flooding, as a result of major flooding within the broader river system.

The following sections outline the existing and future flooding scenarios in the study area under the various flooding mechanisms identified above. These conditions are used as the basis for assessment of potential flood impact in the study area corridor.

2.2.1 Ocean Flooding

Oceanic inundation as a result of elevated tide levels are derived from combinations of the following conditions:

- Barometric pressure set up of the ocean surface due to the low atmospheric pressure of the storm;
- Wind set up due to strong winds during the storm "piling" water upon the coastline;
- Astronomical tide, particularly the Higher High Water Solstice Springs (HHWSS); and
- Wave set up.

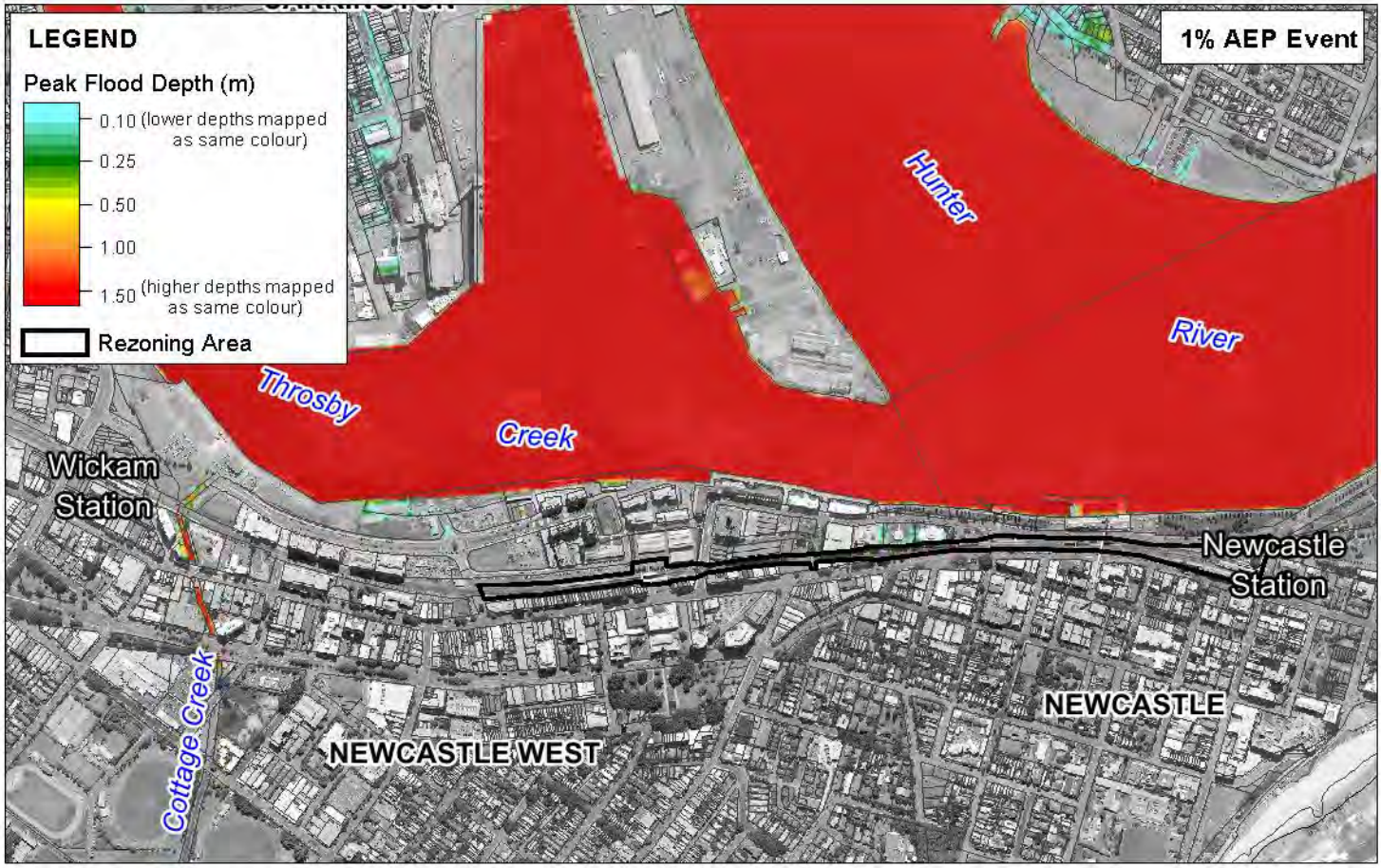
A summary of peak water levels under ocean flooding conditions for key design events is presented in Table 2-1, including the projected influence of sea level rise.

Table 2-1 Design Peak Water Levels (m AHD) - Ocean Flooding

Design Event	Existing Conditions	+0.4m SLR	+0.9m SLR
King Tide	1.0	1.4	1.9
10 % AEP	1.35	1.75	2.25
1% AEP	1.4	1.8	2.3
Extreme (PMF) Event	2.5	2.9	3.4

Given the topography of the study area (refer to Figure 2-1) there is the potential for extensive inundation under ocean flooding scenarios. The relative extents and depths of inundation for the 1% AEP and PMF design ocean events are shown in Figure 2-2. No major inundation of the low-lying foreshore area is expected under existing 1% AEP design ocean flood conditions. For the extreme event (PMF) condition, significant inundation would occur, with some peak flood depths up to the order 0.5 -1.0m.

As noted in Table 2-1, ocean flooding conditions are exacerbated with potential sea level rise. The design 1% AEP peak ocean flooding level incorporating 0.9m sea level rise is 2.3m AHD, thereby approaching the severity of inundation under existing extreme event conditions (2.5m AHD). Accordingly, the extent of ocean inundation shown at the bottom of Figure 2-2 is indicative of the typical design flood condition to be considered for the nominal 1% AEP design planning event under future catchment conditions (i.e. beyond 2100).





Title:

Ocean Peak Flood Depths - 1% AEP and PMF Existing Conditions

Figure: 2-2

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2.2.2 Local Catchment Flooding

The design local catchment flooding conditions have been derived in the Throsby Creek and Cottage Creek Flood Study (WBM, 2006). Local catchment flooding is referred to as “Flash Flooding” in the Newcastle City-wide Floodplain Risk Management Study, acknowledging the relatively flashy nature of flooding in local catchments across the CBD area and distinguishing from the mainstream flooding of the Hunter River system.

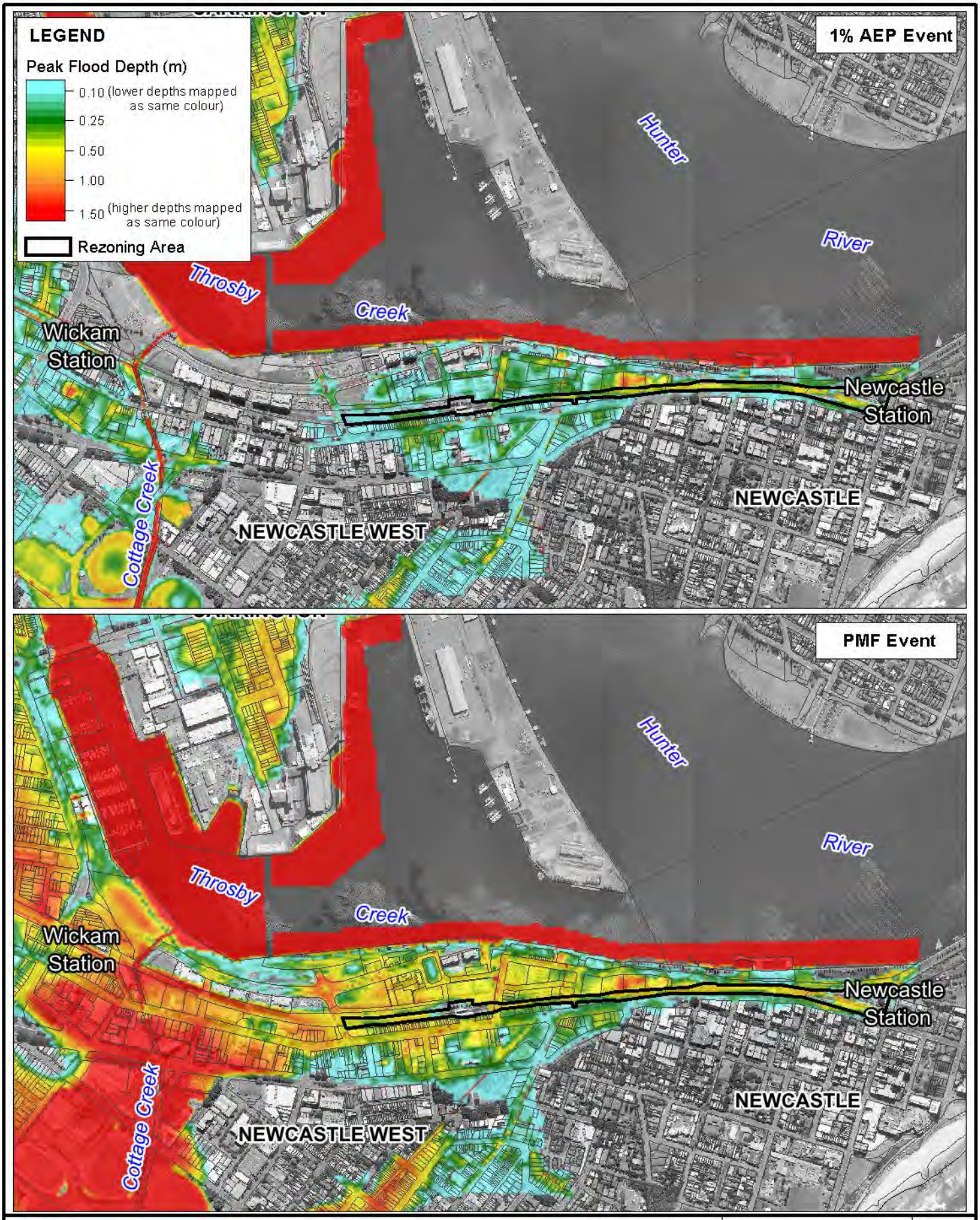
The simulated design flood inundation extents and depths across the study area for the 1% AEP and PMF events under existing conditions is shown in Figure 2-3.

The inundation across the development area at the 1% AEP design flood magnitude is largely characterised by relatively shallow depth of flooding (typically less than 0.3m) with some localised areas of higher depth often corresponding to low points in the local road network. There are some localised areas of higher flood depth shown within the existing rail corridor towards Newcastle Station. These areas also correspond to low points along the rail alignment, typically where the rail alignment is lower than adjacent land (i.e. effectively in shallow cutting). The higher flood depths shown in these areas are largely a function of the coarse model configuration and localised depressions in the underlying topography.

Overland flow regimes in urban environments can be quite complex with interconnecting and varying flowpaths once the design stormwater drainage capacity is exceeded. Road networks often convey a considerable proportion of floodwaters due to the hydraulic efficiency of the road surface compared to developed areas (eg. blocked by fences and buildings), in addition to the underground pipe network draining mainly to open channels. Excluding the main Cottage Creek catchment (i.e. areas west of Worth Place outside the proposed rezoning area) the contributing local catchments are relatively small. Accordingly, there is not a significant overland flooding risk within the project area up to the 1% AEP flood magnitude. This is reflected in the definition of hydraulic category (i.e. floodway/flood storage and flood fringe area) discussed further in Section 2.3.1

Other minor overland flow paths don’t provide a major constraint to redevelopment of the corridor. The exact configuration and location of the local overland flow network through the corridor will ultimately be dependent on the finished land form within the redeveloped corridor. This level of detail on proposed finished surface levels within the corridor is not available at this stage of the flood risk assessment. Accordingly, there may be some local changes in the local overland flow distribution. However, noting the small contributing catchments and therefore relatively small flow magnitudes, it would be expected that effective management of the overland flows be readily accommodated through local drainage and overland flow provisions through the corridor. These would typically be located along existing road network alignments and the proposed open space connections.

At the PMF level there is greater inundation extent with higher depth of floodwaters. The flows generated in the local drainage catchments provide for extensive overtopping of the existing railway embankment. Again reference should be made to Section 2.3.1 in the definition of major floodway flow paths at the PMF level.



Title:

Local Catchment Peak Flood Depths - 1% AEP and PMF Existing Conditions

Figure: 2-3

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2.2.3 Hunter River Flooding

The design Hunter River flooding conditions have been derived in the Lower Hunter River Flood Study (PWD, 1994) with some local refinement in the subsequent model upgrade report (DHI, 2009). The peak design flood level profiles (10% AEP, 1% AEP and PMF events) along the South Arm of the Hunter River between Hexham Bridge and the harbour entrance are shown in Figure 2-4. Included in the figure are key reference locations along the River and the approximate location of the study area (extent of the Carrington suburb boundary between Walsh Point and Throsby Creek).

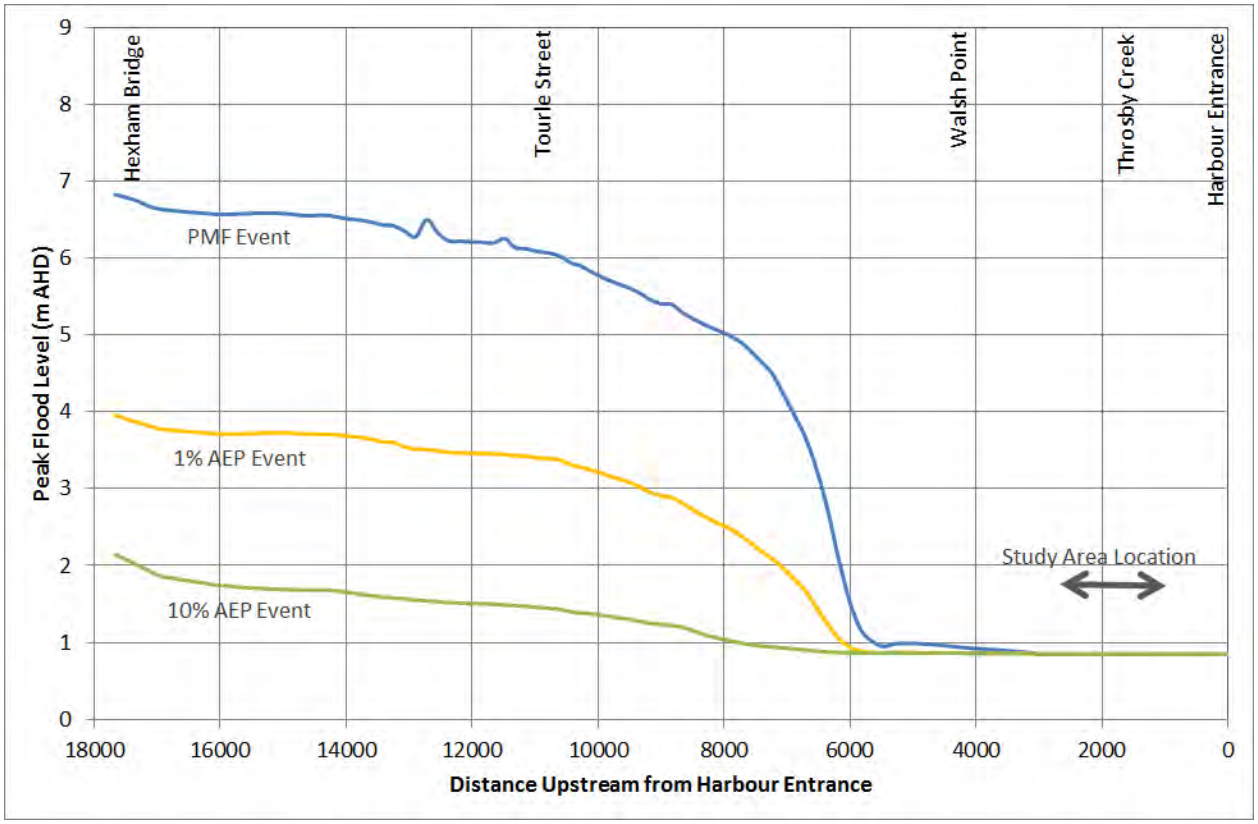


Figure 2-4 Hunter River (South Arm) Design Flood Level Profiles

The study area is largely not directly impacted by major flooding in the Hunter River. As shown in Figure 2-4, all of the events presented have a peak flood level of the order 0.8-0.9m AHD in the reach of the Hunter River adjacent to Throsby Creek. This peak flood level corresponds to the adopted boundary condition at the harbour entrance, approximating a peak spring tide level. A very flat peak flood level gradient is evident through the lower reach of the Hunter River given its large conveyance which has been significantly enlarged through channel widening and dredging works.

2.3 Flood Risk Classifications

The key planning documents with consideration of flood risks in the Newcastle City Council LGA. include:

- Newcastle City Council Flood Policy 2003
- Newcastle Development Control Plan (DCP) 2012 – Section 4.01 Flood Management

- Newcastle City-wide Floodplain Risk Management Study and Plan 2012; and
- NSW Government Floodplain Development Manual (FDM) 2005

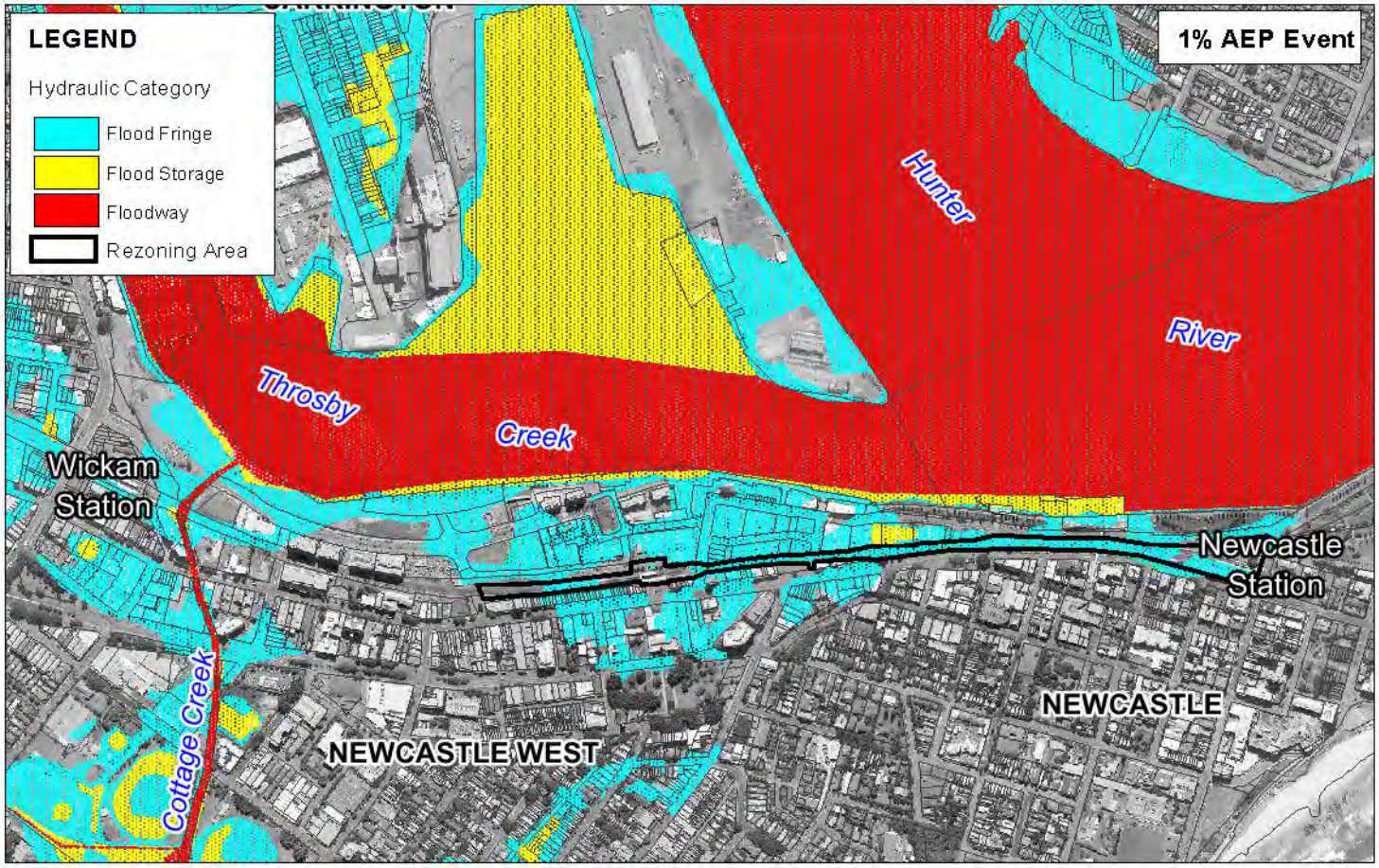
These documents provide information regarding processes to classify the severity of flooding in both quantitative and qualitative terms, and the policies and controls that are applicable to dwellings and developments on flood prone land based on these initial classifications.

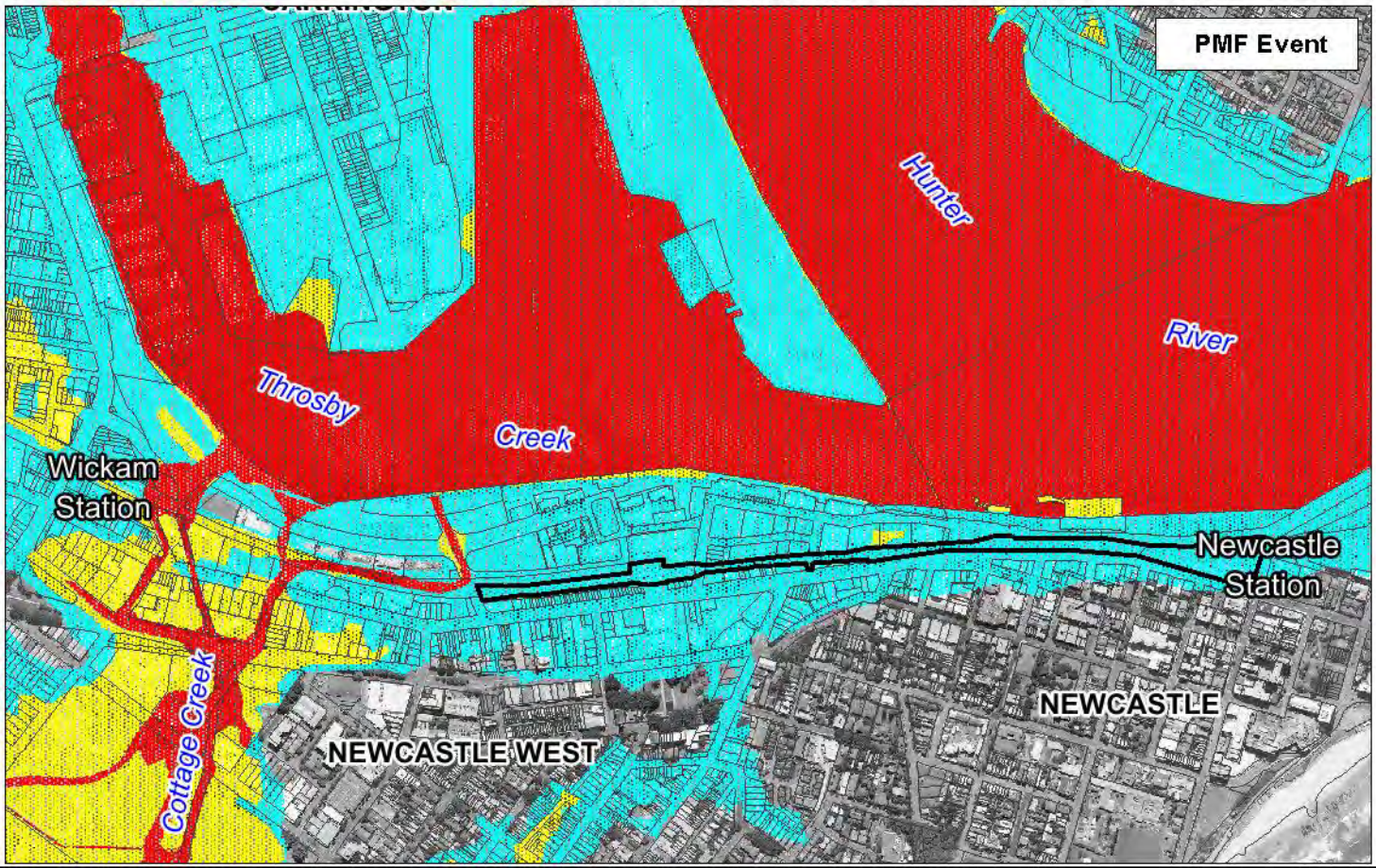
2.3.1 Hydraulic Impact Categories

There are no prescriptive methods for determining what parts of the floodplain constitute floodways, flood storages and flood fringes. Descriptions of these terms within the FDM (NSW Government, 2005) are essentially qualitative in nature and emphasis is placed on the need for site specific consideration when determining appropriate methods for hydraulic category classification. The hydraulic categories as defined in the FDM, and the advised general guidelines to assist in the delineation of flooding and flood storage areas, are:

- **Floodway -** Areas that convey a significant portion of the flow. These are areas that, even if partially blocked, would cause a significant increase in flood levels or a significant redistribution of flood flows, which may adversely affect other areas.
- **Flood Storage -** Areas that are important in the temporary storage of the floodwater during the passage of the flood. If the area is substantially removed by levees or fill it will result in elevated water levels and/or elevated discharges. Flood Storage areas, if completely blocked would cause peak flood levels to increase by 0.1m and/or would cause the peak discharge to increase by more than 10%.
- **Flood Fringe -** Remaining area of flood prone land, after Floodway and Flood Storage areas have been defined. Blockage or filling of this area will not significantly affect the flood pattern or flood levels.

The adopted hydraulic impact categories in the Newcastle FRMS are shown in Figure 2-5 and identifies that majority of the site is classed as flood fringe. Flood fringe areas typically don't have major constraints with respect to development type subject to appropriate assessment of potential impacts. Further discussion on flood related development controls applicable to the proposed development site are presented in Section 3.





Title:

Hydraulic Categories - 1% AEP and PMF Existing Conditions

Figure: 2-5

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2.3.2 Property Hazard Categories

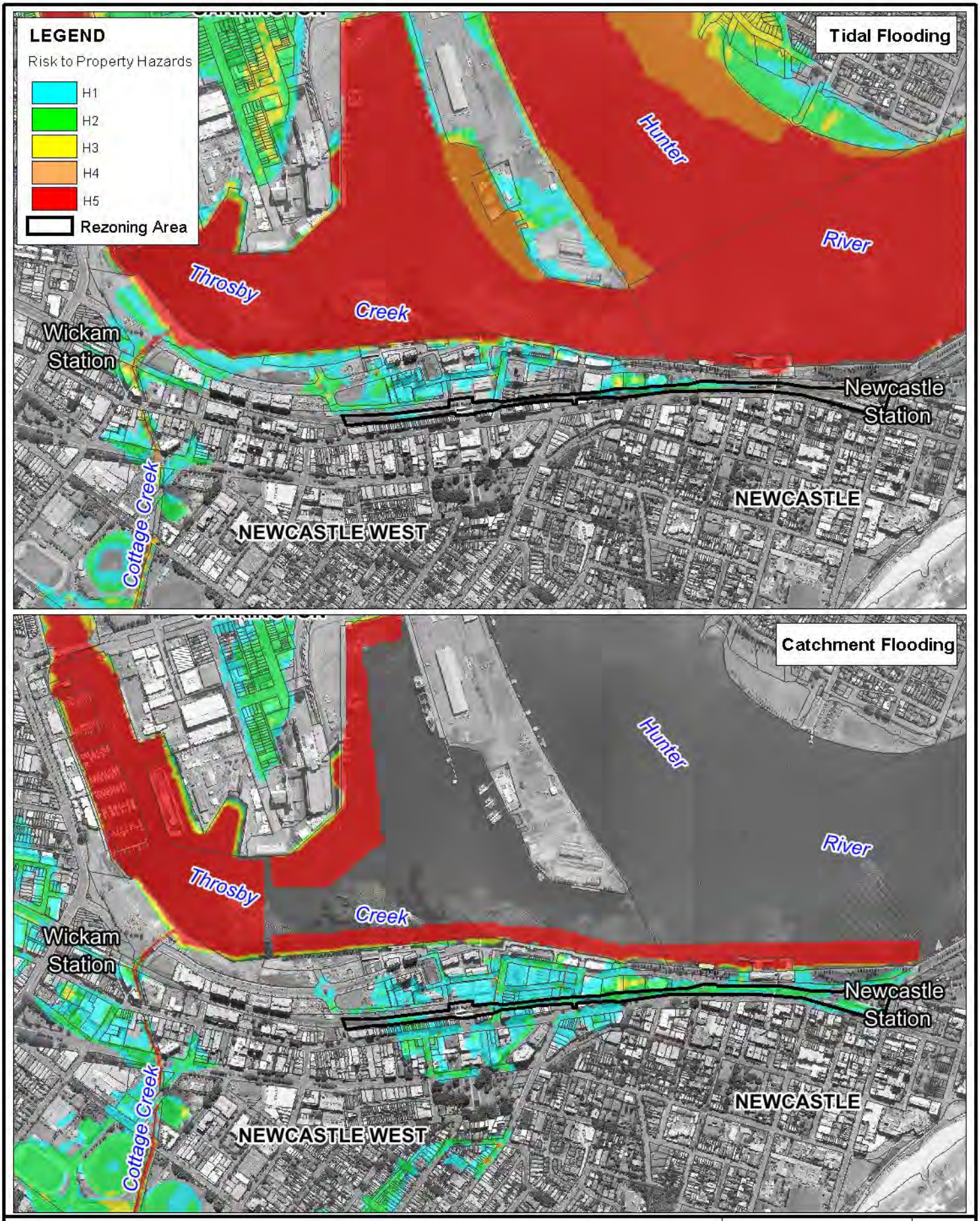
The combination of flood depths and flood velocities can be used to assess the risk to property and life based on the physical flood behaviour. Situations whereby flood depths are shallow, but velocities are high can be just as critical as situations where flood depths are large, but velocities are low. The combination of flood depths and flood velocities (v*d) is defined as the flood hydraulic behaviour. Different values, or thresholds, for flood hydraulic behaviour helps to categorise the risk to people exposed to the flood, either directly as pedestrians, or indirectly inside a vehicle, or inside a building/structure. The hydraulic behaviour also aids in the categorisation of risk to property.

The hydraulic behaviour thresholds are described in Table 2-2, which outline associated technical equations in terms of flow depth and velocity. They are not inherently tied to any particular size or likelihood of flood, but rather, they just describe the stability of a chosen object (e.g. a type of building construction) in water of a particular depth and velocity.

Table 2-2 Definition of Hydraulic Behaviour Thresholds (Newcastle City Council, 2003)

Hydraulic Behaviour Threshold	Velocity-Depth Relationship	Risk to Property
H1	v < 0.5m/s and d < 0.3m	P1 - Parked or moving cars remain stable
H2	v < 2m/s, d < 0.8m and v < (3.2 – 4*d)	P2 - Parked or moving heavy vehicles remain stable
H3	v < 2m/s, d < 2m and v*d < 1	P3 - Suitable for light frame construction
H4	v < 2.5m/s, d < 2.5m and v*d < 2.5	P4 - Suitable for heavy frame construction or structural reinforcement
H5	Remaining areas	P5 - Hydraulically unsuitable for normal building construction

The property hazard classification based on the above definition in the vicinity of the rezoning area is shown in Figure 2-6. The highest property hazard category across the majority of the site is H2. Typically this type of flood condition provides little constraint on the types of construction.



Title:

Property Hazard Categories - 1% AEP Existing Conditions

Figure: 2-6

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.

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0 250 500m

Approx. Scale

BMT WBM

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2.3.3 Life Hazard Categories

In addition to hydraulic behaviour, risks to life are influenced by the flooding mechanism (i.e. flash, river or ocean), as well as the availability of an evacuation route. Generally, evacuation can be expected from areas that are under threat from river or ocean flooding. As such, the risks to life in areas affected by river and ocean flooding are considered to be low. Flash flooding, however, can represent a significant risk, as there is generally little time to respond or evacuate. If there is an evacuation route available, which consists of a continuously rising route to flood free land (above the PMF level), then the risks in flash flood situations are reduced.

Risks to life categorisation adopted by Council has been developed taking into account both the availability for evacuation and the hydraulic behaviour, as presented in Table 2-3.

The Risks to Life criteria are determined based on PMF conditions. These extreme flood conditions are adopted as the FDM (2005) is explicit in requiring risks to life to be considered and managed over the full range of flood events (i.e. up to the most extreme conditions, or PMF).

Table 2-3 Risk to Life Hazard Categories (adopted at the PMF level)

<table>
<tr><td colspan="4"></td><td colspan="5">Hydraulic Behaviour Threshold</td></tr>
<tr><td colspan="4"></td><td>H1</td><td>H2</td><td>H3</td><td>H4</td><td>H5</td></tr>
<tr><td rowspan="3">Catchment Response Time</td><td colspan="3">Riverine and Ocean Flooding</td><td colspan="5">L1</td></tr>
<tr><td rowspan="2">Flash</td><td rowspan="2">Escape Route to flood free land</td><td>available</td><td colspan="2">L2</td><td rowspan="2">L4</td><td rowspan="2">L5</td></tr>
<tr><td>not available</td><td colspan="2">L3</td></tr>
</table>

Where:

L1 Riverine flooding where there is sufficient time to remove people from the risk to their lives by means of formal community evacuation plans.

L2 Short duration flash flooding with no warning time in circumstances where there is an obvious escape route to flood free land with enclosing waters during the PMF which are suitable for wading or heavy vehicles i.e. hydraulic threshold does not exceed H2. On site flood refuge not necessary and normal light frame residential building are appropriate.

L3 Short duration flash flooding with no warning time and no obvious escape route to flood free land with enclosing waters during the PMF which are suitable for wading or heavy vehicles i.e. hydraulic threshold does not exceed H2. On site flood refuge not necessary and normal light frame residential buildings and appropriate.

L4 Short duration flash flooding with no warning time and enclosing waters during the PMF not suitable for wading or heavy vehicles i.e. hydraulic threshold exceeds H_2. On site refuge is necessary and if hydraulic threshold exceeds H_3, heavy frame construction or suitable structural reinforcement required.

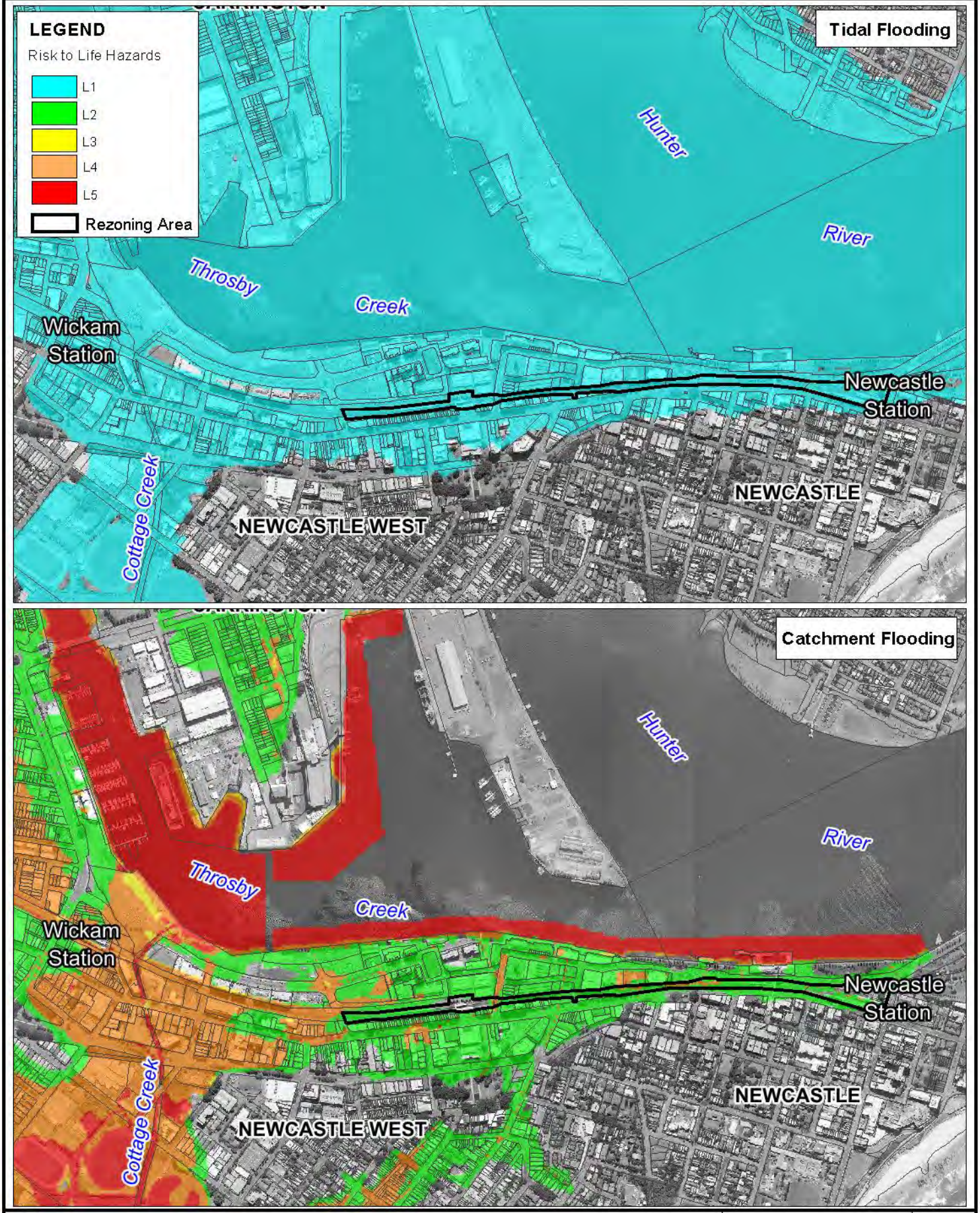
L5 Short duration flash flooding with no warning time and enclosing waters during the PMF have too much energy for normal heavy building construction and therefore it is generally not possible to construct a flood refuge i.e. hydraulic threshold is H_5. The risk to life is considered extreme and the site is unsuitable for habitation, either residential or short stay.

As noted in Table 2-3, the risk to life categorisation for the Hunter River and ocean flooding at the site is the lowest category L1. This is due to the significant warning times afforded to the site for flooding of this nature such that appropriate evacuation plans could be executed.

The local catchment flash flooding scenarios provide the dominant conditions in determining risk to life classification given the short warning times available. As shown on Figure 2-7, the risk to life category across the majority of the rezoning area is L2.

There are some isolated pockets of L4 classification. This L4 area is somewhat limited in extent, however, highlights the potential for rapidly enclosing floodwaters in which wading or driving through floodwaters as a means of evacuation may be difficult. Within the rezoning area, the L4 zones are limited to an existing overland flow path through Merewether Street (limited to the existing road corridor) and small areas of the existing rail corridor that are localised depressions in which the depth of inundation is driving the L4 classification (noting depressions likely to be removed by filling). The areas of existing L4 classification would not be expected to have major constraints on corridor redevelopment.

.



Title:

Life Hazard Categories - 1% AEP Existing Conditions

Figure: 2-7

Rev: A

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3 Flood Planning Controls

3.1 Review of Regulatory Provisions

3.1.1 State Environmental Planning Policy No. 71 – Coastal Protection (SEPP 71)

State Environmental Planning Policy No. 71 – Coastal Protection (SEPP 71) aims to protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast. SEPP 71 aims for development in the NSW coastal zone to be appropriate and suitably located, in accordance with the principles of the Ecologically Sustainable Development (ESD). The policy provides for: the protection of and improvement to public access compatible with the natural attributes coastal foreshores; and protects and preserves Aboriginal cultural heritage, visual amenities of the coast, the beach environment and amenity, native coastal vegetation, marine environment of New South Wales, and rocky platforms.

The key elements of SEPP 71 with specific reference to flooding and water management constraints for the proposed development include consideration of:

- the likely impact of coastal processes and coastal hazards on development and any likely impacts of development on coastal processes and coastal hazards, and
- the likely impacts of development on the water quality of coastal waterbodies.

Section 3.2 outlines the development constraints and design management with respect to the coastal planning provisions.

3.1.2 The NSW Flood Prone Land Policy and Floodplain Development Manual

The NSW Flood Prone Lands Policy aims to reduce personal and public losses and impacts associated with flooding. The Policy does not attempt to preclude development from the floodplain, but rather, recognises the importance of floodplains for development purposes. The Policy promotes a merit-based approach to floodplain development, wherein all social, economic and ecological consequences are to be considered.

The merit-based approach of the Policy requires a holistic approach by Councils and other consent authorities when prescribing responses and requirements for existing and future development in accordance with the principles of the Floodplain Development Manual (2005). The Manual aims at a fundamental consistency of approach across Councils, and in particular seeks to clarify “the intent … with respect to the determination of Flood Planning Levels and the consideration of rare floods up to the PMF (which) will reduce the potential for inconsistent interpretation by consent authorities”.

The policy is directed towards providing solutions to existing flooding problems in developed areas and ensuring that new development is compatible with the flood hazard and does not create additional flooding problems in other areas. The Policy and recommendations on how to apply the principles of the Policy are defined in the NSW Government’s Floodplain Development Manual (2005).

The NSW Floodplain Development Manual (2005) presents general principles and a process for flood risk management, to enable councils and associated committees to understand flood behaviour, impacts and risks to communities. The Manual has been prepared to assist councils prepare flood risk plans through a staged floodplain risk management process.

The Newcastle City-wide Floodplain Risk Management Study and Plan (City-wide Flood Plan) has been developed to direct and co-ordinate the future management of flood prone lands across the City of Newcastle. Development of the City-wide Flood Plan has been guided by the NSW Government's Floodplain Development Manual (2005).

3.1.3 Newcastle LEP (2012)

Local Environmental Plans (LEP) are prepared in accordance with Part 3 Division 4 of the *Environmental Planning and Assessment Act 1979*. The intent of the LEP is to define the legal framework for land use and development by 'zoning' all land. The LEP incorporates standard planning provisions, clauses, definitions and zones into the one document. It identifies standard zones and zone objectives and specifies permitted and prohibited uses in zones, and identifies compulsory and optional provisions.

The Newcastle LEP (2012) does not contain a standard flood clause. It is understood Council negotiated with the Department of Planning and Environment to have no flood clause in its LEP, and instead rely on the Flood Management provisions of Council's adopted Development Control Plan (2012) (refer to Section 3.1.4). These provisions have been preserved in Council's companion revised Newcastle Development Control Plan, which became effective with the LEP gazettal.

In terms of managing coastal hazards, the LEP contains 'Part 5.5. Development within the Coastal Zone', which is a compulsory clause for all LEPs that apply to land within the coastal zone. Part 5.5 sets objectives and matters for consideration by the consent authority prior to granting consent to development on land wholly or partly within the coastal zone. The objectives include implementing the principles of the NSW Coastal, in particular including the objective to "(iv) recognise and accommodate coastal processes and climate change". In this regard, Part 5.5. states that development consent must not be granted unless the consent authority is satisfied that:

"(d) the proposed development will not:

(i) be significantly affected by coastal hazards, or

(ii) have a significant impact on coastal hazards, or

(iii) increase the risk of coastal hazards in relation to any other land."

3.1.4 Newcastle Development Control Plan (2012)

The Newcastle Development Control Plan 2012 (DCP) provides guidelines to Development Applications for assessment by Council. Section 4.01 of Councils DCP addresses flood management, and applies to all development on flood prone land. The DCP aims to apply elements of the Newcastle Flood Policy in relation to proposed future development and provides

specific guidelines on development within flood prone land. In particular, the DCP provides guidelines on:

- Development within floodways;
- Development within flood storage areas;
- Measures to minimise risks to property (linked to the Flood Planning Level);
- Measures to minimise risks to life (in particular, on site refuge for flash flooding only); and
- Riparian zone management and restoration.

The definition of various flood risk categories referred to on the DCP have been determined across the Newcastle LGA within the adopted City-wide Floodplain Risk Management Study and Plan. As noted, the Plan was developed under the guiding principles for floodplain management as outlined in the Floodplain Development Manual (2005). The DCP provisions in conjunction with Council's adopted flood risk mapping (as presented in Section 3 of this report) define the overarching floodplain risk management constraints for the proposed development.

None of the sections within the DCP provide guidance for managing or minimising risks from coastal hazards, in particular, erosion and recession, and coastal inundation with wave overtopping.

Section 4.01 Flood Management details provisions for managing flooding risks to development. While specific provisions for climate change are not given within this DCP section, the definition of "flooding" recognises the contribution of coastal inundation which is defined as "caused by seawater inundation due to king tides, storm surge, barometric effects, shoreline recession, subsidence, the enhanced greenhouse effect or other causes". The DCP does not directly address coastal inundation or climate change. Instead, for coastal inundation and climate change to be managed through these DCP provisions, they would need to be incorporated when determining the flood planning level.

3.2 Development Constraints

Flooding

Section 2 and 3 outline the expected flood conditions at the site for the key flood planning events and the typical classifications used for flood planning in accordance with Council policies. Provided hereunder is a summary of the key flood related development controls appropriate to the proposed development site.

- Flood Planning Level – 2.8m AHD – the flood planning levels for proposed new buildings is expected to be derived from the peak 1% AEP Flood Level from ocean flooding incorporating 0.9m sea level rise allowance and appropriate 0.5m freeboard allowance. This would provide for the minimum occupiable floor levels for proposed developments. Other floor level controls may relate to parking entries/basements etc.
- Flood Classification – the only area classified as floodway in Council's existing mapping (refer to Figure 2-5) in the vicinity of the rezoning area is the extension of the overland flow path along Worth Place. However, there is no floodway area within the proposed rezoning boundary. The

remainder of the rezoning area is largely classified as flood fringe. By definition, blockage or filling of this area will not significantly affect the flood pattern or flood levels. This would be demonstrated by appropriate detailed modelling of design development layouts to support future Development Applications.

- Risk to Life – the high hazard areas within the rezoning area are limited to the existing overland flow path along existing road alignments and localised depressions within the rail corridor (refer to Figure 2-7). It is envisaged that in providing greater connectivity through open space area, there will be the potential to increase the areas of high hazard. Whilst typically not constraining development, given the high flash flood risk, consideration will need to be given to evacuation and emergency response opportunity in these public space areas. It is envisaged this can be achieved through future design phases with opportunity to provide pedestrian access to suitable areas of refuge above the PMF extent and modification of ground levels to remove localised depressions.

For the full suite of development controls, reference should be made to Section 4.01 Flood Management of Councils DCP 2012.

Coastal

Given the proximity of the rezoning area to the Hunter River estuary, the proposal constitutes Development in the Coastal Zone. Provided hereunder is a summary of the key development constraints related to coastal zone management:

- Coastal Processes – the scale and nature of the proposed development is such that it would have insignificant impact on the coastal processes of the broader Hunter River estuary. The works provide for no significant changes to existing overland flow distributions or tidal dynamics of the estuary. The development site is adjacent to the estuarine reaches of Throsby Creek, with the existing shoreline being a hard engineered sea wall. Accordingly there is considered no significant coastal erosion/recession risk to be managed for the development. The site may be impacted upon by coastal flooding, which may be exacerbated by potential climate change influences such as sea level rise. However, existing flood risk policies and appropriate development controls include consideration of the coastal inundation risk.
- Protection of coastal environment – as noted, the development is not expected to have any significant changes in existing flow regimes, however, there is some potential for potential impacts on water quality in the estuary. Again, given the nature and scale of the development, appropriate control of these risks are expected to be effectively managed through development of appropriate stormwater management and erosion/sedimentation control plans for both construction and operational phases of the development. In developing these plans, more detailed consideration of potential pollutant sources will need to be considered including existing contaminated lands and acid sulphate soil areas.

The constraints identified above are expected to be effectively managed through the design phases of the redevelopment through the development of an appropriate flood risk management plan and stormwater/water quality management plan. The local detail of plans will be dependent on the proposed built form environments and accordingly concept plans would be developed through the

design process in future planning stages. At this rezoning planning phase it is considered there are no major constraints on the proposed future development from a flooding/stormwater perspective.

4 Consistency with Flood Prone Land Direction

Parts of the land to which the planning proposal applies are affected by flooding. By seeking to change the land use zoning in a Flood Planning Area, and thereby increasing the potential for an increase in flood risk exposure on the land, the proposal needs to demonstrate consistency with Section 117 Direction 4.3 Flood Prone Land.

The consistency with the flood planning direction is demonstrated through the preparation of the planning proposal being in accordance with the relevant Newcastle City-wide Floodplain Risk Management Plan, developed on the principles of the NSW Governments Flood Policy and the NSW Floodplain Development Manual. The planning proposal has considered relevant flood planning cotrols (Section 4.01 Newcastle Development Control Plan 2012) developed as a direct result of the City-wide FRMP.

Any risks associated with higher density development will be effectively dealt with through flood planning development controls at the DA stage. No development in the rezoned areas will be permitted without consent. Accordingly, application of development control policies through the development approval process would provide for appropriate flood planning conditions such as:

- New development which occurs will be developed in such a way as to effectively avoid, minimise, or mitigate the flood risk according to the individual circumstances of each site.
- Physical impacts, brought about by increases to building footprints or the presence of walls and fences which might interfere with overland flows will be effectively dealt with by Council's flood planning controls.
- The requirement for a flood evacuation strategy or a site emergency response flood plan will ensure that no additional risk to life or property occurs in these areas as a result of increased population density.

4.1 Summary of Response to S.117 Direction 4.3 Flood Prone Land

Objectives

(1) The objectives of this direction are:

(a) 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, and

(b) to ensure that the provisions of an LEP on flood prone land is commensurate with flood hazard and includes consideration of the potential flood impacts both on and off the subject land.

Where this direction applies

(2) This direction applies to all relevant planning authorities that are responsible for flood prone land within their LGA.

- The direction applies. City of Newcastle is responsible for flood prone land.

When this direction applies

(3) 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 direction applies. The Planning Proposal seeks to alter a zone that affects flood prone land.

What a relevant planning authority must do if this direction applies

(4) A planning proposal must include provisions that give effect to and are consistent with the NSW Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005 (including the Guideline on Development Controls on Low Flood Risk Areas).

- Consistent. The Newcastle LEP (2012) does not contain a standard flood clause. It is understood Council negotiated to have no flood clause in its LEP, and instead rely on the Flood Management provisions of Council's adopted Development Control Plan (2012) These provisions are consistent with the NSW Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005. The Planning Proposal will not alter flood prone land provisions within the DCP2012.

(5) A planning proposal must not rezone land within the flood planning areas from Special Use, Special Purpose, Recreation, Rural or Environmental Protection Zones to a Residential, Business, Industrial, Special Use or Special Purpose Zone.

- Inconsistent. The Planning Proposal intends to rezone land from SP2 Infrastructure to B4 Mixed Use. However, the area is generally classified as low risk precinct such that application of appropriate development controls is expected to provide effective flood risk management to enable change in land use without increase in overall flood risk.

(6) A planning proposal must not contain provisions that apply to the flood planning areas which:

(a) permit development in floodway areas,

- Consistent. No parts of the subject lands are located within a floodway area. Further, the planning proposal does not include provisions that permit development to be carried out without development consent. Existing development controls controls will effectively restrict new residential or commercial development from occurring within floodway zones which would be incompatable with the flood hazard.

(b) permit development that will result in significant flood impacts to other properties,

- Consistent. The planning proposal does not include provisions that permit development to be carried out without development consent. Existing development controls require consideration of potential adverse flood impact in the development assessment process.

(c) permit a significant increase in the development of that land,

- Inconsistent. The rezoning of parcels to B4 Mixed Use provides the opportunity for increased development from the existing rail corridor. However, the area is generally classified as low risk precinct such that application of appropriate development controls is

expected to provide effective flood risk management to enable proposed development yields to be realised without increase in overall flood risk.

(d) are likely to result in a substantially increased requirement for government spending on flood mitigation measures, infrastructure or services, or

- Consistent. Future redevelopment consistent with the new zoning will be required to satisfy objectives of Councils flood policy objective to reduce the risks and costs of flooding to existing areas.

(e) permit development to be carried out without development consent except for the purposes of agriculture (not including dams, drainage canals, levees, buildings or structures in floodways or high hazard areas), roads or exempt development.

- Consistent. The planning proposal does not include provisions that permit development to be carried out without development consent.

(7) A planning proposal must not impose flood related development controls above the residential flood planning level for residential development on land, unless a relevant planning authority provides adequate justification for those controls to the satisfaction of the Director-General (or an officer of the Department nominated by the Director-General).

- Consistent. The Planning Proposal will not impose flood related development controls above the residential flood planning level for residential development on land.

(8) For the purposes of a planning proposal, a relevant planning authority must not determine a flood planning level that is inconsistent with the Floodplain Development Manual 2005 (including the Guideline on Development Controls on Low Flood Risk Areas) unless a relevant planning authority provides adequate justification for the proposed departure from that Manual to the satisfaction of the Director-General (or an officer of the Department nominated by the Director-General).

- Consistent. The flood planning levels adopted by Council are based on the City-wide Floodplain Risk Management Study and Plan (2012) which has been prepared in accordance with the Floodplain Development Manual 2005.`

Consistency

(9) A planning proposal may be inconsistent with this direction only if the relevant planning authority can satisfy the Director-General (or an officer of the Department nominated by the Director- General) that:

(a) the planning proposal is in accordance with a floodplain risk management plan prepared in accordance with the principles and guidelines of the Floodplain Development Manual 2005, or

- Applicable. The rezoning proposal has considered provisions and is consistent with Newcastle City-wide Floodplain Risk Management Plan developed under the guiding principles for floodplain management as outlined in the Floodplain Development Manual (2005).

(b) the provisions of the planning proposal that are inconsistent are of minor significance.

- Not applicable

5 References

BMT WBM (2012) *Newcastle City-wide Floodplain Risk Management Study and Plan*

Newcastle City Council (2003) *Newcastle Flood Policy*

Newcastle City Council (2004) *Newcastle Stormwater Management Plan*

NSW Government (2005) *Floodplain Development Manual*

Newcastle City Council (2012) *Newcastle Development Control Plan – Section 4.01 Flood Management*

WBM, 2006. *Throsby Creek and Cottage Creek Flood Study*. Prepared for City of Newcastle.

Appendix A Newcastle DCP Section 4.01 Flood Management

4.01 Flood Management

Amendment history

Version Number	Date Adopted by Council	Commencement Date	Amendment Details
1	15/11/2011	15/06/2012	New

Savings provisions

Any development application lodged but not determined prior to this section coming into effect will be determined as though the provisions of this section did not apply.

Land to which this section applies

This section applies to all development on flood prone (= flood liable) land in the Newcastle Local Government Area, as defined by Council's Flood Policy - (adopted 2004) and *The NSW Government Floodplain Development Manual – the management of flood liable land (2005)*, being "land susceptible to flooding by the PMF event" *.

A flood information application form can be obtained from Council's website: (www.newcastle.nsw.gov.au) or Council's Customer Enquiry Centre, City Administration Centre, 282 King Street Newcastle NSW 2300.

Development (type/s) to which this section applies

All of these provisions apply to all development on flood prone land with the exception of minor additions to existing buildings.

Minor additions (refer to definitions) are allowable without further reference to the provisions of this section, provided that the flood risk is not unreasonably increased.

Applicable environmental planning instruments

The provisions of the Newcastle Local Environmental Plan 2012 also applies to development applications to which this section applies.

In the event of any inconsistency between this section and the above environmental planning instrument, the environmental planning instrument will prevail to the extent of the inconsistency.

Note 1: Additional environmental planning instruments may also apply in addition to those listed above.

Note 2: Section 74E (3) of the *Environmental Planning and Assessment Act 1979* enables an environmental planning instrument to exclude or modify the application of this DCP in whole or part.

* Supplementary note (not required for application of this DCP): This definition remains unchanged to that defined by the previous Element 4.3 Flood Management Newcastle DCP 2005.

Associated technical manual/s

- *The NSW Government Floodplain Development Manual – the management of flood liable land (2005)*. This Manual is available from the NSW Government website at the time of writing (www.environment.nsw.gov.au) or a copy may be viewed at Council's Customer Enquiry Centre.

Additional information

More information about floodplain risk management in the Newcastle Local Government Area can be found at Council's website. Copies of various flood studies and reports are also available for viewing at Council's Customer Enquiry Centre.

Definitions

A word or expression used in this development control plan has the same meaning as it has in Newcastle Local Environmental Plan 2012, unless it is otherwise defined in this development control plan.

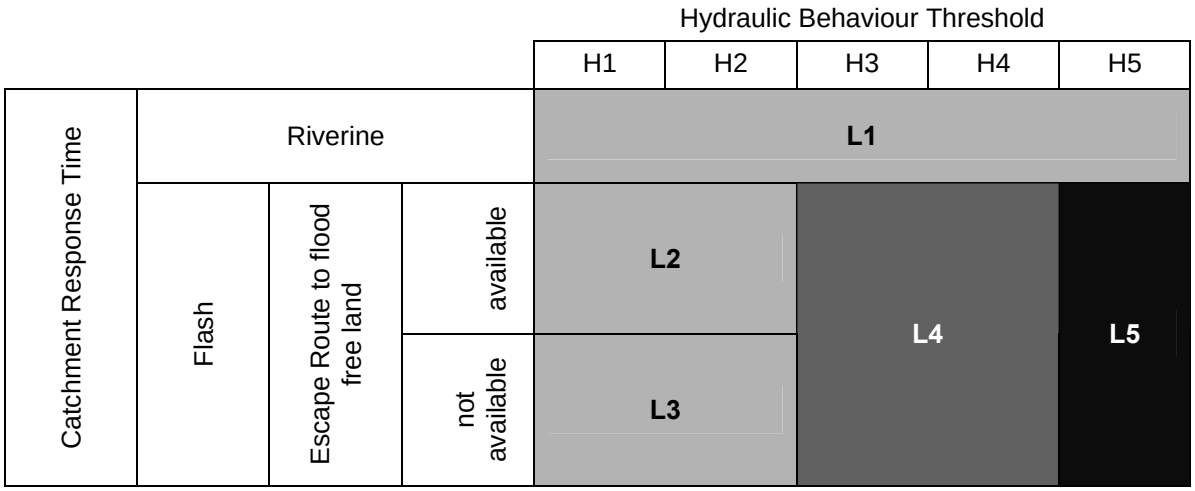
Other words and expressions referred to within this section are defined within Part 9.00 – Glossary and include:

- **Annual exceedance probability (AEP)** – is the probability that a flood of a given or larger magnitude will occur within a period of one year. Its reciprocal is equivalent to average recurrence interval.
- **Average recurrence interval (ARI)** – the average period between the recurrence of a storm event of at least a given rainfall intensity. The ARI represents a statistical probability. For example, a 10 year ARI indicates an average of 10 events over 100 years. The ARI is not the period between actual events.
- **Basement garage** – is a garage normally used for the parking of vehicles with the floor constructed below the street level.
- **Flood fringe areas** - the remaining area of the floodplain not included in flood storage areas and floodways. Flood fringe areas can usually be developed without reference to how that development will affect the flood behaviour either upstream or downstream.
- **Flood information certificate** - is a certificate issued by Council that provides information about the likelihood, extent or other characteristics of flooding known to affect a specified parcel of land.
- **Flooding** - is relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river estuary, lake or dam, and/or local overland flooding associated with major drainage, and/or coastal inundation resulting from super-elevated sea levels and/or waves , excluding tsunami. Accordingly, flooding may occur due to a variety of reasons, either separately or in combination including:
  - river flooding - caused by a river or stream overtopping its banks onto the surrounding floodplain
  - urban flooding - caused by urban stormwater flows during an intense rainfall event, such as surface flows, surcharge from piped drainage systems or overflow from man-made stormwater channels.
  - coastal inundation - caused by sea water inundation due to king tides, storm surge, barometric effects, shoreline recession, subsidence, the enhanced greenhouse effect or other causes.

- **Flood liable land** - is synonymous with flood prone land (ie) land susceptible to flooding by the PMF event on the basis of flood information held by Council. Note that the term flood liable land covers the whole floodplain, not just that part below the FPL (see flood planning area).
- **Floodplain** - an area of land along the course of a river that is subject to periodic inundation due to the river overtopping its bank. It is commonly delineated by the area that would be flooded by an event with a given average recurrence interval.
- **Flood planning area** - the area of land below the FPL. Note that development controls that mainly relate to risk to property apply to the flood planning area, but other development controls mainly relating to risk to life and floodways and flood storages may apply to the remainder of flood liable (prone) land.
- **Flood planning level (FPL)** - is the level of the planning flood plus an additional freeboard as advocated in the NSW Floodplain Development Manual. For purposes of this element, the planning flood is the 1% Annual Exceedance Probability flood, and the freeboard is generally 500mm.
- **Flood prone land** - is land that, on the basis of flood information held by Council, is estimated to be inundated by the probable maximum flood.
- **Flood refuge** - is an area free of flooding. It can be either higher ground or it could be in the form of an area of the building, either constructed specifically for the purpose or as an intrinsic part of the building.
- **Flood storage area** - is an area where flood water accumulates and the displacement of that floodwater will cause a significant redistribution of floodwaters, or a significant increase in flood levels, or a significant increase in flood frequency. Flood storage areas are often aligned with floodplains and usually characterised by deep and slow moving floodwater.
- **Floodway** - those areas of the floodplain where a significant discharge of water flows during floods; often aligned with obvious naturally defined channels. Floodways are areas which, even if only partially blocked, would cause a significant redistribution of flood flow or increase in flood levels, which may in turn adversely affect other areas.
- **Freeboard** - is a margin applied to the estimation of flood levels to compensate for factors such as wave action, localised hydraulic behaviour, climatic change and modelling confidence.
- **Hydraulic behaviour threshold** - is a set of circumstances (that may or may not be present at some locations at some time in any particular sized flood) that constitutes a particular level of hydraulic impact, as specified below:

H_1	hydraulically suitable for parked or moving cars V < 0.5m/sec and d < 0.3m
H_2	hydraulically suitable for parked or moving heavy vehicles and wading by able-bodied adults V < 2m/sec, d< 0.8m and v < 3.2 – 4*d
H_3	hydraulically suitable for light construction *(eg. timber frame and brick veneer)* v < 2m/sec, d < 2m, v*d < 1
H_4	hydraulically suitable for heavy construction *(eg. steel frame and reinforced concrete)* v < 2.5m/sec, d < 2.5m and v*d < 2.5
H_5	generally unsuitable

Life hazard - is the 'risk to life hazard category' as a combination of hydraulic hazard category, warning time and escape path availability, applied to all floods, up to and including the PMF (as required by the NSW Government Floodplain Development Manual for the management of personal safety). For simplicity, the Life Hazard categories set out below are only assessed at the PMF in the application of this DCP section, on the assumption that once the PMF is managed for personal safety, all other lesser floods will also be managed. The life hazards "L1" to "L5" are defined below*:



L1	Riverine flooding where there is sufficient time to remove people from the risk to their lives by means of formal community evacuation plans. Not relevant to flash flooding scenarios such as the Wallsend Catchment.
L2	Short duration flash flooding with no warning time in circumstances where there is an obvious escape route to flood free land with enclosing waters during the PMF which are suitable for wading or heavy vehicles ie. hydraulic threshold does not exceed H2. On site flood refuge not necessary and normal light frame residential building are appropriate.
L3	Short duration flash flooding with no warning time and no obvious escape route to flood free land with enclosing waters during the PMF which are suitable for wading or heavy vehicles ie. hydraulic threshold does not exceed H2. On site flood refuge not necessary and normal light frame residential buildings and appropriate.
L4	Short duration flash flooding with no warning time and enclosing waters during the PMF not suitable for wading or heavy vehicles ie. hydraulic threshold exceeds H2. On site refuge is necessary and if hydraulic threshold exceeds H3, heavy frame construction or suitable structural reinforcement required.
L5	Short duration flash flooding with no warning time and enclosing waters during the PMF have too much energy for normal heavy building construction and therefore it is generally not possible to construct a flood refuge ie. hydraulic threshold is H5. The risk to life is considered extreme and the site is unsuitable for habitation, either residential or short stay.

*Supplementary note (not required for application of this DCP): This definition remains unchanged to that defined by the previous Element 4.3 Flood Management Newcastle DCP 2005.

- **Minor additions** - (for the purpose of section 4.01 Flood Management) are additions that fall below the following limits:

Existing building area	Minor addition limit
< 250m^2	50m^2
250m^2 – 750m^2	20% of the existing building area
>750m^2	150m^2

- **Occupiable rooms** – rooms of buildings where people may be present in the normal use of the building.
- **Planning flood** - is the flood event from which the flood planning level is derived. It is expressed in terms of the probability of the event being exceeded, usually within any given year (see annual exceedance probability).
- **Probable maximum flood (PMF)** - is the largest flood that could conceivably occur at a particular location.
- **Probable maximum flood level** - the flood level calculated to be the maximum which is likely to occur.
- **Property hazard** - is the 'risk to property hazard category' as a combination of hydraulic behaviour threshold and its effect on property. The risk to property hazards are based on the peak hydraulic behaviour thresholds *(H_1-H_5)* determined for the 1 in 100 annual chance flood. Five risks to property hazard categories (P1-P5) are defined as P1-P5 correlate directly with H1-H5 as follows*:

P_1	Parked or moving cars remain stable ie. equivalent to areas of H_1 at the Flood Planning Event.
P_2	Parked or moving heavy vehicles remain stable ie. equivalent to areas of H_2 at the Flood Planning Event.
P_3	Suitable for light construction *(eg. timber frame, masonry and brick veneer)* ie. equivalent to areas of H_3 at the Flood Planning Event.
P_4	Suitable for heavy construction *(eg. steel frame, reinforced concrete)* ie. equivalent to areas of H_4 at the Flood Planning Event.
P_5	Hydraulically unsuitable for normal building construction is equivalent to areas of H_5 at the Flood Planning Event.

The distribution of P_1-P_5 is identical to the related H_1-H_5 *(at the Flood Planning Event).*

- **Tsunami** - a series of ocean waves with very long wavelengths (typically hundreds of kilometres) caused by large-scale disturbances of the ocean, such as:
  - earthquakes
  - landslide
  - volcanic eruptions
  - explosions
  - meteorites.

* Supplementary note (not required for application of this DCP): This definition remains unchanged to that defined by the previous Element 4.3 Flood Management Newcastle DCP 2005.

Aims of this section

1 To guide the development of floodprone land, applying balanced strategies to economically, socially and environmentally manage risk to life and property.

2. To set aside appropriate areas to convey and/or store flood waters.

3. To ensure development, when considered both individually and as an instance of cumulative development trends, will not cause unreasonable adverse flooding impacts in other locations.

4. To implement the principles of *The NSW Government Floodplain Development Manual (2005)* to new development as applicable.

Notes: Tsunami and very minor nuisance flooding (such as the trapping of surface runoff in a road shoulder or against a building) are specifically excluded from the application of the DCP.

The life risk hazard category "L1" assumes people will respond to warnings and safely evacuate to the safety flood free high ground. Additional requirements may be necessary to manage personal safety in riverine flooding if there is evidence that a lack of response is likely, and this may lead to life threatening situations.

4.01.01 Floodways

Objectives

1. Retain floodways in a condition capable for the conveyance of essential flood flow.

Controls

1. No building or structure erected and no land filled by way of the deposition of any material within any area identified as a floodway except for minor alterations to ground levels which do not significantly alter the fundamental flow patterns for:

   (a) roads

   (b) parking

   (c) below ground structures

   (d) landscaping.

2. Where dividing fences across floodways are unavoidable, they are constructed only of open type fencing that does not restrict the flow of flood waters and are resistant to blockage. New development shall be designed to avoid fences in floodways.

Note: Floodways are shown on a flood information certificate obtainable on application from Council. In general, development other than low level driveways and parking areas is not practicable in floodways. Floodways are not necessarily indicative of high hazard flow, although the two will generally coincide. It is necessary to separately investigate hazard in order to determine if parking areas and the like are suitable within floodways.

4.01.02 Flood storage areas

Objectives

1. Protect flood storage areas to provide storage of floodwaters to ensure that other areas are not significantly worse off due to development of the site.

Controls

1. Not more than 20% of the area of any development site in a flood storage area is filled. The remaining 80% is generally developed allowing for underfloor storage of floodwater by the use of suspended floor techniques such as pier and beam construction.

2. Where it is proposed to fill development sites, the fill does not impede the flow of ordinary drainage from neighbouring properties, including overland flow.

Note: Flood storage areas are identified on the flood information certificate.

4.01.03 Management of risk to property

Objectives

1. Manage risks to property up to an acceptable level of risk (the flood planning level).

Controls

1. Floor levels of all occupiable rooms of all buildings are not set lower than the FPL.

2. Garage floor levels are no lower than the 1% Annual Exceedance Probability Event. However, it is recognised that in some circumstances this may be impractical due to vehicular access constraints. In these cases, garage floor levels are as high as practicable.

3. Basement garages may be acceptable where all potential water entry points are at or above the probable maximum flood (PMF), excepting that vehicular entry points can be at the FPL. In these cases, explicit points of refuge are accessible from the carpark in accordance with the provisions for risk to life set out below.

4. Electrical fixtures such as power points, light fittings and switches are sited above the FPL unless they are on a separate circuit (with earth leakage protection) to the rest of the building.

5. Where parts of the building are proposed below the flood planning level, they are constructed of water-resistant materials.

6. Areas where cars, vans and trailers are parked, displayed or stored are not located in areas subject to property hazard of P2 or higher. Containers, bins, hoppers and other large floatable objects also are not stored in these areas. Heavy vehicle parking areas are not located in areas subject to property hazard P3 or higher.

7. Timber framed, light steel construction, cavity brickwork and other conventional domestic building materials are generally not suitable forms of construction where the property hazard is P4 or higher. Where property hazard is P4, the structure is certified by a practising structural engineer to withstand the hydraulic loads (including debris) induced by the flood waters.

8. Property hazards of P5 are generally unsuitable for any type of building construction and building is discouraged from these areas. Where building is necessary, the structure is certified by a practising structural engineer to withstand the hydraulic loads (including debris) induced by the flood waters.

Note: This provision limits the risk of inundation relative to the flood planning level (FPL). The FPL is the water surface level of the relevant 'planning flood' plus a freeboard. Compliance with the flood planning level does not guarantee that flooding will not affect work carried out in accordance with Risk to Property Development Controls: In most cases, the flood planning levels and the property hazards are given on the flood information certificate for the relevant property. The "planning flood" for all development in all areas of Newcastle is the 1% Annual Exceedance Probability event.

4.01.04 Management of potential risk to life

Objectives

1. Only permit new development or redevelopment where the full potential risk to life from flooding can be managed for all floods up to and including the PMF.

Controls

Risk to life category L5

1. Risk to life hazards of L5 are generally unsuitable for any type of building construction and building is discouraged from these areas. Reliable safe escape to high ground is likely not possible and normal building construction would likely suffer structural failure from the force of floodwaters, so that any people seeking refuge in the building would likely perish. Where building is necessary, the structure is certified by a practising structural engineer to withstand the hydraulic loads (including debris) induced by the flood waters.

Islands

2. The formation of islands in the floodplain during a flood is a potentially dangerous situation, especially when floods larger than the FPL totally inundate the island for an extended period. Development of such land is considered with great care.

On-site refuge

3. On-site refuge is to be provided for all development where the life hazard category is L4 unless the proposed development is less than 40m from the perimeter of the PMF extent and the higher ground is accessible.

> Note: Refuge can be in the form of on-site refuge or convenient access to flood free ground. In general, it is not acceptable to rely on refuge provided by or on other development sites. In all cases where on site refuge is provided, it is to be both intrinsically accessible to all people on the site and an integrated part of the development (eg a second storey with stair access). The route to the refuge is to be fail safe, plainly evident and self-directing. In most cases, life hazard categories are nominated on the flood information certificate for the relevant property.

Standards for on-site refuge

4. Where on-site refuge is required for a development, it should comply with the following minimum standards:

   (a) The minimum on-site refuge level is the level of the PMF. On-site refuges are designed to cater for the number of people reasonably expected on the development site and are provided with emergency lighting.

   (b) On-site refuges are of a construction type able to withstand the effects of flooding. Design certification by a practising structural engineer that the building is able to withstand the hydraulic loading due to flooding (at the PMF).

> Note: In most cases, the potential risk to life hazards categories are given on the flood information certificate for the relevant property.

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BMT WBM Bangalow
6/20 Byron Street, Bangalow 2479
Tel +61 2 6687 0466 Fax +61 2 66870422
Email bmtwbm@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Brisbane
Level 8, 200 Creek Street, Brisbane 4000
PO Box 203, Spring Hill QLD 4004
Tel +61 7 3831 6744 Fax +61 7 3832 3627
Email bmtwbm@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Denver
8200 S. Akron Street, #B120
Centennial, Denver Colorado 80112 USA
Tel +1 303 792 9814 Fax +1 303 792 9742
Email denver@bmtwbm.com
Web www.bmtwbm.com

BMT WBM London
International House, 1st Floor
St Katharine's Way, London E1W 1AY
Email london@bmtwbm.co.uk
Web www.bmtwbm.com

BMT WBM Mackay
Suite 1, 138 Wood Street, Mackay 4740
PO Box 4447, Mackay QLD 4740
Tel +61 7 4953 5144 Fax +61 7 4953 5132
Email mackay@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Melbourne
Level 5, 99 King Street, Melbourne 3000
PO Box 604, Collins Street West VIC 8007
Tel +61 3 8620 6100 Fax +61 3 8620 6105
Email melbourne@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Newcastle
126 Belford Street, Broadmeadow 2292
PO Box 266, Broadmeadow NSW 2292
Tel +61 2 4940 8882 Fax +61 2 4940 8887
Email newcastle@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Perth
Suite 6, 29 Hood Street, Subiaco 6008
Tel +61 8 9328 2029 Fax +61 8 9486 7588
Email perth@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Sydney
Level 1, 256-258 Norton Street, Leichhardt 2040
PO Box 194, Leichhardt NSW 2040
Tel +61 2 8987 2900 Fax +61 2 8987 2999
Email sydney@bmtwbm.com.au
Web www.bmtwbm.com.au

BMT WBM Vancouver
Suite 401, 611 Alexander Street
Vancouver British Columbia V6A 1E1 Canada
Tel +1 604 683 5777 Fax +1 604 608 3232
Email vancouver@bmtwbm.com
Web www.bmtwbm.com

Attachment F - Flora and Fauna Assessment

By RPS, dated March 2017

Flora and Fauna Assessment

Newcastle Urban Transformation and Transport Program
Rezoning of Surplus Rail Corridor Lands

Prepared by:

RPS AUSTRALIA EAST PTY LTD

PO Box 428
Hamilton NSW 2303

T: +61 2 4940 4200
F: +61 2 4961 6794
E: newcastle@rpsgroup.com.au

Client Manager: Arne Bishop
Report Number: PR129379
Version / Date: March 2017

Prepared for:

URBAN GROWTH NSW

c\- Elton Consulting
PO Box 1488
Level 6, 332-342 Oxford St
Bondi Junction NSW 1355
Edgeworth NSW 2285

T: (02) 9387 2600
M: 0400 953 317
E: jennyr@elton.com.au

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Approval for Issue

Name	Signature	Date
Arne Bishop		27-03-2017

Summary

RPS Australia East Pty Ltd (RPS) was engaged by Elton Consultants on behalf of UrbanGrowth NSW to provide a Flora and Fauna Assessment to inform the Newcastle Urban Transformation and Transport Program – Rezoning of Surplus Corridor Lands from Worth Place to Watt Street Newcastle.

The objective of this assessment was to provide a description of the terrestrial and aquatic habitats available within the site for both flora and fauna, determine the likelihood of occurrence of threatened species and their habitats as well as assessing the likelihood of the proposal to have a significant impact on any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (TSC Act). The report recognises the relevant requirements of the Environmental Planning and Assessment Act 1979 (EP&A Act) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (EP&AA Act).

Database searches were undertaken to identify existing records of threatened species, populations and endangered ecological communities occurring within the site and the surrounding locality. Flora and fauna surveys were undertaken across the site on 2-3 November 2015.

Flora surveys detected 26 flora species, most of which were exotic. No vegetation communities or threatened species were detected within the site.

A total of 14 fauna species were detected during surveys consisting primarily of common bird species. No threatened were fauna were detected during surveys.

Existing uses of the site as a rail corridor significantly reduce the available habitats for local flora and fauna. Only a small number of trees were found to occur within the site, and no surrounding fauna corridors are present due to the urbanised nature of the surrounding city. No aquatic habitats occur within the site.

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1.0 Introduction

RPS Australia East Pty Ltd (RPS) was engaged by Elton Consulting on behalf of UrbanGrowth Pty Ltd to provide a Flora and Fauna Assessment (FFA) to inform the Newcastle Urban Transformation and Transport Program – Rezoning of Surplus Corridor Lands. The following land holdings are contained within the corridor:

- Part Lot 22 DP1165985
- Lot 1 DP1192409
- Lot 1001 DP1095836
- Lot 21 DP1009735
- Lot 22 DP1009735

The corridor proposed for rezoning extends approximately 1.5 km from Worth Place to Watt Street, hereafter referred to as the 'site' (see **Figure 1**).

This assessment aims to examine the likelihood of the proposal to have a significant effect on any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (TSC Act). The report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (EP&AA Act). Preliminary assessment was also made with regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report has been based upon the proposed zoning under the Planning Proposal as submitted for Gateway determination, with the inclusion of Parcel 13. It is noted that this parcel has been removed from the current Planning Proposal in accordance with the Gateway determination as issued by the NSW Department of Planning and Environment. Nevertheless, for completeness, this report has considered the potential for some development occurring within this parcel in the future (subject to outcomes of a separate Planning Proposal). The recommendations of this report discuss whether there are any specific implications arising from this additional parcel.

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4. The aerial photography used in this plan has not been rectified. This image has been overlaid as a best fit on the boundaries shown and position is approximate only.

Legend

N

Corridor Boundary

Cadastre

Honeysuckle Dr
Settlement Ln
Wright Ln
Workshop Way
Merewether St
Centenary Rd
Argyle St
Wharf Rd
Hunter St
Scott St
Market St
Clown St
Theatre Lane
King St
Thorn St
Laing St
Morgan St
Worth Pl
Wheeler Pl
Burwood St
Christie St
Union Lane
Lawers Lane
Auckland St
Carlton St
Perkins St
Noster Pl
Bolton St
Watt St
Pacific St
King St
John St
Gibson St
Charles St
Laman St
Hamilfords Lane
Hooker Av
Darby St
McCormack Av
Brown St
Lee Tce
Wolfe St
Newcomen St
Church St
Tyrrell St
Marine View
Queen St
Corlette St
Bruce St
Glovers Lane
Dawson St
Council St
Railway St
Swan St
Kitchener Pde
Barker St
Pit St
Bull St

100 50 0 100 200 m

SCALE: 1:4,000 AT A3 SIZE

TITLE : **FIGURE 1: SITE LOCATION**

LOCATION : **NEWCASTLE**

DATUM:GDA 1994

PROJECTION: GDA 1994 MGA Zone 56

DATE : **9/03/2017**

PURPOSE: **ECOLOGY**

VERSION (PLAN BY): C A3 (Natalie.Wood)

PATH: J:\JOBS\129k\129379 Newcastle Heavy Rail Corridor\10 - Drafting\Arcgis Map Documents\Eco\129379 Figure 1 Site Location C A3 20170309.mxd

CLIENT: **ELTON CONSULTING**

JOB REF: **PR129379**

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

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1.2 Site Particulars

Locality	Newcastle to Civic, NSW (Refer to **Figure 1**).
LGA	Newcastle City Council.
Area	The site is 4.2 hectares in total, and approximately 2.1km in length.
Zoning	The land is currently zoned as Special Purpose Infrastructure (SP2).
Boundaries	The site is a disused rail corridor that dissects Newcastle from Worth Place to Watt Street, running parallel to Hunter Street. It is bordered by a combination of commercial and residential buildings and road infrastructure.
Current Land Use	At the time of inspection, the site supported a disused rail corridor with existing infrastructure including rail lines, overhead powerlines, disused control buildings and train platforms. The existing rail corridor has since been removed.
Topography	The site is situated on flat land.
Hydrology	At the closest point, the site is located approximately 50 metres south of Newcastle Harbour. No hydrological features occur within the site.
Vegetation	Native vegetation within the site is highly restricted, with weeds and garden plants the dominant vegetation present.

1.3 Description of the Proposal

The proposed zoning amendments applying to the rail corridor land will form part of the delivery of urban transformation, comprising a package of transport, built form and public domain improvements in and around the rail corridor lands.

The Newcastle Urban Renewal Strategy (NURS) sets out the NSW Government's long term approach and vision for the revitalisation of Newcastle city centre to the year 2036.

The NURS identifies three character precincts in Newcastle city centre (West End, Civic and East End), within which significant housing and employment opportunities, together with built form and public domain changes and improvements exist. The NURS describes these precincts as:

- East End: residential, retail, leisure and entertainment
- Civic: the government, business and cultural hub of the city
- West End: the proposed future business district including the western end of Honeysuckle (Cottage Creek)

UrbanGrowth NSW has been directed by NSW Government to deliver on NURS through the Program, in partnership with Transport for NSW (TfNSW), the Hunter Development Corporation (HDC) and the City of Newcastle Council (Council). Necessary amendments to the NLEP include:

- amending the Land Use Zoning Map to introduce B4 Mixed Use, SP3 Tourism and RE1 Public Recreation zones to sites along the corridor; and
- amending the Height of Building and Floor Space Ratio maps to apply appropriate development standards to selected parcels of land.

1.4 Scope of the Study

The scope of this flora and fauna assessment is to:

- identify vascular plant species occurring within the site, including any threatened species listed under the TSC Act and/or EPBC Act;
- identify and map the extent of vegetation communities within the site, including any Endangered Ecological Communities (EEC) listed under the TSC Act or EPBC Act;
- identify any fauna species including; threatened and migratory species, populations or their habitats, occurring within the Site and are known or likely to occur within 10 km of the site (locality);
- assess the potential of the proposed development to have a significant impact on any threatened species, populations or ecological communities (or their habitats) identified from the site; and
- describe measures to be implemented to avoid, minimise, manage or monitor potential impacts of the proposal.

1.5 Legislation and Policy

1.5.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the EPBC Act as matters of National Environmental Significance (NES). Matters of NES identified in the Act include:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Threatened species and communities.
- Migratory species protected under international agreements.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear Actions.
- Protection of water sources from coal seam gas development.

Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of NES require approval from the Australian Government Minister for Sustainability, Environment, Water, Population and Communities (the Minister).

1.5.2 NSW Threatened Species Conservation Act 1995

The NSW *Threatened Species Conservation Act 1995* (TSC Act) provides for the protection and management of threatened species, populations and ecological communities listed under the schedules 1, 1A and 2 of the Act. The purpose of the TSC Act is to:

- Conserve biological diversity and promote ecologically sustainable development.
- Prevent the extinction and promote the recovery of threatened species, populations and ecological communities.
- Protect the critical habitat of those species, populations and ecological communities that are endangered.
- Eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities.

- Ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed.
- Encourage the conservation of threatened species, populations and ecological communities through co-operative management.

1.5.3 NSW Environmental Planning and Assessment Act 1979

The proposal will be submitted for approval under Part 3 of the Environmental Planning and Assessment Act 1979 (EP&A Act), which provides an amendment to the Local Environment Plan (LEP).

1.5.4 SEPP 44 (Koala Habitat Protection)

Schedule 2 of State Environmental Planning Policy (SEPP) No. 44 – 'Koala Habitat Protection' aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range, and reverse the current state trend of koala population decline. SEPP 44 applies to the Newcastle LGA.

1.6 Qualifications and Licensing

Qualifications

This report was written by Lauren Eather BSc and reviewed by Arne Bishop B. Env Sc. of RPS. The academic qualifications and professional experience of all RPS consultants involved in the project are documented in **Appendix 4**.

Licencing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence S100536 (Valid 31 December 2015);
- Animal Research Authority (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2016);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2016); and

Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 22 May 2017).

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Legend

N

Proposed Parcel Plan

Proposed Zoning

- B4 - Mixed Use
- RE1 - Public Recreation
- SP2 - Infrastructure
- SP3 - Tourist

Parcel 01
Parcel 02
Parcel 03
Parcel 04
Parcel 05
Parcel 06
Parcel 07
Parcel 08
Parcel 09
Parcel 10
Parcel 11
Parcel 12
Parcel 13
Parcel 14
Parcel 15

Honeysuckle Dr
Settlement Ln
Wright Ln
Workshop Way
Merewether St
Centenary Rd
Argyle St
Wharf Rd
Hunter St
Scott St
Market St
Crown St
Theatre Lane
King St
Thorn St
Laing St
Morgan St
Worth Pl
Union Lane
Lauers Lane
Auckland St
Christie St
Wheeler Pl
Burwood St
Carlton St
Parkins St
Nobbys Rd
Bolton St
Watt St
Newcomen St
Wolfe St
Lee Tce
Brown St
McCormack Av
Darby St
John St
Gibson St
Charles St
Laman St
Hooker Av
Hamilfords Lane
Church St
Tyrrell St
Marine View
Queen St
Corlette St
Bruce St
Glovers Lane
Dawson St
Council St
Railway St
Swan St
Kitchener Pde
Barker St
Burl St
Pit St

100 50 0 100 200
m

SCALE: 1:4,000 AT A3 SIZE

TITLE : **FIGURE 2: PROPOSED REZONING**	LOCATION : **NEWCASTLE**	DATUM:GDA 1994 PROJECTION: GDA 1994 MGA Zone 56	DATE : **9/03/2017** PURPOSE: **ECOLOGY**	VERSION (PLAN BY): F A3 (Natalie.Wood) PATH: J:\JOBS\129k\129379 Newcastle Heavy Rail Corridor\10 - Drafting\Arcgis Map Documents\Eco\129379 Figure 2 Prop Rezoning F A3 20170309.mxd

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JOB REF: **PR129379**

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

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2.0 Methodology

Field work was undertaken on the 2-3 November 2015 by an RPS Ecologist. The survey methodology outlined below was developed in recognition of the highly disturbed nature of the site.

2.1 Desktop Assessment

2.1.1 Literature Review

A review of relevant information was undertaken to provide an understanding of ecological values occurring or potentially occurring on the site and locality (i.e. within 10km of the site). Information sources reviewed included:

- Review of fauna and flora records contained in the Office of Environment and Heritage (OEH 2015) Atlas of NSW Wildlife within a 10 km radius of the site; and
- Review of fauna and flora records contained in the Department of the Environment, (DoE 2015) Protected Matters Search within a 10 km radius of the site.

2.1.2 Weather Conditions

The prevailing weather conditions during the site survey period are presented in **Table 1** below.

Table 1 Prevailing Weather Conditions*

Date	Minimum Temperature (°C)	Maximum Temperature (°C)	Rain (mm)	Sunrise-Sunset	Moon Rise-Moon Set
2 Nov 2015	19.3	30.1	1.8	05:23-18:49	00:04-10:53
3 Nov 2015	20.0	21.5	1.6	05:23-18:50	00:50-11:49

*Sources: http://www.bom.gov.au/climate/dwo/201511/html/IDCJDW2097.201511.shtml
http://www.ga.gov.au/bin/geodesy/run/gazmap_sunrise?placename=cooranbong&placetype=0&state=0
http://www.ga.gov.au/bin/geodesy/run/gazmap_moonrise?placename=Cooranbong&placetype=0&state=0#loc

2.2 Flora Survey

2.2.1 Vegetation Mapping

Desktop analysis of regional mapping of the site and its surrounds was informed by large-scale vegetation mapping projects and aerial photography, including:

- Preliminary consultation of the Lower Hunter & Central Coast Regional Environmental Management Strategy (LHCCREMS) Extant Vegetation of the Lower Hunter and Central Coast Map (NPWS 2003) to determine the broad categorisation of the site; and
- Aerial Photograph Interpretation (API) and consultation of topographic map (Scale 1:25,000) of the site.

2.2.2 General Flora Survey

Due to the linear and highly disturbed nature of the site, the approach taken to assess flora within the site was to document the presence of weeds and remaining native species as opposed to a full botanical survey as outlined in section 3.1.19 of the draft Threatened Biodiversity Survey and Assessment Guidelines (DEC 2004). The site was traversed by foot using the random meander technique over its entire length.

The location of the random meander is shown in **Figure 3** and a flora list is contained within **Appendix 1**.

2.3 Fauna Survey

With consideration to the disturbed nature of the site, fauna survey methods included the use of Anabats and opportunistic surveys during fieldwork.

2.3.1 Avifauna

The observation of avifauna within the site was undertaken via opportunistic census during diurnal fieldwork. Other features, such as evidence of breeding, dominant species etc. were also noted. Threatened species that have been previously recorded in the locality were specifically targeted during surveys.

2.3.2 Microchiropteran Bats

Microbat echolocation calls were recorded using Anabat II Detector and CF ZCAIM units set to remotely record for the entire night (6pm to 6am). The site had one night of sampling using two Anabat units, with emphasis placed on those areas deemed likely to provide potential roosting and flyway sites for microbats. The locations of the Anabat sites are shown in **Figure 3**.

Bat call analysis was undertaken by Dr Anna McConville of Echo Ecology who is experienced in the analysis of bat echolocation calls. Each call sequence ('pass') was assigned to one of three categories, according to the confidence with which an identification could be made, being:

- Definite - Pass identified to species level and could not be confused with another species;
- Probable - Pass identified to species level and there is a low chance of confusion with another species; or
- Possible - Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species.

Appendix 3 shows the Anabat reports with all results whilst **Figure 3** shows the Anabat locations.

2.3.3 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted. Specifically, the following indicators were sought:

- Distinctive scats left by mammals;
- Scratch marks made by various types of arboreal animals;
- Nests made by various guilds of birds;
- Feeding scars on Eucalyptus trees made by Gliders;
- Whitewash, regurgitation pellets and prey remains from Owls;
- Aural recognition of bird and frog calls;
- Skeletal material of vertebrate fauna; and
- Searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, and diggings).

2.4 Habitat Survey

An assessment of the relative habitat value present within the site was undertaken. This assessment focused primarily on the identification of specific habitat types and resources in the site favoured by known

threatened species from the locality. The assessment also considered the potential value of the Site (and surrounds) for all major guilds of native flora and fauna. Habitat assessment included:

- presence, size and types of tree hollows;
- presence of rocks, logs, caves, rocky outcrops, leaf litter, overhangs and crevices;
- vegetation complexity, structure and quality;
- presence of freshwater or estuarine aquatic habitats, noting permanency;
- connectivity to adjacent areas of habitat;
- extent and types of disturbance;
- presence of foraging opportunities such as flowering eucalypts, fruits, seeds or other nectar bearing native plants; and
- presence and abundance of various potential prey species.

Habitat assessment was based on the specific habitat requirements of each threatened fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.

2.5 Survey Limitations

The flowering and fruiting plant species that attract some nomadic or migratory threatened species, often fruit or flower in cycles spanning a number of years. Furthermore, these resources might only be accessed in some areas during years when resources more accessible to threatened species fail. As a consequence, threatened species may be absent from some areas where potential habitat exists for extended periods and this might be the case for the above-mentioned opportunistic species. This limitation has been reduced to some extent by the large amount of survey work that has been undertaken throughout the local area, as well as local knowledge of species occurrence.

In these instances, a precautionary approach has been adopted; as such ‘assumed presence’ of known and expected threatened species, populations and ecological communities has been made where relevant and scientifically justified to ensure a holistic assessment.

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Legend

- Corridor Boundary
- Anabats
- Flora Transects

N

Honeysuckle Dr
Settlement Ln
Wright Ln
Workshop Way
Merewether St
Centenary Rd
Argyle St
Wharf Rd
Hunter St
Scott St
Crown St
Theatre Lane
Market St
King St
Thorn St
Laing St
Morgan St
Bolton St
Watt St
Newcomen St
Lee Tce
Wolfe St
Brown St
Perkins St
Nobbs Pl
Carlton St
Worth Pl
Wheeler Pl
Burwood St
Christie St
Union Lane
Lauers Lane
Auckland St
John St
Gibson St
Charles St
Laman St
Hooker Av
Hamilfords Lane
Darby St
McGormack Av
Church St
Tyrrell St
Marine View
Queen St
Corlette St
Bruce St
Glovers Lane
Dawson St
Council St
Railway St
Swan St
Kitchener Pde
Barker St
Pit St
Bull St

100 50 0 100 200 m

SCALE: 1:4,000 AT A3 SIZE

TITLE : **FIGURE 3: FLORA AND FAUNA SURVEY LOCATIONS**

LOCATION : **NEWCASTLE**

DATUM:GDA 1994

PROJECTION: GDA 1994 MGA Zone 56

DATE : **9/03/2017**

PURPOSE: **ECOLOGY**

VERSION (PLAN BY): D A3 (Natalie.Wood)

PATH: J:\JOBS\129k\129379 Newcastle Heavy Rail Corridor\10 - Drafting\Arcgis Map Documents\Eco\129379 Figure 3 F& F D A3 20170309.mxd

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3.0 Results

3.1 Desktop Assessment

The results from the EPBC Protected Matters and NSW Wildlife Atlas searches identified 15 threatened flora species, 47 threatened fauna species, three ecological communities (**Table 2**) and eight terrestrial migratory species (**Table 3**) as having been recorded or having the potential to occur within a 10 km radius of the study area. A likelihood of occurrence assessment is provided in Section 5. The inclusion of marine and aquatic fauna for the purpose of this assessment is not required and therefore has not been included in the results.

Table 2 Threatened Flora and Fauna Desktop Search Results

Family	Scientific name	Common name	TSC Act	EPBC Act	Records within 10 km
Flora					
Asteraceae	*Rutidosis heterogama*	Heath Wrinklewort	V	V	11
Elaeocarpaceae	*Tetratheca juncea*	Black-eyed Susan	V	V	51
Fabaceae (Faboideae)	*Pultenaea maritima*	Coast Headland Pea	V	-	4
Myrtaceae	*Eucalyptus camfieldii*	Camfield's Eucalypt	V	V	0
	Eucalyptus parramattensis subsp. *decadens*	Earp's Gum	V	V	3
	Melaleuca biconvexa	Biconvex Paperbark	V	V	1
	Syzygium paniculatum	Magenta Lilly Pilly	E	V	1
Orchidaceae	*Cryptostylis hunteriana*	Leafless Tongue-orchid	V	V	0
	Diuris praecox	Rough Doubletail	V	V	14
	Pterostylis gibbosa	Illawarra Greenhood	E	E	0
	Phaius australis	Lesser Swamp-orchid		E	0
Polygonaceae	*Muehlenbeckia costata*	Scrambling Lignum	V	-	1
Proteaceae	*Grevillea parviflora subsp. parviflora*	Small-flower Grevillea	V	V	0
	Grevillea shiressii	-	V	V	1
Zannichelliaceae	*Zannichellia palustris*	-	E	-	23
Birds					
Anseranatidae	*Anseranas semipalmata*	Magpie Goose	V	-	7
Columbidae	*Ptilinopus superbus*	Superb Fruit-Dove	V	-	2
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E	-	30
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E	E	11
Accipitridae	*Circus assimilis*	Spotted Harrier	V	-	3
	Hieraaetus morphnoides	Little Eagle	V	-	1
	Pandion cristatus	Eastern Osprey	V	M	12
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E	-	3
Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	V	-	19
	Haematopus longirostris	Pied Oystercatcher	E	-	27
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	E	CE, M	1,907
	Calidris tenuirostris	Great Knot	V	-	33

Family	Scientific name	Common name	TSC Act	EPBC Act	Records within 10 km
	Limicola falcinellus	Broad-billed Sandpiper	V	-	41
	Limosa limosa	Black-tailed Godwit	V	-	290
	Numenius madagascariensis	Eastern Curlew	-	CE, M	138
	Xenus cinereus	Terek Sandpiper	V	-	473
Charadriidae	*Charadrius leschenaultii*	Greater Sand-plover	V		6
	Charadrius mongolus	Lesser Sand-plover	V		178
Jacanidae	*Irediparra gallinacea*	Comb-crested Jacana	V	-	2
Rostratulidae	*Rostratula australis*	Australian Painted Snipe	E	E	0
Pardalotidae	*Dasyornis brachypterus*	Eastern Bristlebird	E	E	0
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V	-	2
	Grantiella picta	Painted Honeyeater	V	V	0
	Lathamus discolor	Swift Parrot	E	E	1
	Neophema pulchella	Turquoise Parrot	V	-	2
Strigidae	*Ninox strenua*	Powerful Owl	V	-	13
Tytonidae	*Tyto longimembris*	Eastern Grass Owl	V	-	1
	Tyto novaehollandiae	Masked Owl	V	-	1
Meliphagidae	*Epthianura albifrons*	White-fronted Chat	V	-	57
	Anthochaera phrygia	Regent Honeyeater	CE	CE	0
Frogs					
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E	V	745
	Litoria littlejohni	Littlejohn's Tree Frog	V	V	0
Reptiles					
Elapidae	*Hoplocephalus bungaroides*	Broad-headed Snake	E	V	0
Mammals					
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	0
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	3
Potoroidae	*Potorous tridactylus tridactylus*	Long-nosed Potoroo	-	V	0
Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V	-	2
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	34
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V	-	3
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V	-	13
Vespertilionidae	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V	-	1
	Myotis macropus	Southern Myotis	V	-	12
	Chalinolobus dwyeri	Large-eared Pied Bat	V	V	0
	Miniopterus australis	Little Bentwing-bat	V	-	11
	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	15
	Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	10
Muridae	*Pseudomys novaehollandiae*	New Holland Mouse	-	V	0

Family	Scientific name	Common name	TSC Act	EPBC Act	Records within 10 km
Ecological Communities					
Subtropical and Temperate Coastal Saltmarsh (EPBC)			E	V	0
Central Hunter Valley Eucalypt Forest and Woodland			E	CE	0
Lowland Rainforest of Subtropical Australia			E	CE	0

Note: V = Vulnerable
E = Endangered
CE = Critically Endangered
M = Migratory

Table 3 Potentially Occurring Migratory Terrestrial Species

Scientific Name	Common Name	EPBC Act Status
Cuculus optatus	Oriental Cuckoo	M
Hirundapus caudacutus	White-throated Needletail	M
Merops ornatus	Rainbow Bee-eater	M
Monarcha melanopsis	Black-faced Monarch	M
Monarcha trivirgatus	Spectacled Monarch	M
Motacilla flava	Yellow Wagtail	M
Myiagra cyanoleuca	Satin Flycatcher	M
Rhipidura rufifrons	Rufous Fantail	M

3.2 Flora Survey

Flora surveys detected a total of 26 flora species across the site, of which 17 were exotic and nine were native species. No threatened species were detected, and due to the disturbed nature of the site, no vegetation communities exist within the site boundaries. A full inventory of recorded flora species is included in **Appendix 1**.

3.2.1 Vegetation Mapping

A review of regional mapping - 'Lower Hunter & Central Coast Regional Environmental Management Strategy (LHCCREMS)' resulted in no vegetation communities having been mapped as occurring within the site. This was evident during the site inspection as only sporadic urban trees and weeds were identified within the site (refer to **Plates 1** and **2**).



Plate 1 Existing rail within the site



Plate 2 Infrastructure within the site, highlighting the lack of vegetation and habitat

3.3 Fauna Survey

The following sections provide the results of the fauna surveys undertaken for the Project throughout the site. Survey techniques employed to determine the composition of fauna species on site resulted in a total of 14 species being detected including; 11 bird, one reptile and two microbat species. A full list of the fauna species recorded within the site is provided in **Appendix 2**. The results for each group are discussed further below.

3.3.1 Avifauna

A total of 11 bird species were recorded during field surveys. The most commonly recorded bird was the feral Rock Dove (*Columba livia*) which was observed regularly throughout the site inspection. Native birds including the Masked Lapwing (*Vanellus miles*) and Australian Magpie (*Cracticus tibicen*) were observed, and a dead Pied Cormorant (*Phalacrocorax varius*) was detected on the tracks.

No threatened bird species were recorded on site.

An inventory of fauna species recorded on site is provided in **Appendix 2**.

3.3.2 Herpetofauna

One reptile was detected on site, specifically the Dark-flecked Garden Skink (*Lampropholis delicata*) which was seen in moderate numbers throughout the site inspection, residing in the rocky substrate of the tracks.

No threatened reptile or amphibian species were detected on site during surveys.

3.3.3 Microchiropteran Bats

A total of two microbat species were detected via the use of Anabat echo-location call recorders. Both species were common species including Gould's Wattled Bat (*Chalinolobus gouldii*) and White-striped Free-tailed Bat (*Tadarida australis*).

Refer to **Appendix 2** for a detailed list of recorded species and **Appendix 3** for the Anabat Call Recording reports.

3.4 Habitat Survey

Flora and fauna habitats are extremely limited within the site, as a result of its most recent use as an active railway corridor. A small number of individual trees were identified within the corridor, none of which were hollow bearing species. The trees do however provide foraging resources for local bird and microbat species when in flower. Flora is limited to primarily weedy ground cover, which provides limited resources for most fauna. Dark-flecked Garden Skinks were observed inhabiting the rocky substrate throughout the site, which may provide a food source for common predatory bird species.

Artificial structures including the existing platforms, bridges and buildings provide suitable habitat for numerous microbat species that are known to occur in the area and reside in man-made structures. Results detected two common microbat species, however no threatened species were detected within the site.

Habitat corridors are absent from the surrounding areas due to the urbanised nature of the surrounding city. Subsequently, use of the site by most fauna is highly limited, with only highly mobile species having access to the site.

No arboreal habitats and no aquatic habitats occur within the site.

3.5 State Environmental Planning Policy No. 44 (Koala Habitat Protection)

Assessment of potential koala habitat under SEPP 44 requires the following steps be undertaken:

(a) Identification of 'potential Koala habitat' within the proposed development area; if the total tree cover contains 15% or more of the Koala food tree species listed in Schedule 2 of SEPP 44 then it is deemed to be 'potential Koala habitat'. Identification of 'potential Koala habitat requires the determination of the presence of 'core Koala habitat';

(b) Identification of 'core Koala habitat' within the development area. 'Core Koala habitat' is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (females with young), recent sightings and historical records of a Koala population;

(c) Identification of 'core Koala habitat' will require that a plan of management must accompany the DA application;

(d) If the rezoning of lands, other than to environmental protection, involves potential or core Koala habitat then the Director of planning may require a local environmental study be carried out.

No Koala Feed trees listed under Schedule 2 of SEPP 44 were identified within the site. The site contains almost no vegetation and is situated within a highly urbanised city environment. Therefore, the site does not contain potential or core koala habitat.

4.0 Impact Assessment

The proposal involves a zoning change from its current zoning SP2 Special Purpose Infrastructure to B4 Mixed Use, SP3 Tourist and RE1 Public Recreation zones. Although the change of zoning will permit an alternate type of development to be constructed within the site, the current nature of the site in terms of habitat availability for local flora and fauna will not be decreased. As previously discussed, habitats within the site are incredibly disturbed and in parts non-existent. Based on this, the rezoning will enhance, if anything, the current state of the available habitats by providing green space areas including trees, grass and shrubs in which local fauna can forage.

As no threatened flora and fauna were detected during surveys and their presence is considered unlikely, impacts as a result of the proposed rezoning are not expected to be significant, particularly with an improved outcome of additional green spaces.

5.0 Threatened Species and Communities Likelihood of Occurrence Assessment

Threatened flora and fauna species (listed under the TSC Act 1995 and/or EPBC Act 1999) that have been gazetted and recorded within a 10 km radius of the site have been considered within this assessment. Endangered Ecological Communities (EECs) known from the broader area have also been addressed. Each species / community is considered for its potential to occur within the site.

This assessment deals with the following heads of consideration in tabulated form (refer to **Table 4** overleaf):

'Species / Community'/ Population' – Lists each threatened species / population / EEC with potential to occur within the project area. The status of each threatened species or community under the TSC Act 1995 and EPBC Act 1999 are also provided.

'Habitat Description' – Provides a brief account of the species / community / population and the preferred habitat attributes required for the existence / survival of each species / community.

'Likelihood of Occurrence within the site – Assesses the likelihood of each species / community to occur along or within the immediate vicinity of the site in terms of the aforementioned habitat description. This assessment also takes into account local habitat preferences, results of current field investigations, data gained from various sources (such as OEH Atlas of NSW Wildlife, HBOC records etc) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'**Potential for Impact'** – Assesses the potential of each species/community/population to be impacted within the site.

Table 4 Threatened Species/Communities Assessment Table

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
Plants			
Rutidosis heterogama Heath Wrinklewort (V, V*)	This small herb has been recorded from near Cessnock to Kurri Kurri with an outlying occurrence at Howes Valley. On the coast it is located north from Wyong to Newcastle. It grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Tetratheca juncea Black-eyed Susan (V, V*)	Occurs in a variety of forested and heathy habitats. Locally found in Open Forests and Woodlands with dense, undisturbed understorey, often in association with *Angophora costata* / *Corymbia gummifera* on slopes with south-easterly aspects.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Pultenaea maritima Coast Headland Pea (V)	This species occurs in NSW and QLD. In NSW it has been recorded from Newcastle north to Byron Bay. Occurs in grasslands, shrublands and heath on exposed coastal headlands and adjoining low coastal heath.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Eucalyptus camfieldii Camfield's Stringybark (V, V*)	A small/ medium sized tree with a scattered distribution from Waterfall in the south to Raymond Terrace in the north. Occurs in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone or coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of E. *oblonga* (Narrow-leaved Stringybark), *E. capitellata* (Brown Stringybark) and *E. haemastoma* (Scribbly Gum).	All canopy trees within the site were identified and this species was not detected. It is **unlikely** to occur the site	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Eucalyptus parramattensis subsp. *decadens* Earp's Gum (V, V*)	Red Gum species that grows in dry sclerophyll woodland on sandy soils, often in low damp sites. Locally this species occurs almost exclusively in association with Kurri Sand Swamp Woodland (KSSW) and ecotonal areas.	All canopy trees within the site were identified and this species was not detected. It is **unlikely** to occur within the site.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Melaleuca biconvexa Biconvex Paperbark (V, V*)	A shrub to small tree, which grows in poorly drained areas on the Central Coast with outlying populations at Jervis Bay and Port Macquarie. Records in the Hunter Region are confined to western Lake Macquarie. It may occur in dense stands adjacent to watercourses, in association with other Melaleuca species or as an understorey species in wet forest.	All canopy trees within the site were identified and this species was not detected. Additionally, suitable habitat for this species was not present. It is **unlikely** to occur within the site.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Syzygium paniculatum Magenta Lilly Pilly (E, V*)	A shrub to small tree, found in sub-tropical and littoral rainforest on sandy soils or sheltered gullies mostly near water courses. Distributed between Bulahdelah and Jervis Bay. Hunter Region records are confined to the Lake Macquarie hinterland.	All canopy trees within the site were identified and this species was not detected. Additionally, suitable rainforest habitats for this species were not present. It is **unlikely** to occur within the site.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Cryptostylis hunteriana Leafless Tongue-orchid (V, V*)	A very rare leafless, saprophytic orchid, which has a symbiotic relationship with a mycorrhizal fungi which provides the plant with all its nutrient requirements. This orchid remains underground for the majority of its lifecycle, flowering periodically, when conditions are optimal to reproduce. This species is extremely cryptic as it does not flower every year. This species is known to occur within a range of habitats including woodlands to swamp heaths. Within the Hunter region, larger populations have been typically found in woodland dominated by *Eucalyptus racemosa* (Scribbly Gum) and prefer areas with an open grassy understorey.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Diuris praecox Rough Doubletail (V, V*)	A small, terrestrial herb which grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Exists as subterranean tubers most of the year and produces leaves and flowers in winter. In the Hunter Valley, this species has been recorded in *Corymbia maculata* (Spotted Gum) - *Eucalyptus fibrosa* (Ironbark) open forest, *Eucalyptus pilularis* (Blackbutt) open forest, *Eucalyptus haemastoma* (Scribbly Gum) woodland, *Eucalyptus piperita* (Sydney Peppermint) - *Angophora costata* (Smooth-barked Apple) forest as well as *Eucalyptus tereticornis* (Forest Red Gum), *Melaleuca* and *Casuarina glauca* dominated riparian or swamp areas.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Pterostylis gibbosa Illawarra Greenhood (V, V*)	Ground-dwelling orchid which grows in open forest or woodland on flat or gently sloping land with poor drainage. It is a deciduous orchid that is only visible above the ground between late summer and spring, only when soil moisture levels can sustain its growth. In the Hunter region, the species grows in open woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), *Eucalyptus tereticornis* (Forest Red Gum) and *Callitris endlicheri* (Black Cypress Pine). Only five locations are known for this species, one of those being located in Milbrodale in the Hunter Valley.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Phaius australis Lesser Swamp-orchid (E, E*)	This terrestrial orchid occurs in southern Queensland and northern NSW, with known populations occurring in Byron Bay, South Byron bay, South Ballina, SW Yamba, Grafton and Coffs Harbour. This species is associated with coastal wet heath/sedgeland wetlands, swampy grasslands or swampy forest.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Muehlenbeckia costata Scrambling Lignum (V)	In NSW, this species occurs from northern NSW to the Blue Mountains. It grows in coarse sandy soils and peat in heath, mallee and open eucalypt woodland on granite or acid volcanic outcrops at higher altitudes.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Grevillea parviflora subsp. *parviflora* Small-flower Grevillea (V, V*)	Occurs in light, clayey soils in woodlands. Most plants appear capable of suckering from a rootstock. Relatively widespread within the Cessnock LGA. Occurs within Werakata National Park. Much confusion surrounds the taxonomy of this species and other similar Grevillea taxa and a NPWS-funded study of the species is currently in progress.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Grevillea shiressii (V, V*)	This species is known from only two populations neat Gosford on tributaries of the lower Hawkesbury River. Both populations occur in the Gosford LGA. Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
Zannichellia palustris (E)	This species is a submerged aquatic plant known from the lower Hunter and in Sydney Olympic Park. Grows in fresh or slightly saline stationary or slowly flowing waters.	Flora surveys did not detect this species within the site and suitable habitat for this species is not present on site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Amphibians			
Litoria aurea Green and Golden Bell Frog (E, V*)	Inhabits swamps, lagoons, streams and ponds as well as dams, drains and storm water basins. Thought to be displaced from more established study areas by other frog species, thus explaining its existence on disturbed study areas. Previously widespread within the region, but now sparsely distributed within the Lower Hunter and Central Coast areas. A relatively stable population occurs on Kooragang Island.	No aquatic habitat exists within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Litoria littlejohni Littlejohn's Tree Frog (V, V*)	A pale brown frog with dark speckles which occurs along permanent rocky creeks with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. Occurs on the plateaus and eastern plains of the Great Dividing Range. Records within the Hunter Region occur from within the Watagan State Forest.	No aquatic habitat exists within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Reptiles			
Hoplocephalus bungaroides Broad-headed Snake (E, V*)	Largely confined to Triassic sandstones, including the Hawkesbury, Narellan and Shoalhaven formations, within the coast and ranges. Nocturnal, sheltering in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer.	No Hawkesbury sandstone or rocky habitat exists within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Avifauna			
Anseranas semipalmata Magpie Goose (V)	Within NSW, populations disappeared by 1880, however, since 1982 the species has been recorded in Macquarie Marshes (central NSW) and in Seaham Swamp on the Williams River (Lower Hunter Valley). Found on shallow wetlands (especially those with a dense growth of rushes or sedges), drying ephemeral swamps, wet grasslands and floodplains, often roosting in fringing Paperbarks (*Melaleuca* spp.). The diet of this species is composed of grass seeds and sedge rhizomes.	No suitable swamp or floodplain habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Ptilinopus superbus Superb Fruit-Dove (V)	Occurs in rainforest and similar closed forests including, monsoon forest, regrowth, lantana thickets, woodland adjoining rainforest at all altitudes.	No rainforest habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Ephippiorhynchus asiaticus Black-necked Stork (V)	Inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds. Within the Hunter Region it occurs spasmodically on freshwater or estuarine wetlands, along coastal and near coastal environments such as Gloucester.	No bodies of water suitable for this species occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Botaurus poiciloptilus Australasian Bittern (E, E*)	The distribution of this species ranges from south-east Queensland to south-east South Australia, Tasmania and south-west of Western Australia. Preferred habitat includes permanent and seasonal freshwater habitats. It forages in shallow water in wetlands with tall dense vegetation.	No aquatic habitat occurs within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Circus assimilis Spotted Harrier (V)	Occurs throughout the Australian mainland, except in densely forests or wooded habitats of the coast, escarpments and ranges. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including *Acacia* and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	No suitable vegetation occurs within the site that offers feeding or roosting habitat for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Hieraaetus morphnoides Little Eagle (V)	Can be found across most of Australia, but more commonly found near coastal to inland regions in NSW and Victoria. This species is part-migratory to nomadic and dispersive in some areas.	No suitable vegetation occurs within the site that offers feeding or roosting habitat for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Pandion cristatus Eastern Osprey (V, M*)	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern NSW coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south eastern Australia. There are a handful of records from inland areas.	No suitable vegetation occurs within the site that offers feeding or roosting habitat for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Burhinus grallarius Bush Stone-curlew (E)	Prefers open woodland, dry watercourses with fallen branches, leaf litter and sparse grass. Also occurs in coastal scrub, mangrove fringes, golf courses, rail reserves, wooded remnants on roadsides, orchards and plantations. Breeding pairs observed in near shore habitats in south-western Port Stephens and Brisbane Waters.	No suitable vegetation occurs within the site that offers feeding or roosting habitat for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Haematopus fuliginosus Sooty Oystercatcher (V)	Sooty Oystercatchers are found around the entire Australian coast, including offshore islands. This species occurs in small numbers distributed evenly along the NSW coast. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	No suitable coastal or estuarine habitats occur within the site for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Haematopus longirostris Pied Oystercatcher (E)	An unmistakable coastal black and white wader that has a bright orange-red bill, eye-ring and iris, and coral pink legs and feet. This species is found around the entire Australian coastline (and offshore). This species occurs in association with intertidal flats of inlets and bays, open beaches and sandbanks.	The site does not contain suitable aquatic environments for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
Rostratula australis Australian painted Snipe (E, EM*)	A small freshwater and estuarine wader, which prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. This species has been recorded in Pambalong N.R., Ash Island and Lenaghan's Flat.	No suitable aquatic habitats occur within the site for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Calidris ferruginea Curlew Sandpiper (E, M*)	Curlew Sandpipers generally occur on intertidal mudflats in coastal areas such as estuaries bays inlets and lagoons. Have also been located on lakes, dams, waterholes and sewage farms. Forages in mudflats and nearby shallow waters.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Calidris tenuirostris Great Knot (V)	In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. They are occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. The Great Knot rarely occurs on inland lakes and swamps. Typically, the Great Knot roosts in large groups in open areas, often at the water's edge or in shallow water close to feeding grounds. It is known that in hot conditions, waders prefer to roost where a damp substrate lowers the local temperature. A group of approximately 8610 birds have been recorded roosting at an inland claypan near Roebuck Bay in north-west Western Australia.	No suitable aquatic habitats occur within the site for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Limicola falcinellus Broad-billed Sandpiper (V, M*)	In Australia, the Broad-billed Sandpiper is most common on the north and north-west coasts and occur regularly at scattered localities in southern Australia, where they are usually seen singly. Occurs in sheltered parts of the coast, favouring estuarine mudflats but also occasionally occur on saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, and in areas with large soft intertidal mudflats, which may have shell or sandbanks nearby.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Limosa limosa Black-tailed Godwit (V, M*)	In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore-overflows. They also use lagoons in sewage farms and saltworks.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Numenius madagascariensis Eastern Curlew (CE*M*)	The Eastern Curlew is a large wader with a long neck, long legs, and a heavy bill that curves downwards. Within Australia, the Eastern Curlew has a primarily coastal distribution. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbors, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of sea grass.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Xenus cinereus Terek Sandpiper (V)	The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. The species has also been recorded on islets, mudbanks, sandbanks and spits, and near mangroves and occasionally in samphire (Halosarcia spp.). Birds are seldom near the edge of water, however, birds may wade into the water. Less often seen on sandy or shingle beaches, or on rock or coral reefs or platforms, Terek Sandpipers are occasionally sighted around drying sewage ponds and saltpans if surrounded by mudflats. The species is also found around brackish coastal swamps, lagoons and dune-lakes; and also on gravel or rocky edges of estuarine pools and freshwater river-pools. Very occasionally, birds use swampy, grassy or cultivated paddocks near the coast.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Charadrius leschenaultii Greater Sand-plover (V)	This species occurs in coastal environments of all Australian states, though greatest numbers occur in northern Australia. The habitats in Australia are non-breeding grounds and are almost entirely coastal, inhabiting littoral and estuarine habitats. Feed from the surface of wet sand or mud on open intertidal flats of sheltered embayments, lagoons and estuaries.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Charadrius mongolus Lesser Sand-plover (V)	In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. It also sometime occurs in short saltmarsh or among mangroves. The species also inhabits saltworks and near-coastal saltpans, brackish swamps and sandy or silt islands in river beds.	No estuarine or coastal habitats occur within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Irediparra gallinacea Comb-crested Jacana (V)	This distinctive water bird occurs in northern and eastern Australia, with main populations occurring across the top end. It inhabits permanent freshwater wetlands either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies or fringing and aquatic vegetation.	No suitable aquatic habitats occur within the site for this species. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Dasyornis brachypterus Eastern Bristlebird (E, E*)	Found in dense, low vegetation including heath and open woodland with a heathy understorey; in northern NSW occurs in open forest with tussocky grass understorey.	Dense vegetation on which this species depends does not persist within the site, and the known populations of this species do not occur within 10km of the study area. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
Glossopsitta pusilla Little Lorikeet (V)	The Little Lorikeet extends from Cairns to Adelaide coastally and to inland locations. Commonly found in dry, open eucalypt forests and woodlands. Can be found in roadside vegetation to woodland remnants. The Little Lorikeet feeds on abundant flowering Eucalypts, but will also take nectar from *Melaleuca* sp and Mistletoe sp. *Eucalyptus albens* (White Box) and *E. melliodora* (Yellow Box) are favoured food sources on the western slopes in NSW. On the eastern slopes and coastal areas favoured food sources are *Corymbia maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark), *E. robusta* (Swamp Mahogany) and *E. pilularis* (Blackbutt). Nesting takes place in hollow-bearing trees.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Grantiella picta Painted Honeyeater (V, V*)	This small honeyeater is nomadic throughout its range and occurs at low densities. Almost all breeding occurs on the inland slopes of the Great Dividing Range. Occurs in Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. It specialises on the fruits of mistletoe growing in eucalypts and acacias.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Lathamus discolor Swift Parrot (E, E*)	On the mainland this species frequents Eucalypt forests and woodlands with large trees having high nectar production during winter. Mainland winter foraging study areas often vary from year to year. Nests only in Tasmania, but regularly visits the Hunter Region in winter. Visits the Hunter Region when food sources are abundant or food sources are lacking in other areas. Food sources used in the Hunter include *Eucalyptus robusta* (Swamp Mahogany) on the coast, and near coastal to inland the Swift Parrot uses *Corymbia maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark) and *E. crebra* (Narrow-leaved Ironbark). Occasional records have come from *E. alba* (White Box) and *E. sideroxylon* (Mugga Ironbark). These food source trees have been recorded as roosting sites for Swift Parrots.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Neophema pulchella Turquoise Parrot (V)	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Ninox strenua Powerful Owl (V)	Occurs in wet or dry sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals). Requires large hollows, usually in Eucalypt trees, for nesting. Roosts in dense vegetation within such areas. Roosts in dense vegetation within such species as *Syncarpia glomulifera* (Turpentine), *Allocasuarina littoralis* (Black She-Oak), *Acacia melanoxylon* (Blackwood), *Angophora floribunda* (Rough-barked Apple), *Exocarpos cupressiformis* (Cherry Ballart) and *Melaleuca nodosa* (Ball Honeymyrtle). Many records across the Hunter region, a lot coastal.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Tyto novaehollandiae Masked Owl (V)	Found in a range of habitats, locally within sclerophyll forests and woodlands where appropriate / preferred prey species occur (being predominantly terrestrial mammals). Requires large Eucalypt hollows for nesting and prefers to roost in these hollows as well. Recorded at Medowie, Heddon Greta and the Dungog area.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Tyto longimembris Eastern Grass Owl (V)	In NSW, they are more likely to be resident in the north-east. Grass Owl numbers can fluctuate greatly, increasing especially during rodent plagues. They are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Epthianura albifrons White-fronted Chat (V)	This species is found in damp open habitats, particularly estuarine and marshy grounds, as well as wetlands containing saltmarsh, bordered by open grasslands or lightly timbered lands. The species is also observed in open grasslands and sometimes in low shrubs bordering wetland areas. Inland, the White-fronted Chat is often observed in open grassy plains, saltlakes and saltpans that are along the margins of rivers and waterways The species is sensitive to human disturbance and is not found in built areas.	No saltmarsh habitat suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Anthochaera phrygia Regent Honeyeater (CE, E)	Nomadic Honeyeater that disperses to non-breeding areas, including the coast, in winter, where flowering trees are sought. Within the region, mostly recorded in Box-Ironbark Eucalypt associations along creek flats, river valleys and foothills. Coastal swamp forests in Lower Hunter are used when more western resources fail. The main feed tree for coastal areas is *Eucalyptus robusta* (Swamp Mahogany). Hunter records are more common in near coastal areas such as Cessnock LGA. Feed trees in this region are *Corymbia maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark), *E. crebra* (Narrow-leaved Ironbark) and various stringybark sp.. Nests mainly west of the divide, although local breeding attempts have occurred at Quorrobolong.	No vegetation suitable for this species is present within the highly disturbed site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Mammals			
Dasyurus maculatus Spotted-tailed Quoll (V, E*)	Found in a variety of forested habitats. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. Hunter Region records are largely confined to the surrounding ranges.	No suitable habitat occurs within the site, and the site is situated in a highly developed urban area. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Phascolarctos cinereus Koala (V, V*)	Occurs in forests and woodlands where it requires suitable feed trees (particularly Eucalyptus spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more vulnerable to predator attack and road mortality during these excursions. Records from the Lower Hunter Region are largely confined to the greater Port Stephens area, the Lake Macquarie hinterland and the Watagan Mountains, with a small number of records from Cessnock LGA.	No feed trees listed under Schedule 2 of SEPP 44 were detected within the site. The site is highly disturbed with no canopy trees, and occurs in a highly urbanised area. It is therefore considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
Potorous tridactylus tridactylus Long-nosed Potoroo (V*)	Prefers cool rainforest, wet sclerophyll forest and heathland. Sleeps by day in a nest on the ground, and digs for succulent roots, tubers, fungi and subterranean insects. Some diggings seemingly attributable to this species may belong to *Isoodon macrourus* (Northern Brown Bandicoot). Records exist from the Karuah vicinity and the Gosford LGA.	No rainforest, wet sclerophyll forest or heathland occurs within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Petaurus norfolcensis Squirrel Glider (V)	Occurs in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. This species also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species. Widely distributed across the lower hunter region.	No suitable vegetation occurs within the site, due to its previous use as a rail corridor. The site situated in a highly urbanised environment. Therefore this species is unlikely to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Pteropus poliocephalus Grey-headed Flying-fox (V, V*)	This species forages over a large area for nectar/fruits. Seasonally roosts in communal base camps situated within wet sclerophyll forests or rainforests. Frequently observed to forage in flowering Eucalypts. May occur anywhere within the Hunter Region where food or roosting resources are available.	This species is known to occur within the site's locality, most likely due to surrounding fig trees in which this species feeds. Whilst this species may fly over the site, there is no suitable habitat within the site on which this species could forage or roost. Therefore, this species is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat (V)	This wide-ranging species can be found across northern and eastern Australia. In NSW this species occurs both east and west of the Great Dividing Range, but not on it. It roosts singly or in groups up to six, in tree hollows and buildings. Forages for insects above the canopy.	This species was not detected during surveys, and only three records occur within a 10km radius of the site. It is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Mormopterus norfolkensis Eastern Freetail-bat (V)	This species is distributed south of Sydney extending north into south-eastern Queensland. There are no records west of the Great Dividing Range. Most records of this species have been reported from dry Eucalypt forest and woodland. It is expected that open forested areas and the cleared land adjacent to bushland, constitutes important habitat for this species, It is a predominantly tree-dwelling species, roosting in hollows or behind loose bark in mature Eucalypts. Widely distributed across the Lower Hunter Region.	This species was not detected during surveys, and only 13 records occur within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Chalinolobus dwyeri Large-eared Pied Bat (V, V*)	This species forages in tall open forests and the edges of rainforest. It roosts in mine shafts and similar structures. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of *Hirundo ariel* (Fairy Martin), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Hunter Region records for this species are largely confined to the Watagan Mountains, but it has been recorded on the southern side of Port Stephens.	No record of this species within 10km and no suitable cave structures required for roosting occur in the nearby vicinity. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Falsistrellus tasmaniensis Eastern False Pipistrelle (V)	This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m). This species roosts in tree hollows and caves. Appears to locally favour upland habitats. A limited number of records occur on the central coast and the Lower Hunter Region.	This species was not detected during surveys, and only one record occurs within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Myotis macropus Southern Myotis (V)	Usually found near bodies of water, including estuaries, lakes, reservoirs, rivers and large streams, often in close proximity to their roost site. Although usually recorded foraging over wet areas, it also utilises a variety of wooded habitats adjacent to such areas including rainforest, wet and dry sclerophyll forest, woodland, and swamp forest. Roosts in small colonies of between 15 and several hundred individuals in caves, mines and disused railway tunnels. A number of records from the Central Coast, with fewer numbers in the Lower Hunter Region and Central Hunter Region (RPS pers. obs.).	This species was not detected during surveys, and only 12 records occur within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Miniopterus australis Little Bentwing-bat (V)	Prefers to forage in well-vegetated areas, such as within wet and dry sclerophyll forests and rainforests. Requires caves or similar structures for roosting habitat. Largely confined to more coastal areas in the Lower Hunter Region.	This species was not detected during surveys, and only 11 records occur within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Miniopterus schreibersii oceanensis Eastern Bentwing-bat (V)	This species utilises a range of habitats for foraging, including rainforest, wet and dry sclerophyll forests, woodlands and open grasslands. Requires caves or similar structures for roosting habitat. Widely distributed across the Lake Macquarie and Lower Hunter Regions.	This species was not detected during surveys, and only 15 records occur within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Scoteanax rueppellii Greater Broad-nosed Bat (V)	Forages in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces/ecotones. This species roosts in tree hollows and is relatively widespread within the Lower Hunter Region.	This species was not detected during surveys, and only 10 records occur within a 10km radius of the site. Given the disturbed nature of the site, and low records, it is considered **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
Pseudomys novaehollandiae New Holland Mouse (V*)	This species has a patchy distribution within open woodlands, heathlands and in hind dune vegetation throughout Eastern Australia. In the Hunter Region the species stronghold is in the Myall Lakes region.	No suitable heathland habitat occurs within the site. It is **unlikely** to occur.	Unlikely to occur therefore it is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.

Species / Community	Habitat Description	Likelihood of Occurrence within the study area	Likely Level of Impact
Ecological Communities			
Subtropical and Temperate Coastal Saltmarsh (EPBC) (CE*)	This vegetation community occurs in coastal areas under regular intermittent tidal influence. Generally restricted to the upper intertidal environment. Coastal Saltmarsh consists mainly of salt-tolerant vegetation including grasses, herbs, sedges, rushes and shrubs. There is often a degree of endemism at the species level.	Due to the previous activities associated with the site, no vegetation commensurate with a vegetation community exists. The site is highly disturbed and still contains infrastructure associated with the rail corridor. This EEC **does not** occur.	Does not occur therefore it is **unlikely** to be impacted upon as a result of the proposal. An AoS is not required for this species.
Central Hunter Valley Eucalypt Forest and Woodland (CE*)	This ecological community occurs in the Hunter Valley region of NSW, mainly in the Singleton and Muswellbrook LGAs. Limited occurrences have been recorded in the Cessnock, Maitland, Lake Macquarie, Newcastle and Port Stephens LGAs. The ecological community is an open forest or woodland, typically dominated by eucalypt species, with an open to sparse mid-layer of shrubs and an understorey of graminoids and forbs. The composition of the ecological community at a particular site is influenced by the size of the site, recent rainfall, and drought conditions and by its disturbance history. Canopy is dominated by one or more of the following species: *Eucalyptus crebra* (narrow-leaved ironbark), *Corymbia maculata* (syn. *E. maculata*) (spotted gum), *E. dawsonii* (slaty gum) and *E. moluccana* (grey box). The shrub layer is likely to include *Bursaria spinosa* subsp. *spinosa* (native blackthorn). Other common species include: *Acacia amblygona*, *A. decora* (western silver/golden / showy wattle), *A. implexa* (lightwood), *A. falcata* (sickle wattle), *A. parvipinnula* (silver-stemmed wattle), *Breynia oblongifolia* (Breynia, coffee bush), *Daviesia genistifolia* (broom bitter pea), *D. ulicifolia* (gorse bitter pea), *Notelaea microcarpa* (native olive) and *Pultenaea spinosa* (spiny bush-pea). Groundcover is likely to include species such as *Cheilanthes sieberi* subsp. *sieberi* (poison rock fern), *Desmodium varians* (slender or variable tick treefoil), *Dichondra repens* (kidney weed), *Eremophila debilis* (winter apple) and *Lomandra multiflora* subsp. *multiflora* (many flowered mat rush). Grasses commonly include *Aristida ramosa* (wire-grass), *Cymbopogon refractus* (barbed wire grass) and *Microlaena stipoides* subsp. *stipoides* (weeping grass).	Due to the previous activities associated with the site, no vegetation commensurate with a vegetation community exists. The site is highly disturbed and still contains infrastructure associated with the rail corridor. This EEC **does not** occur.	Does not occur therefore it is **unlikely** to be impacted upon as a result of the proposal. An AoS is not required for this species.
Lowland Rainforest of Subtropical Australia (CE*)	The ecological community occurs on basalt and alluvial soils, including sand and old or elevated alluvial soils as well as floodplain alluvia. Generally a moderately tall to tall closed forest. The canopy comprises a range of tree species but in some areas a particular species may dominate e.g. palm forest, usually dominated by *Archontophoenix cunninghamiana* (bangalow palm) or *Livistona australis* (cabbage palm); and riparian areas dominated by *Syzygium floribundum* (syn. Waterhousea floribunda) (weeping satinash/weeping lilly pilly). The canopy/subcanopy layer contains a diverse range of species. Representative species include: hoop pine, figs, *Argyrodendron trifoliolatum/Heritiera trifoliolata* (white booyong), *Castanospermum australe* (black bean), *Cryptocarya obovata* (white walnut, pepperberry *Dendrocnide excelsa* (giant stinging tree), *Diploglottis australis* (native tamarind), *Dysoxylum fraserianum* (rosewood), *Dysoxylum mollissimum* (red bean), *Elattostachys nervosa* (green tamarind), *Endiandra pubens* (hairy walnut), *Flindersia schottiana* (bumpy ash, cudgerie, silver ash), *Gmelina leichhardtii* (white beech), *Neolitsea australiensis* (bolly gum), *Neolitsea dealbata* (white bolly gum), *Sloanea australis* (maiden‟s blush), *Sloanea woollsii* (yellow carabeen), *Toona ciliata* (red cedar), and epiphytes such as Platycerium spp. and *Asplenium australasicum* (bird‟s nest fern). The understorey contains a sparse layer of species such as *Cordyline stricta* (narrow-leaved palm lily), *Linospadix monostachya* (walking stick palm), *Neolitsea dealbata* (white bolly gum), *Notelaea johnsonii* (veinless mock olive), *Pittosporum multiflorum* (orange thorn), *Triunia youngiana* (native honey-suckle bush), *Wilkiea austroqueenslandica* (smooth wilkiea) and *Wilkiea huegeliana* (veiny wilkiea) as well as seedlings of a variety of canopy species.	Due to the previous activities associated with the site, no vegetation commensurate with a vegetation community exists. The site is highly disturbed and still contains infrastructure associated with the rail corridor. This EEC **does not** occur.	Does not occur therefore it is **unlikely** to be impacted upon as a result of the proposal. An AoS is not required for this species.

Notes: (V) = Vulnerable species, population or ecological community listed under the Threatened Species Conservation Act 1995.
(E) = Endangered species, population or ecological community listed under the Threatened Species Conservation Act 1995.
(CE) = Critically Endangered species, population or ecological community listed under the Threatened Species Conservation Act 1995.
(V*) = Vulnerable species, population or ecological community listed under the Commonwealth EPBC Act 1999.
(E*) = Endangered species, population or ecological community listed under the Commonwealth EPBC Act 1999.
(CE*) = Critically Endangered species, population or ecological community listed under the Commonwealth EPBC Act 1999.
(M*) = Migratory species listed under the Commonwealth EPBC Act 1999.

6.0 Matters of National Environmental Significance

Considerations have been made under the Commonwealth EPBC Act 1999. An EPBC Act 1999 Protected Matters Search was undertaken within the DoE on-line database (accessed 19 October 2015) to generate a list of those matters of National Environmental Significance (NES) from within 10 km of the site, which may have the potential to occur within the site. This data, combined with other local knowledge and records, was utilised to assess whether the type of activity proposed within the site will have, or is likely to have a significant impact upon a matter of NES, or on the environment of Commonwealth land.

The matters of NES and site-specific responses are listed below.

World Heritage Properties

The project area is not a World Heritage Property, and is not in close proximity to any such area. Therefore, the Project will not impact upon any World Heritage Property.

National Heritage Places

The project area is not a National Heritage Place, and is not in close proximity to any such area. Therefore, the Project will not impact upon any National Heritage Place.

Wetlands of International Importance (declared Ramsar wetlands)

The Ramsar listed Hunter Estuary Wetland, which comprises Kooragang Nature Reserve and Shortland Wetlands, is located approximately 9 km north west of the project area. The proposed rezoning is not expected to have an impact on any body of water; therefore the proposal will not impact upon the Hunter Estuary Wetland.

The Great Barrier Reef Marine Park

The Great Barrier Reef Marine Park does not occur within or adjacent to the project area, therefore, the Project will not impact upon any areas of the Great Barrier Reef Marine Park.

Commonwealth Marine Area

The project area is not a Commonwealth Marine Area, and is not in close proximity to any such area. Therefore, the Project will not impact upon any Commonwealth Marine Area.

Listed threatened Ecological Communities

Three threatened ecological communities were considered as potentially occurring within the area, including:

- Subtropical and Temperate Coastal Saltmarsh;
- Central Hunter Valley Eucalypt Forest and Woodland; and
- Lowland Rainforest of Subtropical Australia.

None of the above listed threatened communities were detected on site. Therefore, they are not likely to be impacted upon by the Project.

Nationally listed threatened species

A total of 29 threatened species (excluding marine species) listed under the EPBC Act 1999 have been recorded or have suitable habitat within a 10 km radius of the site. Refer to **Table 4** for likelihood of occurrence of threatened species listed under EPBC Act 1999 within the site.

No EPBC Act threatened species are considered as having potential to occur within the site, thus no impacts upon EPBC Act listed species is expected to occur.

Nationally listed migratory species

A total of eight migratory terrestrial species and seven migratory terrestrial species listed under the EPBC Act 1999 have been recorded or have potential suitable habitat within a 10 km radius of the site. The Project is unlikely to substantially modify, destroy or isolate an area of important habitat, result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat or seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

7.0 Conclusion

RPS has been engaged by Elton Consulting on behalf of UrbanGrowth Pty Ltd to undertake a Flora and Fauna Assessment for the proposed rezoning of the Newcastle Surplus Rail Corridor lands.

A total of 26 flora species were identified within the site. No threatened flora species listed under the TSC Act 1995 and/or EPBC Act 1999 were detected within the site during RPS surveys.

A total of 14 fauna species were detected within the project area during surveys, all of which were common or exotic species. No threatened fauna listed under the TSC Act 1995 and/or EPBC Act 1999 were detected within the site during surveys.

Consideration was given to the potential occurrence of threatened fauna and flora species based on the available habitats within the site and species specific ecological requirements. Of those species that have been recorded within a 10km radius of the site, or that were considered as having potential to occur, none were expected to be impacted upon as a result of the proposed rezoning.

The proposed development associated with the rezoning is not expected to alter the existing nature of the site to the extent that it would negatively impact on flora or fauna. Green space areas incorporated into the proposed design will arguably provide enhanced areas of habitats for robust urban species. Subsequently, impacts upon flora and fauna are considered negligible.

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Appendix 1

Flora Species List

Appendix Key: * = introduced species
(V) = listed as Vulnerable in NSW.
(V*) = Species listed under the Commonwealth EPBC Act as Vulnerable

Family	Scientific Name	Common Name
Papaveraceae	*Argemone ochroleuca* subsp. *ochroleuca**	Mexican Poppy
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern
Proteaceae	*Banksia marginata*	Silver Banksia
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Poaceae	*Bromus cartharticus**	Prairie Grass
Poaceae	*Cenchrus echinatus**	Mossman River Grass
Poaceae	*Chloris gayana**	Rhodes Grass
Asteraceae	*Conyza bonariensis**	Flax-leaf Fleabane
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo
Poaceae	*Cynodon dactylon*	Common Couch
Cyperaceae	*Cyperus eragrostis**	Umbrella Sedge
Phormiaceae	*Dianella* spp.	
Poaceae	*Echinochloa esculenta**	Japanese Millet
Moraceae	*Ficus macrophylla*	Moreton Bay Fig
Araliaceae	*Hedera helix**	English Ivy
Asteraceae	*Hypochaeris radicata**	Flatweed
Arecaceae	*Livistona australis*	Cabbage Tree Palm
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark
Poaceae	*Panicum* sp.	-
Apocynaceae	*Plumeria obtusa* (Cultivar)*	Frangipani
Polygonaceae	*Polygonum aviculare**	Wire Weed
Euphorbiaceae	*Ricinus communis**	Castor Oil Plant
Fabaceae/faboideae	*Trifolium arvense**	Haresfoot Clover
Fabaceae/faboideae	*Trifolium repens**	White Clover
Plantaginaceae	*Veronica* spp.*	

Appendix 2

Fauna Species List

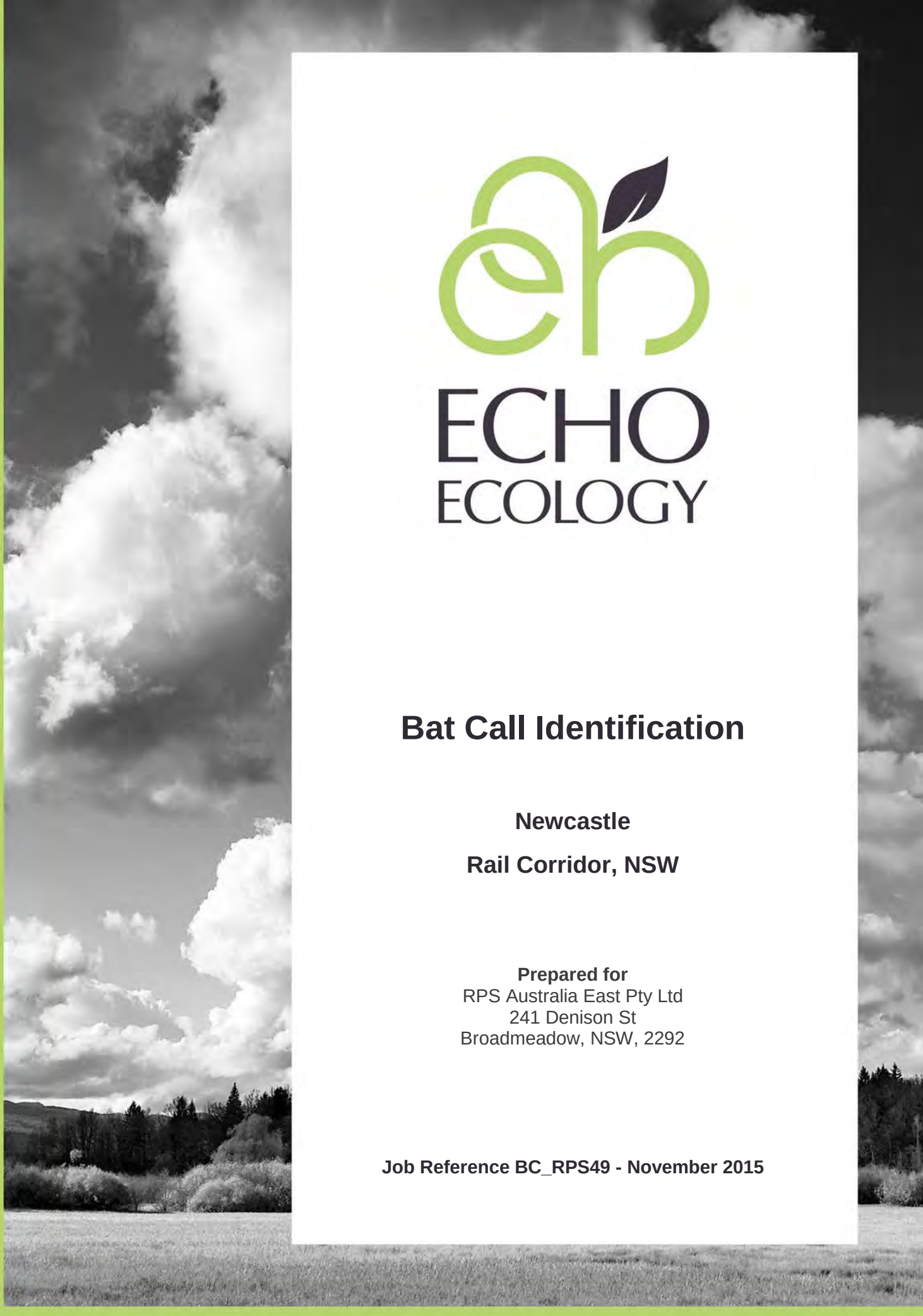
Appendix Key:

* = introduced species
(C) = listed as CAMBA species
(J) = listed as JAMBA species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(V*) = Species listed under the Commonwealth EPBC Act as Vulnerable
(E*) = Species listed under the Commonwealth EPBC Act as Endangered
(M) = Species listed under the Commonwealth EPBC Act as Migratory
Species indicated in **BOLD** font are those threatened species recorded from within the site.

Family	Scientific Name	Common Name	TSC Act 1995	EPBC Act 1999
Birds				
Columbidae	*Columba livia**	Rock Dove	-	-
Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	-	-
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	-	-
Charadriidae	*Vanellus miles*	Masked Lapwing	-	-
Cuculidae	*Eudynamys orientalis*	Eastern Koel	-	-
Meliphagidae	*Manorina melanocephala*	Noisy Miner	-	-
Artamidae	*Cracticus tibicen*	Australian Magpie	-	-
Corvidae	*Corvus coronoides*	Australian Raven	-	-
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	-	-
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	-	-
Sturnidae	*Sturnus tristis**	Common Myna	-	-
Reptiles				
Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	-	-
Mammals				
Molossidae	*Tadarida australis*	White-striped Freetail-bat	-	-
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	-	-

Appendix 3

Anabat Report



ECHO ECOLOGY

Bat Call Identification

Newcastle

Rail Corridor, NSW

Prepared for
RPS Australia East Pty Ltd
241 Denison St
Broadmeadow, NSW, 2292

Job Reference BC_RPS49 - November 2015

Echo Ecology Pty Ltd ABN 73 162 118 710 • PO Box 4132 Crescent Head, NSW 2440 Australia • P: 0423 801 779 • E: info@echoecology.com.au • W: echoecology.com.au

This report has been prepared to document the analysis of digital ultrasonic bat echolocation calls received from a third party. The data was not collected by the author and as such no responsibility is taken for the quality of data collection or for the suitability of its subsequent use.

This report was authored by



Dr Anna McConville
PhD, B.Env.Sc.

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Figure 4-2: *Tadarida australis* definite call 5

1.0 INTRODUCTION

This report has been commissioned by RPS Australia East Pty Ltd to analyse bat echolocation call data (Anabat and Anabat Express, Titley Electronics) collected from the Newcastle rail corridor, NSW. Data was provided electronically to the author. This report documents the methods involved in analysing bat call data and the results obtained only.

2.0 METHODS

The identification of bat echolocation calls recorded during surveys was undertaken using AnalookW (Version 4.1t, Chris Corben) software. The identification of calls was undertaken with reference to Pennay *et al*. (2004) and through the comparison of recorded reference calls from north-eastern NSW and the Sydney Basin. Reference calls were obtained from the NSW database and from the authors personal collection.

Each call sequence ('pass') was assigned to one of five categories, according to the confidence with which an identification could be made, being:

- Definite - Pass identified to species level and could not be confused with another species
- Probable - Pass identified to species level and there is a low chance of confusion with another species
- Possible - Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species
- Species group - Pass could not be identified to species level and could belong to one of two or more species. Occurs more frequently when passes are short or of poor quality
- Unknown - Either background 'noise' files or passes by bats which are too short and/or of poor quality to confidently identify.

Call sequences that were less than three pulses in length were not analysed and were assigned to 'Unknown' and only search phase calls were analysed. Furthermore, some species are difficult to differentiate using bat call analysis due to overlapping call frequencies and similar shape of plotted calls and in these cases calls were assigned to species groups.

The total number of passes (call sequences) per unit per night was tallied to give an index of activity.

It should be noted that the activity levels recorded at different sites may not be readily able to be compared. Such comparisons are dependent on many variables which need to be carefully controlled during data collection and statistically analysed. Influential variables include wind, rain, temperature, duration of recording, season, detector and microphone sensitivity, detector placement, weather protection devices etc.

2.1 Characteristics Used to Differentiate Species

Chalinolobus gouldii was differentiated from other species by the presence of curved, alternating call pulses.

Tadarida australis was differentiated from other bat species on the basis of characteristic frequency.

3.0 RESULTS

A total of 308 call sequences were recorded, of which three call sequences were able to be analysed (ie were not 'noise' files or bat calls of short length). Of the bat calls, three call sequences (100 %) were able to be confidently identified (those classified as either definite or probable identifications) to species level (Table 3-1). Species recorded confidently within the site include:

- *Chalinolobus gouldii* (Gould's wattled bat)
- *Tadarida australis* (White-striped free-tailed bat)

It should be noted that additional bat species may be present within the site but were not recorded by the detectors and habitat assessment should be used in conjunction with these results to determine the likelihood of occurrence of other bat species.

Table 3-1 below summarises the results of the bat call analysis.

Table 3-1: Results of bat call analysis (number of passes per site per night)

IDENTIFICATION	Anabat 4 1/11/2015	Anabat 4 2/11/2015	Anabat Express 2/11/2015
DEFINITE			
Chalinolobus gouldii	-	-	1
Tadarida australis	-	-	1
PROBABLE			
Chalinolobus gouldii	-	-	1
UNKNOWN			
'Noise' files	88	212	5
TOTAL	**88**	**212**	**8**

4.0 SAMPLE CALLS

A sample of the calls actually identified from the site for each species is given below.



Figure 4-1: *Chalinolobus gouldii* definite call

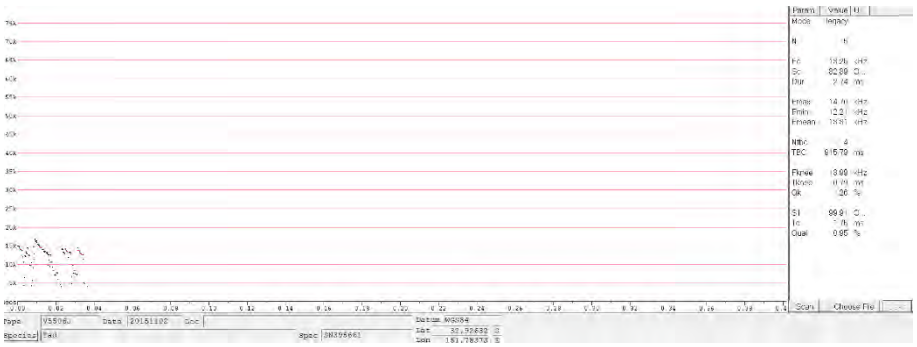


Figure 4-2: *Tadarida australis* definite call

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Appendix 4

Staff Qualifications

CURRICULUM VITAE

Arne Bishop

Ecology Manager

Newcastle, NSW

Bachelor of Environmental Science, University of Canberra, 2009

Bachelor of Landscape Architecture, University of Canberra, 2009

Cert IV Horticulture (Landscape), Canberra Institute of Technology, 2003

Cert II Australian Land Conservation and Restoration, Conservation Volunteers Australia, 2001

Accredited Biobanking Assessor

Areas of Expertise

Arne has over 16 years experience in the environmental sector. In his position as Ecology Manager, Arne manages the Newcastle environment department including the day to day running of projects, verification of reports and other outputs and ensures clients are well informed of project progress and key findings.

Arne's current and previous roles have provided him with an extensive knowledge of a plethora of exotic and endemic NSW flora, fauna, ecological communities and migratory species. He conducts ecological assessments on a daily basis, which aim to identify the likelihood for threatened entities such as threatened flora, fauna, populations and communities listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or *Threatened Species Conservation Act 1995* (TSC Act) to occur within a specified area.

Arne is an accredited BioBanking Assessor and has conducted BioBanking assessments for Major Projects (State Significant Infrastructure and State Significant Developments) under the Framework for Biodiversity Assessment (OEH 2014) and assessments for smaller developments under the *BioBanking Assessment Methodology* (OEH 2014). He has also conducted EPBC offset calculations under the *EPBC Act Environmental Offsets Policy* (SEWPAC 2012).

During his career, Arne has project managed and/or participated in numerous large-scale land development, mining, energy and infrastructure projects. He subsequently possesses a firm understanding and working knowledge of local, state and federal government legislation and policies that underpin environmental assessments, environmental mitigation, management and offsetting techniques.

Selected Project Experience

Urban Growth

Reticulated Water, Sewer and Recycled Water (Glossodia, Huntlee new town and Cooranbong), Flow Systems - RPS has prepared a number of REF's to enable licences to be sought by the client for the provision of reticulated water, sewer and recycled water across large urban release areas in accordance with the *Water Industry Competition Act 2006*. Conducted notional BioBanking calculations to quantify biodiversity impacts and potential offset requirements.

Subdivision and Urban Development at Windmill Downs Tamworth, Combined Development Group – Conducted detailed floristic surveys to determine the condition and extent of the EPBC Act Critically Endangered Ecological Community - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland).

Lower Hunter Lands subdivision, Coal and Allied – Preparation of a detailed Part 3A ecological inventory and impact assessment for a proposed residential subdivision including extensive flora, fauna and habitat surveys over approximately 3,800 hectares. Ongoing liaison, negotiations and presentations were made to authorities and community forums. The project involved significant offsets that helped to secure regional corridors and conservation initiatives long sought after in the region.

Catherine Hill Bay and Gwandalan, Rose Group – Preparation of detailed Part 3A ecological impact assessment for a proposed residential development over two sites in Catherine Hill Bay and Gwandalan. The project also involved negotiating approval under the EPBC Act including preparation Preliminary Information.

Huntlee Ecological works, LWP Property Group – Undertook Ecology works to inform Major Project Approval and negotiations under the EPBC Act for the new Hunter Valley town at Huntlee. This project involved critically endangered species, offsets and presentations to stakeholder groups.

Subdivision and Urban Development at Hills Plain Tamworth, Marloelle – Conducted detailed floristic surveys to determine the condition and extent of the EPBC Act Critically Endangered Ecological Community - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland).

Infrastructure

Bells Line of Road Corridor – Chifley Rd Upgrade, RMS – Conducted targeted threatened species filed surveys and assisted in the preparation of a biodiversity assessment for the proposed Chifley Road upgrade located on the Bells Line of Road between Bell and Scenic Hill.

Westmead Hospital Upgrade, Price Waterhouse Coopers and Johnstaff – Ecological surveys and reporting. Ecological opportunities and constraints were assessed in relation to the relevant state and federal legislation to inform the concept design.

Energy & Mining

Mandalong South Powerline Relocation - Flora and Fauna Impact Assessment, Centennial Coal – Conducted targeted threatened seasonal threatened species surveys, client liaison and report development. Conducted notional BioBanking calculations to quantify biodiversity impacts and potential offset requirements.

Gunnedah Basin, Santos – Conducted multiple projects over approximately two years. These projects included; ecological works for Santos within the Gunnedah Basin covering gas exploration and provision of infrastructure, including, gas pipelines and access tracks. Works included field survey, preparation of advice, impact assessments, EPBC referrals, preparation and implementation of well lease rehabilitation plans, liaison and negotiations with regulators and agencies.

Springvale Temperate Highland Peat Swamp (THPSS) Monitoring, Centennial Coal – Ecological field surveys and associated monitoring report preparation for Springvale underground mine on the Newnes Plateau project.

Angus Place and Springvale Extension Projects, Centennial Coal – Ecological surveys were undertaken over a period of 1.5 years to aid in the production of a Flora and Fauna Report for both the Angus Place and Springvale underground mines. The project role included flora and fauna field surveys and assistance with associated reporting. Conducted notional BioBanking calculations for Springvale Extension Project to quantify biodiversity impacts and potential offset requirements.

Bulga Mine Annual Fauna Monitoring, Glencore – Conducted and project managed an annual monitoring program for the past four years. The program spans two operations and involves seasonal bird surveys, habitat assessments, and the full spectrum of fauna monitoring methodologies, provides technical input and document review.

Airly Coal Mine Flora and Fauna Surveys and Assessment, Centennial Coal – A range of flora and fauna surveys were undertaken to inform both the Airly Baseline Survey Report and the Airly Flora and Fauna Report. Project tasks included; review of specialist reports, interpretation of legislative requirements, targeted field survey, assessment of fauna habitat quality and value to threatened species, identification of project impacts and measures to avoid or mitigate potential impacts.

Mandalong Mine Extension Project, Centennial Coal – Project tasks included preliminary desktop assessment, interpretation of legislative requirements, targeted field survey, assessment of fauna habitat quality and value to threatened species, identification of project impacts and measures to avoid or mitigate potential impacts. Conducted notional BioBanking calculations to quantify biodiversity impacts and potential offset requirements

Beltana Underground Mine Bat Impact Assessment and Monitoring, Glencore – Conducted extensive fieldwork to identify potential habitat, assessed habitat using night vision technology and developed reporting.

Previous Experience

Environmental Consultant – Ecological Australia 2008 - 2010

Arne completed several contracts as an environmental consultant for Eco Logical Australia, assisting with threatened species identification and monitoring on a range of projects.

Field Assistant / Consultant – Alison Rowell 1999 - 2010

This role included working on flora and fauna surveys, and habitat / vegetation assessment and mapping

Green Corps Traineeship – Conservation Volunteers Australia (CVA) 2001

Arne received accredited practical and theoretical training in; First Aid (Level 2, St Johns); Occupational Health and Safety and Environmental Concepts. This training contributed to Certificate II in Australian Land Conservation and Restoration.

Memberships & Achievements

Accredited BioBanking Assessor (accreditation number 161)

Snake and Spider Safety Awareness for Employees (SSSafe) Training

Four Wheel Drive Training and Certification

First Aid Certification

Member – Ecological Consultants Association

Member – Royal Zoological Society NSW

Member – Birds Australia

OH&S Induction Training (White Card)

Award for Excellence for First Place in Conservation Biology and Genetics, University of Canberra

CURRICULUM VITAE

Lauren Eather

Ecologist / Bushfire Consultant

Newcastle, NSW

Bachelor of Science, University of Newcastle

Areas of Expertise

During her eight years working as an Ecologist, Lauren has gained a broad range of ecological field experience and experience in Ecological Assessment and management reporting in accordance with relevant State and Commonwealth government legislative frameworks.

In addition, Lauren has gained a broad range of experience in bushfire preparedness planning. She has developed numerous Bushfire Threat Assessments and Bushfire Attack Level certificates informed by field surveys and desktop assessments in accordance with Planning for Bushfire Purposes (2006).

Her experience within the consulting industry has primarily included a wide range of flora and fauna assessment disciplines as required by a wide range of public and private clients, along with significant Bushfire Management reporting along with a detailed understanding of environmental legislation.

Selected Project Experience

Bushfire

Bellbird North Subdivision Bushfire Attack Level (BAL) Certificate, Royal Haskoning DHV – Advice regarding Bushfire Attack Levels in line with AS 3959-2009 for a subdivision of land at Bellbird North was provided from desktop assessment.

Wallarah House Bushfire Threat Assessment (BTA), Baudinet Group – Desktop assessments for the reconstruction of a dwelling that was substantially damaged during fires in October 2013. These assessments formed the production of the Bushfire Threat Assessment for the site.

Ringall Valley Housing Estate - Jewells, SNL Construction – RPS has been engaged as the Principal Consultant undertaking all project management responsibilities associated with delivering this 60 small lot housing development. As part of the bushfire hazard assessment and management plan for this project, Lauren undertook the compilation of report and desktop assessments on slope and vegetation type.

Myall Lodge BTA, RSL Lifecare – Myall Lodge, or Peter Sinclair Gardens, in Hawkes Nest NSW offers medical / rehabilitative care, restorative care and dementia care. As the facility is completely surrounded by dense, bushfire prone reserve land, RPS was appointed to provide Ecology and Bushfire advice prior to construction. Lauren undertook site inspections, slope and vegetation assessments, and the construction of a Bushfire Threat Assessment.

Vantage Estate BAL, UrbanGrowth NSW – Lauren completed a Bushfire Attack Level letter of advice for this proposed housing estate.

Big Prawn Service Centre BTA, Westside Petroleum – The Big Prawn service station at Crangan Bay was completely damaged during the October 2013 bushfires. Field and desktop investigations allowed for the development of a Bushfire Threat Assessment that assessed the current hazards to the reconstruction of the service station and associated facilities on site.

Fisherman's Bay, Landcom – RPS carried out bushfire hazard investigations to inform master planning and prepared a Bushfire Threat Assessment in support of the DA with particular reference to the requirements of the Rural Fires Act 1997 and its Regulation, and the Environmental Planning and Assessment Act 1979. For this project Lauren was tasked with writing the Bushfire Threat Assessment and undertook the desktop slope and vegetation assessments for the location.

Ecology

Urban Growth

Multi-dwelling Townhouse Project, SNL Building Constructions – Production of an Ecological Assessment informed by flora and fauna field surveys involving vegetation mapping and flora and fauna identification.

Nest Box Monitoring Program, Rose Group – Conduct biannual monitoring of over 500 nest boxes to comply with Conditions of Consent for residential development at Gwandalan.

Boatmans Creek Culvert Upgrade Vegetation Management Plan, Royal Haskoning – Site inspection and preparation of a Vegetation Management Plan that provided a practical approach to vegetation management for stream bank stability, erosion mitigation through revegetation, and native vegetation enhancement.

Infrastructure

Newcastle Heavy Rail Project, UrbanGrowth – Undertake field work and preparation of ecological impact assessment to inform the proposed rezoning of the Newcastle Heavy Rail Corridor.

Pacific Highway Upgrade-Oxley Highway to Kempsey, NSW Roads and Maritime Services - Implementation of the Microchiropteran Bat Management Plan prepared for the 37km upgrade of the Pacific Highway between the Oxley Highway and Kempsey on the NSW Mid-north coast. For this project Lauren was involved in the installation of 158 bat roost boxes and the provision of GIS data to inform future monitoring activities.

Energy & Mining

Bulga Mine Annual Fauna Monitoring, Glencore – Lauren has been involved in an annual monitoring program that spans two operations and involves seasonal bird surveys, habitat assessments and the full spectrum of fauna monitoring methodologies targeting threatened species as well as comprising an overall species list, and providing technical input and annual report writing

Angus Place Longwalls 900 and 910 Flora and Fauna Monitoring, Centennial Coal Angus Place – Pre and postmining baseline surveys were undertaken by Lauren including flora and fauna species diversity surveys, vegetation condition assessments and nest box erection. Monitoring of multiple sites provides a comparable data set to display any notable changes as a result of longwall mining within this mining lease area. Swamp vegetation monitoring required a memorandum to comment on overall swamp health and potential impacts as a result of surrounding mining activities.

Neubeck Open Cut Coal Mine, Centennial Coal – Flora and fauna field surveys over a three year period and the production of the Flora and Fauna Assessment as part of an overriding Environmental Impact Statement were undertaken for the proposed Neubeck open cut coal mine. Surveys involved targeted threatened species surveys, vegetation mapping, flora and fauna identification and habitat mapping.

Airly Site Specific Biodiversity Management Plan, Centennial Airly – Baseline flora and fauna assessments primarily undertaken for the Airly Flora and Fauna Report informed the production of the Airly Biodiversity Management Plan, both of which Lauren was involved in. The BMP outlined areas of ecological importance and ecological issues on site with associated management actions and monitoring requirements in line with the Development Approval.

Memberships & Achievements

Member – Ecological Society of Australia (ESA)

Member – Birdlife Australia

Member – Australian Mammal Society (AMS)

Attachment G - Visual Impact Statement

By Moir Landscape Architecture, dated 15 March 2017



Proposed Rezoning of Newcastle Surplus Railway Corridor

Visual Impact Statement

Revision: D | Project: 1319 | Date: 15th March 2017

Moir Landscape Architecture Pty Ltd, Studio 1, 88 Fern Street, PO Box 111, Islington NSW 2296 admin@moirla.com.au
Ph.(02) 4965 3500 Fax.(02) 4965 3555 www.moirla.com.au ACN: 097 558 908 ABN: 48 097 558 908

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1.0 Introduction

1.1 Introduction

Moir Landscape Architecture has been commissioned by Urban Growth to undertake a Visual Impact Statement (VIS) in regards to the proposed rezoning of the Newcastle Surplus Railway Corridor (refer to ***Figure 1***).

This VIS has been based on the Concept Master Plan prepared by Hassell in February 2017. The purpose of this report is to identify the existing visual character of the study area and provide an assessment of the potential visual impacts relating to the proposed zoning, indicative building locations and potential building heights (see Appendix).

Survey work was undertaken between April and December 2016 using key viewpoints and locations with potential views towards the site. The report details the results of the field work, documents the assessment of the landscape character and visual setting, and assesses potential visual impacts associated with the proposal.

2.0 The Proposal

2.1 The Site

Newcastle is the second largest city in NSW and is the economic and social heart of the Hunter Region. Regionally significant infrastructure – including transport, government, health and education services – are located in Newcastle city centre.

Newcastle city centre is the core of this regional city and provides a range of functions including commercial, retail, entertainment, cultural, educational and transport services. The rezoning site is located in Newcastle city centre and comprises a collection of land holdings within the surplus rail corridor lands. The site is approximately 2.1km in length generally bounded by Wharf Road to the north, Watt Street to the east, Hunter and Scott Streets to the south and Worth Street to the west. The site includes Civic and Newcastle Stations.

The site area subject to the rezoning is shown in ***Figure 1***. The Site Parcel Areas and Concept Master Plan upon which this assessment is based on are included as ***Figure 2*** and ***Figure 3*** of this report.

2.2 Project Overview

The Newcastle Urban Transformation and Transport Program has been established to deliver on NSW Government's more than $500m commitment to revitalise the city centre through: the truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange; the provision of a new light rail line from Wickham to the Beach; and the delivery of a package of urban transformation initiatives.

The transformation element of the Program aims to bring people back to the city centre by strengthening connections between the city and the waterfront, creating employment opportunities, providing more public space and amenity, and delivering better transport.

The proposed rezoning of the rail corridor land forms a part of the delivery of urban transformation initiatives, comprising a package of transport, built form and public domain improvements.

This Visual Impact Statement has been prepared with reference to the Master Plan developed by Hassell in February 2017 (Refer to ***Figure 3***). Proposed maximum building heights, floor space ratios and rezoning figures upon which this report has been assessed have been included as an Appendix to the report.



Figure 1. Site Locality Plan (Source: Sixmaps)

2.0 The Proposal



Figure 2. The Site Parcel Areas (Image Source: Hassell 2017)



Figure 3. Concept Master Plan (Prepared by Hassell, February 2017)

3.0 Study Method

3.1 Visual Impact Statement (VIS)

The purpose of a Visual Impact Statement (VIS) is to identify and determine the value, significance and sensitivity of the visual landscape and assess the potential visual impact on the character as a result of the proposed development.

The assessment was undertaken in stages as noted below:

- Objective assessment of the relative aesthetic value of the existing visual character, defined as visual quality and expressed as high, medium or low. This assessment generally relates to variety, uniqueness, prominence and naturalness of the landform, vegetation and water forms within each character type.
- Identification of key view corridors and landmark features throughout the Study Area.
- An assessment of viewer sensitivity to change. This includes how different groups of people view the landscape (for example, a resident as opposed to a tourist), and how many people are viewing and from how far.
- The undertaking of a viewpoint analysis to identify areas likely to be affected by development of the site and a photographic survey using a digital camera and a handheld GPS unit to record position and altitude.
- An assessment of visual impacts.

The purpose of the above methodology is to reduce the amount of subjectivity entering into the visual impact assessment and to provide sufficient data to allow for third party verification of results.

3.2 Definitions

Definitions for terms used throughout the VIA are included in this section of the report.

3.2.1 Landscape Values

Landscape values are the cultural attributes (social, indigenous, artistic and environmental) as well as the aesthetics of a place, as shown in ***Figure 4***.



Figure 4. Landscape Values

3.2.2 Visual Quality

Visual quality of an area is essentially an assessment of how viewers may respond to designated scenery. Scenes of high visual quality are those which are valued by a community for the enjoyment and improved amenity they can create. Conversely, scenes of low visual quality are of little value to the community with a preference that they be changed and improved, often through the introduction of landscape treatments.

As visual quality relates to aesthetics its assessment is largely subjective. There is evidence to suggest that certain landscapes are constantly preferred over others with preferences related to the presence or absence of certain elements. The rating of visual quality for this study has been based on scenic quality ratings and on the following generally accepted assumptions arising from scientific research (DOP, 1988):

- Visual quality increases as relative relief and topographic ruggedness increases;
- Visual quality increases as vegetation pattern variations increase;
- Visual quality increases due to the presence of natural and/or agricultural landscapes;
- Visual quality increases owing to the presence of water forms (without becoming too common) and related to water quality and associated activity; and
- Visual quality increases with increases in land use compatibility.
- In addition to the above, cultural items may also endow a distinct character to an area and therefore contribute to its visual quality due to nostalgic associations and the desire to preserve items of heritage significance.

3.0 Study Method

3.2.3 Visual Sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different areas. The assessment is based on the number of people affected, land use, and the distance of the viewer from the proposal. (EDAW, 2000).

For example, a significant change that is not frequently seen may result in a low visual sensitivity although its impact on a landscape may be high. Generally the following principles apply:

- Visual sensitivity decreases as the viewer distance increases.
- Visual sensitivity decreases as the viewing time decreases.
- Visual sensitivity can also be related to viewer activity (eg. a person viewing an affected site whilst engaged in recreational activities will be more strongly affected by change than someone passing a scene in a car travelling to a desired destination).

Sensitivity ratings are defined as high, moderate or low and are shown in the table below (Adapted from EDAW, 2000).

VISUAL SENSITIVITY					
LAND USE	DISTANCE ZONES				
	FOREGROUND		MIDDLE GROUND		BACKGROUND
	0-1	1-2km	2-4.5	4.5-7	> 7kms
Tourist / Recreation	High	High	High	Mod	Low
Residential: Rural or Urban	High	High	High	Mod	Low
Main Travel Corridor	Mod	Mod	Low	Low	Low
Minor / Local Roads	Mod	Mod	Low	Low	Low
Railway Line (Freight)	Low	Low	Low	Low	Low
Industrial Areas	Low	Low	Low	Low	Low

TABLE 1: Visual Sensitivity Table.

3.2.4 Visual Effect

Visual effect is the interaction between a proposal and the existing visual environment. It is often expressed as the level of visual contrast of the proposal against its setting or background in which it is viewed.

Low visual effect: occurs when a proposal blends in with its existing viewed landscape due to a high level of integration of one or several of the following: form, shape, pattern, line, texture or colour. It can also result from the use of effective screening often using a combination of landform and landscaping.

Moderate visual effect: occurs where a proposal is visible and contrasts with its viewed landscape however, there has been some degree of integration (eg. good siting principles employed, retention of significant existing vegetation, provision of screen landscaping, appropriate colour selection and/or suitably scaled development).

High visual effect: results when a proposal has a high visual contrast to the surrounding landscape with little or no natural screening or integration created by vegetation or topography.

3.3.5 Visual Impact

Visual impact is the combined effect of visual sensitivity and visual effect. Various combinations of visual sensitivity and visual effect will result in high, moderate and low overall visual impacts as suggested in the below table (URBIS, 2009).

VISUAL IMPACT				
		VISUAL EFFECT ZONES		
		HIGH	MODERATE	LOW
VISUAL SENSITIVITY LEVELS	HIGH	High Impact	High Impact	Moderate Impact
	MODERATE	High Impact	Moderate Impact	Low Impact
	LOW	Moderate Impact	Low Impact	Low Impact

TABLE 2: Visual Impact Table.

4.0 Existing Visual Character Assessment

4.1 Existing Visual Character

Newcastle City is located on a peninsula between the Pacific Ocean and the Hunter River. The western and central parts of the city centre are largely built upon the floodplain of the Hunter River and Cottage Creek and consequently are relatively flat. By contrast, the eastern end of the city around Newcastle Station and toward the beach is located on two steep hills, providing a scenic backdrop to the city centre when viewed from the foreshore of the Hunter River.

Land use within the study area is generally commercial in the east and industrial to the west. The city centre contains a rich collection of historic and significant civic buildings which give the city a distinct character, particularly along Hunter Street and the eastern end of the City.

The topography of the city centre and the gridded street network permit views from the city centre to the harbour. A number of north - south running streets have strong view corridors towards the harbour (including: Brown Street, Perkins Street, Wolfe Street, Newcomen Street and Watt Street). From the harbour, the steep topography allows views back to the city where the cathedral at the crown of the hill is a recognisable landmark. In addition to the Christ Church Cathedral a number of buildings provide landmark features within the city, for example Customs House, Queens Wharf Tower and St Andrews Church. Visual axis between these key buildings and the harbour appear to have been diminished by built form overtime.

Large areas of open space adjoin the harbour providing a significant recreation facility within close proximity to the city centre, running between Nobbys Beach and Honeysuckle Precinct.



Image 1. Central Promenade



Image 2. View corridor towards harbour



Image 3. Christ Church Cathedral



Image 4. Historic buildings along Bolton Street

4.0 Existing Visual Character Assessment



Figure 5. Existing Visual Character (Image supplied by Hassell 2016)

4.0 Existing Visual Character Assessment

4.2 Existing View Corridors

The following section of the report provides an overview of the existing view corridors and visual axis within the study area (refer to ***Figure 6***).

Western Precinct

For the purpose of this report, the western precinct refers to land surrounding ***Parcels 1 - 6.*** Land in this area is predominantly flat and as a result, views towards the harbour are limited. Built form generally contains views to the north from Hunter Street, with the exception of a indirect visual connections to the harbour (along Merewether Street and Wright Lane). From the south, built form associated with Hunter Street screens views towards the harbour.

Central Precinct

In this report, land surrounding ***Parcels 7 - 12*** is referred to as the central precinct. Land surrounding the central precinct is generally flat, rising to the south towards Church and Tyrell Street. Views towards the Site and harbour from these elevated streets to the south are limited. From Hunter Street, views to the harbour are limited to Argyle Street and voids between existing built form. Vegetation and infrastructure associated with the railway corridor fragment the view corridors.

Eastern Precinct

For the purpose of this report, the east precinct refers to ***Parcels 14 & 15*** the area between Brown Street (to the west) and Watt Street (to the east). From a pedestrian perspective, there are a number of locations from which the harbour is currently visible. View corridors towards the harbour are generally along north - south running streets including Brown Street, Perkins Street (refer to ***Viewpoint 06, pg 15***), Wolfe Street, Newcomen Street (refer to ***Viewpoint 02 pg 13***) and Watt Street. Views to the north from Bolton Street are terminated at the existing Railway Station Building (refer to ***Viewpoint 03, pg 14***). Views from Market Street are currently obstructed by built form associated with the Queen Street Wharf and infrastructure (including the existing overhead pedestrian bridge) associated with the railway.

The topography rises steeply to the south, Tyrell Street runs in a generally east west direction along the ridge. Views from these high points continue along the view corridors to the harbour.

A visual axis towards the Cathedral from the foreshore is currently fragmented by infrastructure associated with the railway, including a overhead pedestrian connection from Queens Wharf to Market Street (refer to ***Viewpoint 09, pg17***).



Image 5. Christ Church Cathedral viewed from Queens Wharf Tower - Prior to removal of Market Street pedestrian bridge (Source: Google Earth)



Image 6. Railway Station and Custom House viewed from Queens Wharf Tower (Source: Google Earth)

4.0 Existing Visual Character Assessment

WESTERN PRECINCT

CENTRAL PRECINCT

EASTERN PRECINCT

Limited views are available towards the harbour from the rear of buildings associated with Hunter Street.

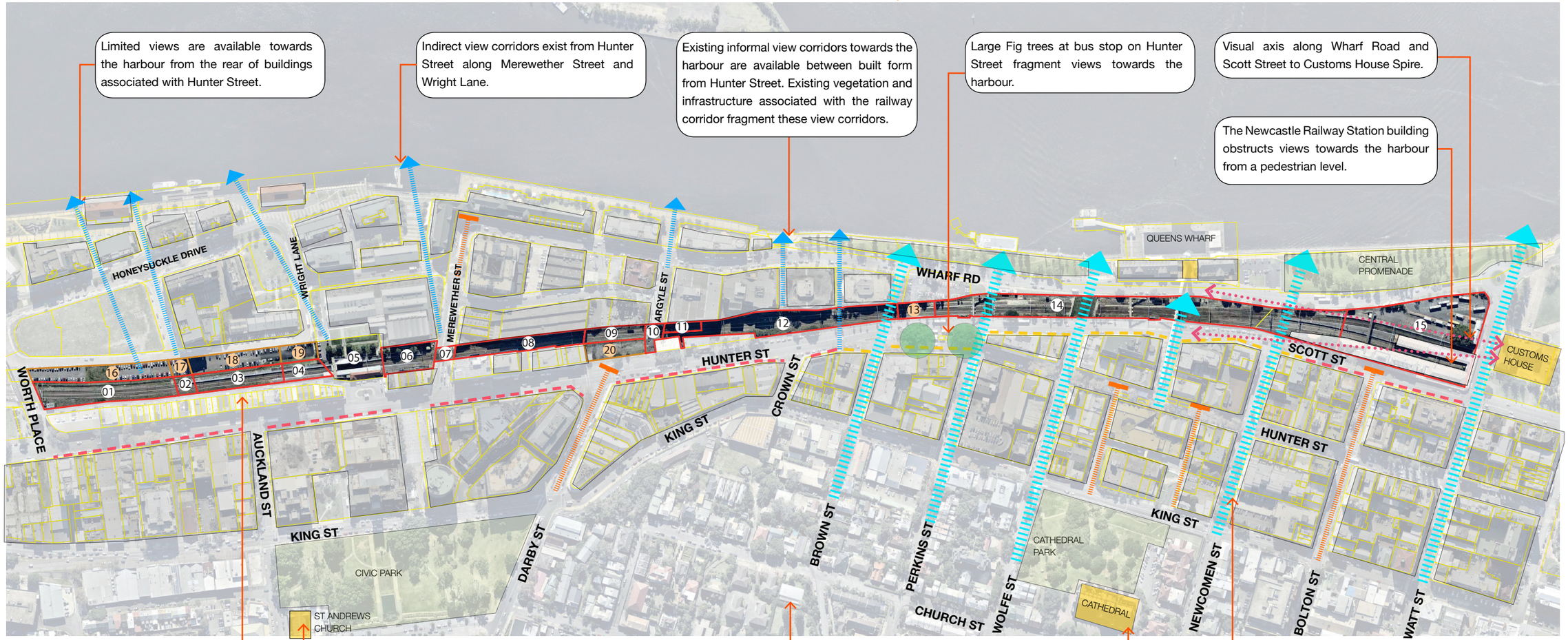
Indirect view corridors exist from Hunter Street along Merewether Street and Wright Lane.

Existing informal view corridors towards the harbour are available between built form from Hunter Street. Existing vegetation and infrastructure associated with the railway corridor fragment these view corridors.

Large Fig trees at bus stop on Hunter Street fragment views towards the harbour.

Visual axis along Wharf Road and Scott Street to Customs House Spire.

The Newcastle Railway Station building obstructs views towards the harbour from a pedestrian level.



Existing built form associated with Hunter Street screens views of the Site from the south.

St Andrews Church is visible from limited view corridors to the north, ie Honeysuckle Drive.

Views towards the harbour are generally contained by built form and street trees and limited to view corridors along north - south orientated streets.

Christ Church Cathedral is located on a high point to the south of the city, and is visible from parts of the foreshore.

Existing visual connections to the harbour from north - south running streets.

LEGEND

- SITE BOUNDARY
- LANDMARK BUILDINGS
- 01 PARCEL NUMBER (WITHIN STUDY AREA)
- 19 PARCEL NUMBER (OUTSIDE OF STUDY AREA)
- VIEW CORRIDOR TO HARBOUR
- VIEW CORRIDOR TERMINATED BY BUILT FORM.
- FRAGMENTED VIEWS AVAILABLE TO HARBOUR FROM A PEDESTRIAN LEVEL.
- VIEWS TO HARBOUR SCREENED BY EXISTING BUILT FORM FROM A PEDESTRIAN LEVEL.

N

0 40 80 160m

Figure 6. Existing Visual Character Assessment (Aerial Image Source: Hassell 2017)

5.0 Visual Impact Assessment

5.1 Visual Impact Assessment

This section of the report considers the likely impact that development would have on the existing landscape character and visual amenity.

A preliminary viewpoint analysis has been undertaken to illustrate the existing visual character of the study area and to identify the potential visual impact from prominent sites.

In addition to the viewpoint analysis, photomontages have been developed to illustrate the proposed building mass and height indicated in the Concept Master Plan.

5.2 Viewpoint Analysis

Viewpoints have been selected to illustrate a combination of the following:

- Present landscape character types.
- Areas of high landscape or scenic value.
- Visual composition (eg. focused or panoramic views, simple or complex landscape pattern).
- Range of distances.
- Varying aspects.
- Various elevations.
- Various extent of development visibility (full and partial visibility).
- Sequential along specific routes.

Viewpoints have been carefully selected to be representative of the range of views within the study area. The selection of viewpoints is informed by topographical maps, field work observations and other relevant influences such as access, visual character and the popularity of vantage points.

A total of **18 viewpoints** were recorded as part of the field work process. The majority of these viewpoints were taken from publicly accessible roads surrounding the site. The viewpoints which have been included represent the areas from where the development would appear most prominent, either based on the degree of exposure or the number of people likely to be affected.

It is important to note that viewpoints for this study have been taken only from accessible public land and from a pedestrian perspective.

5.2.2 Process of Viewpoint Analysis

Once the viewpoint was selected, panoramic photographs were taken at eye level from the viewpoints towards The Site. Photographs were taken with a Canon EOS 5D Mark III digital SLR through a 50mm lens to best represent the perspective of the human eye.

The visual impact of the viewpoint was then assessed both on site and with the topographic and aerial information to ensure accuracy. Viewpoint photographs and analysis is included the following pages.



Figure 6. Viewpoint Assessment Locations (Aerial Image Source: Hassell 2016)

Note: Location of Viewpoint 18 is off the figure.

5.0 Visual Impact Assessment



Viewpoint 01. View North from corner of Hunter Street and Brown Street

Viewpoint 01.

This photograph was taken from the corner of Brown Street and Hunter Street looking in a generally north direction towards the Site. From a pedestrian perspective, views towards the harbour are fragmented by a combination of street trees, railway infrastructure and parked cars. Large Fig and Plane Trees impede existing views towards the harbour from buildings associated with Hunter Street.

The concept master plan proposes Parcel 14 is to be designated as open space. It is likely the visual connections to the foreshore would be improved as a result of the proposal.

Refer to Photomontage 01.



Viewpoint 02. View North along Newcomen Street

Viewpoint 02.

This photograph was taken from Newcomen Street to the south of the intersection with Hunter Street. Newcomen Street runs in a generally north to south direction, with topography rising steeply to the south. Views to the north extend along Newcomen Street, across the existing railway corridor to the harbour.

The preliminary Master Plan proposes Parcel 14 be developed into open space. The view corridor between Newcomen Street to the harbour is likely to be improved as a result of the removal of existing infrastructure associated with the railway corridor. Based on the preliminary Master Plan, the visual impact from this location is likely to be negligible.

5.0 Visual Impact Assessment



Viewpoint 03. View North along Bolton Street

Viewpoint 03.

View from Bolton Street, south of the intersection at Hunter Street looking in a northerly direction towards the Site. Built form associated with Bolton Street is typical of the city, with a mix of historic and newer commercial buildings. Built form ranges in height, in excess of five storeys.

Views along Bolton Street are generally contained by built form. Views to the north, are terminated by street trees and the existing railway station building. The concept master plan indicates a maximum permissible building height of up to 15 metres on the southern end of the existing railway station site. It is unlikely the proposal has the potential to alter the existing visual character from this location.



Viewpoint 04. View from the corner of Scott and Watt Street

Viewpoint 04.

This photograph was taken from the corner of Scott Street and Watt Street looking in a generally north west direction towards Newcastle Railway Station building. Views along Watt Street extend towards the harbour. Customs House is a landmark feature.

The Master Plan identifies the Railway Station Site as a Special Use with an indicative maximum building height of up to 15 metres (along Scott Street). It is unlikely there would be a loss of existing views towards the harbour from Watt Street or from a pedestrian perspective on Scott Street as a result. There is the potential for an increase in building height to impede on the outlook from elevated buildings associated with Scott Street.

5.0 Visual Impact Assessment



Viewpoint 05. View North from Cathedral Park

Viewpoint 05.

This photograph was taken from Cathedral Park, immediately north of Christ Church Cathedral. Views of the harbour from this location are fragmented by built form. The top of Queens Wharf Tower is visible behind the multi storey car park in the foreground.

It is unlikely the proposal would alter the existing outlook from Cathedral Park as existing built form in the foreground screens views towards the Site.



Viewpoint 06. View along Perkins Street from Church Street

Viewpoint 06.

This photograph is taken looking in a generally north direction along Perkins Street from a high point at the intersection with Church Street. Views from Church Street are generally contained by built form, with view corridors along north - south orientated streets. Views from this location extend across the harbour to Stockton yet are fragmented by built form and street trees.

It is unlikely there would be any visible built form from this location as a result of the proposed development.

5.0 Visual Impact Assessment



Viewpoint 07. View South along Watt Street from Wharf Road

Viewpoint 07.

View from roundabout at the northern end of Watt Street at Central Promenade on Wharf Road. Custom House and the T&G Building are visible along Watt Street. From this location, built form associated with Scott Street is visible behind the Railway Station. Large trees associated with Scott Street and the Bus Interchange Site fragment views of built form to the south.

From this location proposed built form associated with the Railway Station and Bus Interchange Sites (Parcel 15) is likely to alter the existing visual character, however there would be no negative impact.

Refer to Photomontage 01



Viewpoint 08. View from Wharf Road in a generally South West direction

Viewpoint 08.

View from Central Promenade looking in a generally south west direction along Wharf Road. Part of the Christ Church Cathedral is visible to the south behind buildings fronting Scott Street and vegetation associated with the railway corridor. Queens Wharf Tower and the elevated pedestrian walkway are visible to the west.

The railway corridor in the foreground has been identified in the preliminary Master Plan as open space, which is likely to have a positive visual effect from this location.

5.0 Visual Impact Assessment



Viewpoint 09. View South along Market Street from Wharf Road

Viewpoint 09.

View from Wharf Road at Queens Wharf Tower looking in a southerly direction across the railway corridor to Market Street. Views from this location extend to the Christ Church Cathedral, however are currently fragmented by the overhead pedestrian walkway.

The recent removal of the overhead walkway associated with Market Street has had a positive visual effect through re-establishing a visual axis between Queens Wharf Tower and Christ Church Cathedral.



Viewpoint 10. View South along Wolfe Street from Wharf Road

Viewpoint 10.

View from Wharf Road looking in a south west direction along Wharf Road. Wolfe Street runs in a generally south direction from this location, rising steeply. Fig trees associated with the Bus Stop at the corner of Hunter Street and Scott Street screen built form to the west.

Parcel 14 has been identified as open space in the concept master plan. It is likely the existing visual character would be improved from this location.

5.0 Visual Impact Assessment



Viewpoint 11. Corner of Wright Lane and Settlement Lane

Viewpoint 11.

View from the corner of Wright Lane and Settlement Lane looking in a generally south direction towards the Site. The rear of existing buildings associated with Hunter Street screen views to the south from Wright Lane. The Site sits between the Wright Lane carpark and buildings associated with Hunter Street.

The indicative built form would be visible from this location, and it is likely the scale would be in keeping with the character of the Honeysuckle precinct. Some limited views of the harbour are available from the rear of buildings associated with Hunter Street through breaks in built form associated with Honey Suckle. It is likely these will be impeded by the proposed built form.



Viewpoint 12. Wright Lane

Viewpoint 12.

View from Wright Lane looking in a generally south direction towards the Site. It is unlikely proposed built form would result in a noticeable change to the existing visual character from this location.

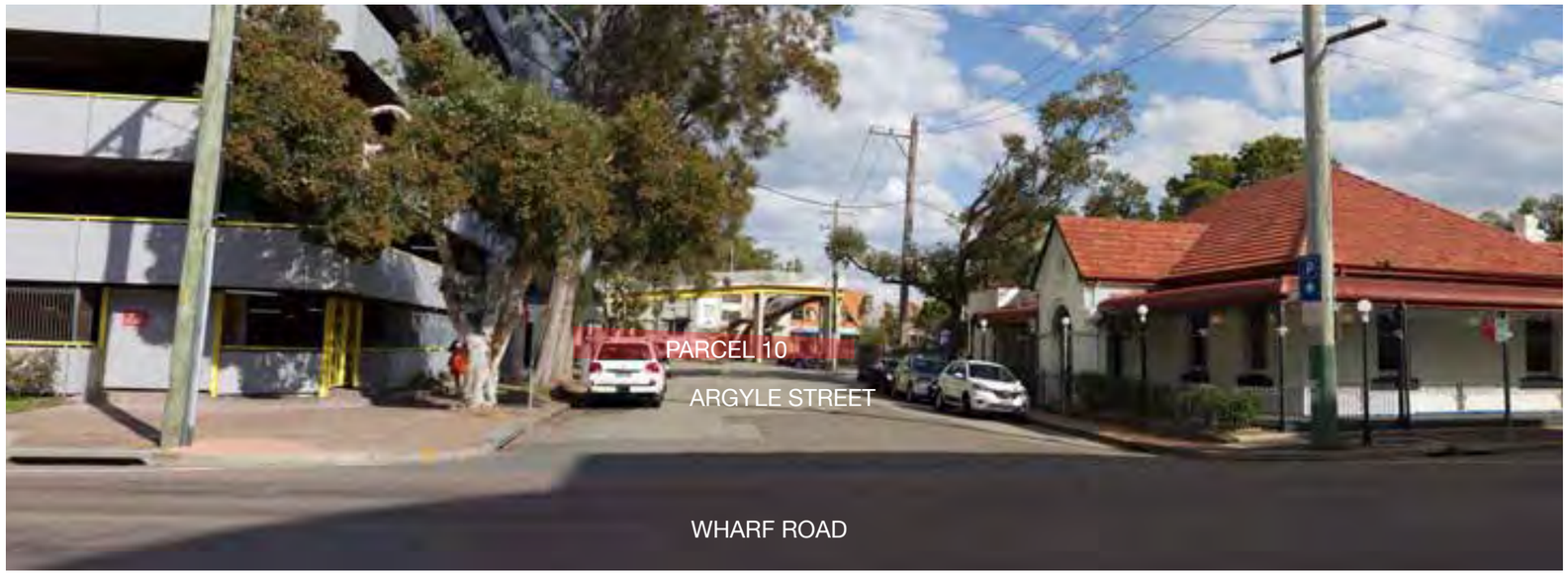
5.0 Visual Impact Assessment



Viewpoint 13. Merewether Street

Viewpoint 13.

View from the corner of Hunter Street and Merewether Street looking in a northern direction to the harbour. Views along Merewether Street are terminated by the Crowne Plaza Hotel. A small view corridor to the harbour is visible to the west of Crowne Plaza Hotel. This existing view corridor is unlikely to be impacted by the proposal.

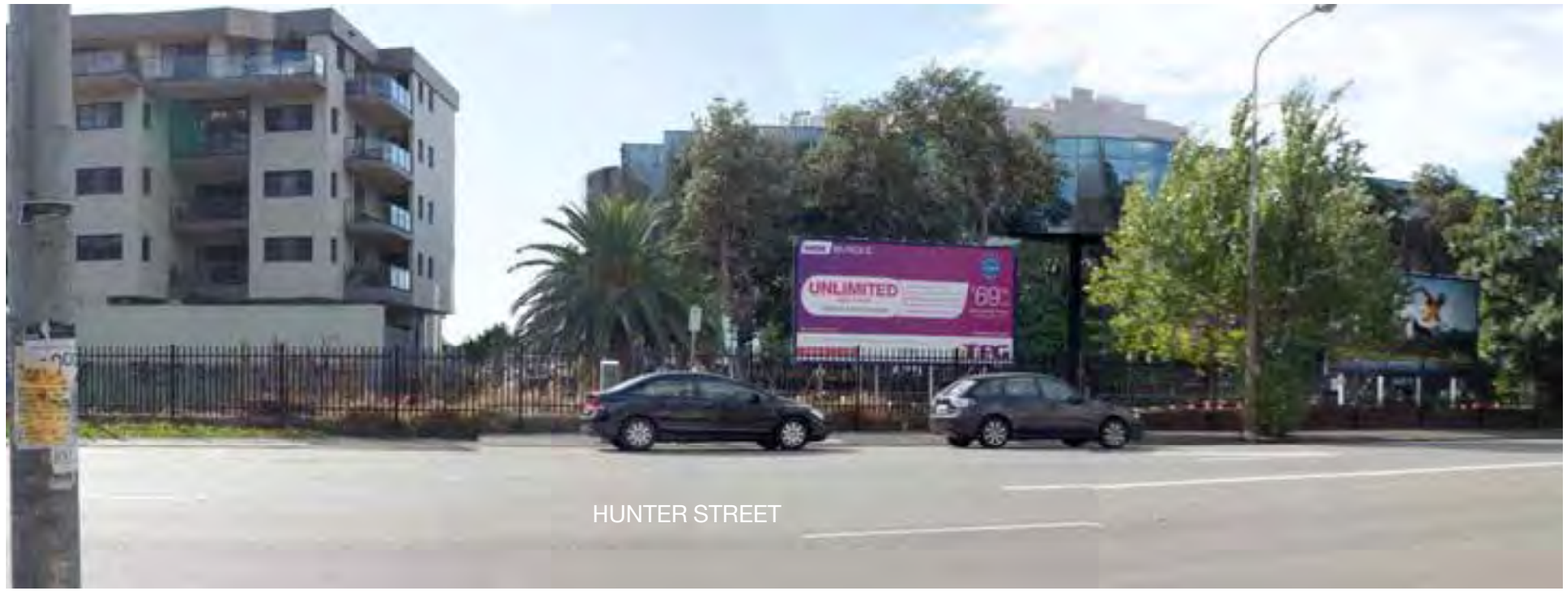


Viewpoint 14. View from Wharf Road look south along Argyle Street

Viewpoint 14.

View from Wharf Road looking in southerly direction along Argyle Street. Parcel 10 is indicated on the concept master plan as a plaza space with no built form. It is likely the removal of infrastructure associated with the railway corridor would result in improvements to the visual character. A view corridor from Hunter Street to the harbour would be established.

5.0 Visual Impact Assessment



Viewpoint 15. View from the corner of Crown Street and Hunter Street

Viewpoint 15.

View from the corner of Crown Street and Hunter Street looking in a northerly direction towards the Site. A view corridor towards the harbour is fragmented by vegetation and infrastructure associated with the existing rail corridor.

It is likely built form indicated on the preliminary master plan would screen the existing view corridor towards the harbour from this location.



Viewpoint 16. View from Scott Street towards Customs House

Viewpoint 16.

This photograph was taken from Scott Street looking in a generally east direction. Customs house is visible at the end of the street. The existing Fig Tree located on the Site of Parcel 15 screens the lower section of Customs House from this location.

The existing visual axis from Scott Street to customs house will not be impacted by the proposed development.

5.0 Visual Impact Assessment



Viewpoint 17. View east along Wharf Road

Viewpoint 17.

This photograph was taken from Wharf Road, next to the carpark associated with Queens Street Wharf. The spire of Customs House forms a landmark element in the landscape from this location for motorists and pedestrians travelling in an easterly direction.

It is unlikely the proposal would impede the existing visual axis to Customs House.



Viewpoint 18. View from carpark in Foreshore Park.

Viewpoint 18.

View from the carpark within Foreshore Park, accessed off Wharf Road. Views from the park looking in a generally east direction towards the Site are screened by Pines associated with Customs House. Landmark buildings including Customs House, Newcastle Cathedral and the T & G Building extend above built form and vegetation.

It is unlikely built form associated with the proposal would alter the existing visual character from this location.

5.0 Visual Impact Assessment

5.3 Summary of Visual Impact

For the purpose of this report, the visual impact resulting from the proposed rezoning and potential future built form on the Site has been assessed in three sections: west, central and east precincts. The preliminary land use, building heights and building massing has been assessed for the Site (**refer to Figure 3**) in relation to the existing visual character and view corridors.

5.3.1 West Precinct (Parcels 1 - 6)

The western end of the Site defined in the Urban Design Analysis as the 'City West Precinct' and for the purpose of this assessment refers to ***Parcels 1 - 6.*** Existing views in this area from a pedestrian perspective are predominantly contained by existing built form. Buildings associated with Hunter Street to the south of the Site are in excess of 2 to 3 storeys high. From a pedestrian perspective, views towards the Site from Hunter Street are screened by dense built form (*refer to* ***Image 07***) between Worth Place and Merewether Street.

View towards the Site from areas to the south of Hunter Street are generally impeded by built form and street trees. It is likely the visual impact of the proposed development in the west precinct would be minimal from the south.

It is proposed Parcel 1 - 4 will be rezoned B4 Mixed Use with a maximum building height of 30 metres (Parcels 1 - 3) and 24 metres (Parcel 4). The proposed Master Plan and proposed FSR identifies a building mass of a similar scale to existing buildings.

Parcel 5 has been identified as RE1 Public Recreation. The visual character in this location is likely to be improved by the removal of infrastructure associated with the existing railway corridor (ie. fences). The removal of any additional infrastructure (ie. pedestrian overpass) would improve the existing visual character in this location.



Image 07. Existing built form typical of Hunter Street (to the south of Parcels 1-3)



Image 08. Existing view south towards St Andrews Cathedral along Settlement Lane from Honeysuckle Drive



Image 09. Existing view south towards St Andrews Cathedral along Settlement Lane from Honeysuckle Drive

5.0 Visual Impact Assessment

5.3.2 Central Precinct (Parcels 7 - 12)

The Master Plan indicates Parcel 7 to be retained as Merewether Street, connecting Hunter Street and Wharf Road. Existing views along Merewether Street are terminated to the north by built form associated with Crown Plaza Hotel. The small view corridor to the left of the Crown Plaza building will be retained (refer to ***Image 10***).

The proposed rezoning would see Parcel 8 (max. building height of 30 metres) and Parcel 9 (max. building height of 24 metres) to be zoned as B4 Mixed Use. Existing buildings associated with Hunter Street to the south of Parcel 8 screen views to the north from a pedestrian perspective. It is likely proposed building would appear as a continuation of the existing built form.

Parcel 9 has been identified as potential B4 Mixed Use rezoning. Built form in the concept Master Plan runs on an angle aligned with Darby Street with open space shown on the eastern end of Parcel 9 and within Parcel 10. From a pedestrian perspective, it is likely visual connections to the harbour along Argyle Street would be improved as they would likely be available from Hunter Street and potentially Darby Street.

It is proposed Parcel 12 be rezoned B4 Mixed Use with a maximum building height of 14 metres. There is unlikely to be any significant visual impact as a result of proposed buildings in this Parcel. Existing buildings associated with Wharf Road generally impede views of the harbour from Hunter Street. Existing view corridors on either side of 251 Wharf Road are likely to be screened by built form.



Image 10. Existing view towards the harbour along Merewether Street to be maintained



Image 11. Existing view towards the harbour between building associated with Wharf Street from Hunter Street



Image 12. Existing view from Hunter Street towards Argyle Street.

5.0 Visual Impact Assessment

5.3.3 East Precinct (Parcels 14 & 15)

The proposal identifies the rezoning of land within Parcel 14 to RE1 Public Recreation. The Concept Master Plan portrays large areas of open space, which would ensure existing views are maintained or improved from a pedestrian perspective. It is likely existing view corridors towards the harbour along Wolfe Street and Newcomen Street would be reinforced as a result of the proposal. The removal of the existing overhead pedestrian walkway between Market Street and Queens Wharf Tower results in an improvement to the visual amenity, and reinforces a significant visual axis from the Christ Church Cathedral to Queens Wharf Tower and the harbour foreshore.

Parcel 15 has been identified for rezoning for SP3 Special Activities with the majority of the site having a maximum building height of 10 metres and a small portion to the south fronting Scott Street having a maximum building height of 15 metres. It is important to note part of the existing railway station building is currently a height of 15 metres and the visual character is unlikely to alter.

The proposed development of Parcel 15 will have no impact on existing views from a pedestrian perspective from Scott Street and Bolton Street. For the most part, the height of the existing railway station building is to remain unchanged. There is the potential for an increase to the height to increase to 15 metres (in keeping with the scale of the existing built form). If the built form is increased it is likely the visual impact would be minimal.

The spire of customs house is visible when travelling in an easterly direction along Scott Street (see ***Viewpoint 16***). Proposed development in Parcel 15 is unlikely to impact this visual axis.

The potential for the extension of built form into the northern pocket of Parcel 15 (currently occupied by the Newcastle Bus Interchange) at a maximum building height of 10 metres, which is in keeping with the scale of the existing buildings.

Customs house is a landmark building, visible when travelling along Wharf Road in an easterly direction (see ***Viewpoint 17***). Though currently fragmented by street trees and infrastructure associated with and railway / bus interchange the axis between queens Wharf and Customs House is a visual connection. The Master Plan illustrates an extension of the existing pedestrian promenade to the north of Customs House which would assist in reinforcing the visual axis between Queens Wharf Tower and Customs House, having a positive impact on the visual character.



Image 13. Existing view across the Site from Perkins Street



Image 14. View towards Christ Church Cathedral along Market Street prior to removal of pedestrian overpass



Image 15. View from Wharf Road illustrating existing street trees fragmenting views from buildings along Hunter St

5.0 Visual Impact Assessment

WESTERN PRECINCT

CENTRAL PRECINCT

EASTERN PRECINCT

Views to the foreshore from a pedestrian perspective may be improved as a result of the removal of pedestrian overpass.

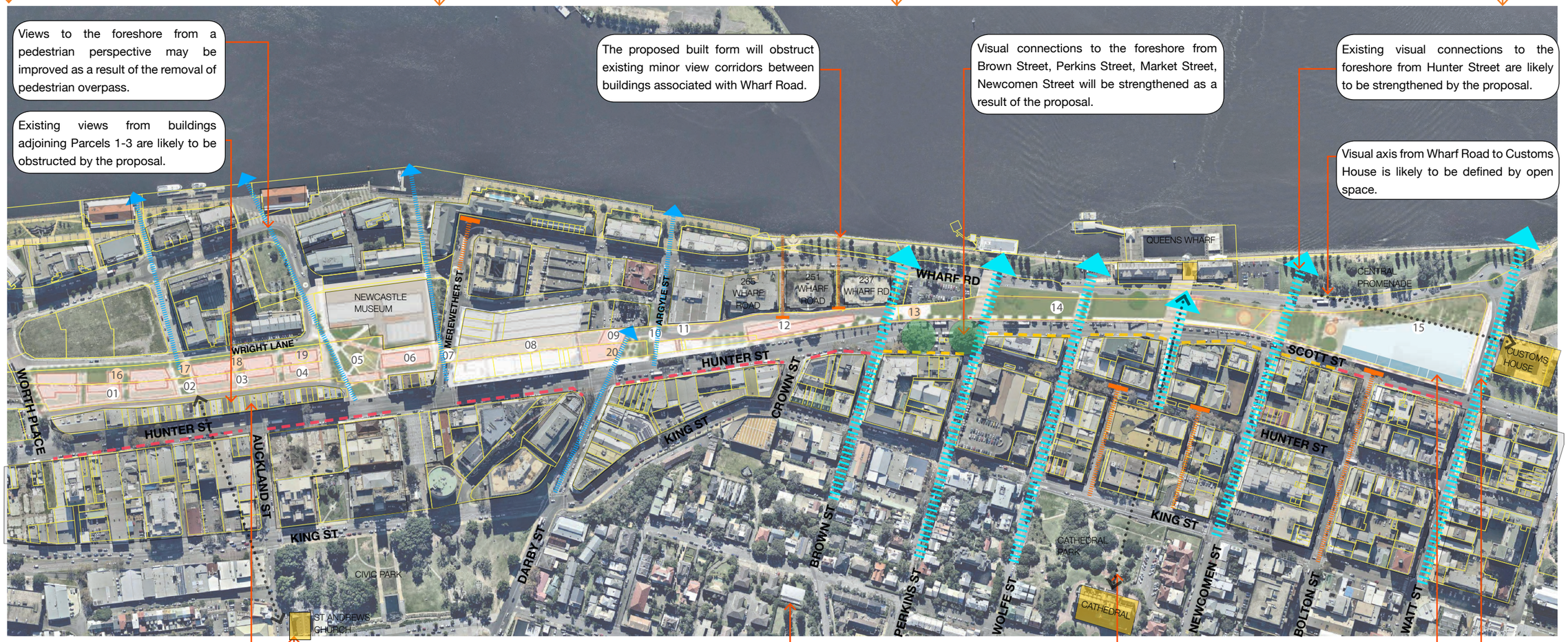
Existing views from buildings adjoining Parcels 1-3 are likely to be obstructed by the proposal.

The proposed built form will obstruct existing minor view corridors between buildings associated with Wharf Road.

Visual connections to the foreshore from Brown Street, Perkins Street, Market Street, Newcomen Street will be strengthened as a result of the proposal.

Existing visual connections to the foreshore from Hunter Street are likely to be strengthened by the proposal.

Visual axis from Wharf Road to Customs House is likely to be defined by open space.



Existing built form associated with Hunter Street screens views of the Site from the south.

View corridor from harbour to St Andrews Church is likely to be reinforced by proposed built form.

The proposed rezoning of the central precinct is unlikely to impact the existing visual character from the south.

Visual axis between Cathedral and Market Street and Queens Wharf is likely to be strengthened as a result of the proposal.

Existing built form associated with Newcastle Railway Station screens views to the foreshore from Scott Street. It is unlikely the proposal would result in any negative visual impacts from the south.

Visual connections between Watt Street and the harbour will not to be impacted by the proposal.

LEGEND

- PROPOSED BUILDING FOOTPRINT
- LANDMARK BUILDINGS
- EXISTING SIGNIFICANT TREE
- VIEW CORRIDOR TO HARBOUR
- VIEW CORRIDOR TERMINATED BY BUILT FORM
- VIEWS AVAILABLE TO HARBOUR FROM A PEDESTRIAN LEVEL
- VIEWS TO HARBOUR SCREENED BY BUILT FORM FROM A PEDESTRIAN LEVEL

Figure 8. Visual Impact Assessment (Image Source: Hassell 2016)

5.0 Visual Impact Assessment



Photomontage 01A. Existing View



Photomontage 01B. Indicative Built Form Overlay

5.0 Visual Impact Assessment



Photomontage 02A. Existing View



Photomontage 02B. Indicative Built Form Overlay (Height increase to Railway Station Building)

6.0 Recommendations

6.1 Summary of Recommendations

The following provides an overview of the recommendations to be considered during the detailed design phase to assist in ensure the visual impact on the existing visual character is minimal.

Where possible, recommendations aim to:

- Ensure existing visual connections are maintained.
- Create opportunities for enhancing or creating new visual connections.
- Emphasise visual links to landmark buildings.

The recommendations summarised for each precinct.

6.1.1 West Precinct (Parcels 1 - 6)

Due to existing buildings associated with Hunter Street, there are limited opportunities to improve visual connections between Hunter Street and the harbour.

The following recommendations are to be considered:

1. Ensure views to St Andrews Cathedral are maintained.

2. Align breaks in built form with existing street alignments / view corridors to ensure potential for future view corridors between Hunter Street and the Harbour.

3. Limit structures to reinforce connections between Newcastle Museum and Civic buildings (Civic Theatre and City Hall).

4. Investigate the removal of existing pedestrian overpass to reinforce visual links between Civic Precinct and the harbour.

5. Consider modifications to Civic Station to allow visual connections between Civic Square and the foreshore.

6. Ensure Built Form associated with Parcel 6 aligns with the set back of buildings associated with Newcastle Museum.



Figure 9. Recommendations - Western Precinct (Image Source: Hassell 2017)

6.0 Recommendations

6.1.2 Central Precinct (Parcels 7 - 12)

The following recommendations are to be considered:

7. Align built form in Parcel 9 and 20 to ensure continual axis along Darby Street.

8. Establish visual axis along Argyle Street.

9. Consider break in built form to align with existing pedestrian connection between 251 and 237 Wharf Road to reinforce view and pedestrian corridor Between Hunter Street and the foreshore.

10. Consider detail design to ensure view corridor along Brown Street to the harbour is maintained and enhanced where possible.



Figure 10. Recommendations - Central Precinct (Image Source: Hassell 2017)

6.0 Recommendations

6.1.3 East Precinct (Parcels 13 - 15)

The following recommendations are to be considered:

11. Consider placement of vegetation and vertical elements in open space (Parcel 14) to ensure existing visual corridors between the harbour and Perkins Street are maintained.

12. Ensure design of open space reinforces visual connections to harbour along Wolfe Street.

13. Ensure design of open space enhances connections between Market Street and the foreshore and reinforces the visual axis to Christ Church Cathedral from Market Street and Queens Street Wharf.

14. Ensure design of open space reinforces visual connections to harbour along Newcomen Street.

15. Consideration of the visual axis along Scott Street to Customs House Spire. Visual axis is to be reinforced where possible by built form associated with Parcel 15.

16. Consideration of views towards Customs House in an easterly direction from Wharf Road. Visual axis is to be maintained by built form associated with Parcel 15.

17. Ensure views to Christ Church Cathedral are maintained from the east of Parcel 15.

18. The design of open space in Parcel 14 is to consider the visual axis to Customs House.



Figure 11. Recommendations - Eastern Precinct (Image Source: Hassell 2017)

7.0 Conclusion

7.1 Conclusion

The objective of this Visual Impact Statement is not to determine whether the proposed impact is visible or not, but to determine how the proposal will impact on the existing visual amenity, landscape character and scenic quality.

Overall, the scale of the proposed built form is in keeping with the surrounding residential and commercial buildings. From most areas within the Study area, the proposed development will appear as a continuation of the existing built form. Distant views towards the harbour from the south are unlikely to be impeded as a result of the proposal.

From a pedestrian perspective it is likely the proposal will result in a positive visual impact upon the existing visual character of the study area. Key view corridors between the City and Harbour will be retained and in some cases reinforced or improved as a result of the proposed built form.

Some aspects of the existing visual character of the study area are likely to be improved through the reinforcement and improvement of existing view corridors and visual axis between key landmark buildings. For example the visual axis between Christ Church Cathedral and Queens Wharf will be reinforced and have a positive impact on the visual character from Market Street.

The proposed redevelopment of rail corridor land to the north of the city (currently inaccessible to the public) into functional open space will have a positive impact on the existing visual character of the study area.

If the proposal is undertaken with consideration of the recommendations of this report, it is our opinion that the proposed rezoning and built form as per the Concept Master Plan could be undertaken with minimal visual impact.

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MAPS

Google Maps, 2017 http://google.com/maps/

Six Maps, 2017, http://http://maps.six.nsw.gov.au/

Appendix A



DRAFT - 2/2/17

WITHIN CORRIDOR

PARCEL	PROPOSED FSR	AREA (m2)
1	3:1	3,370
2	3:1	408
3	3:1	1,869
4	3:1	900
5		2,839
6	3:1	1,604
7	2.5:1	295
8	2.5:1	2,040
9	4:1	988
10		467
11		386
12	1.5:1	4,542
13	2.5:1	659
14		11,151
15	1.5:1	10,698

* *land proposed for transfer to Council under a VPA*

OUTSIDE CORRIDOR

PARCEL	PROPOSED FSR	AREA (m2)
16	3:1	2,544
17	3:1	376
18	3:1	1,795
19	3:1	732
20	4:1	1,108

Appendix A. Proposed Maximum Floor Space Ratio (Source: Elton Consulting 2017)

Appendix B



DRAFT - 2/2/17

WITHIN CORRIDOR

PARCEL	PROPOSED LAND USE	AREA (m2)
1	B4 - Mixed Use	3,370
2	B4 - Mixed Use*	408
3	B4 - Mixed Use	1,869
4	B4 - Mixed Use	900
5	RE1 - Public Recreation	2,839
6	B4 - Mixed Use	1,604
7	B4 - Mixed Use	295
8	B4 - Mixed Use	2,040
9	B4 - Mixed Use	988
10	RE1 - Public Recreation	467
11	SP2 - Infrastructure	386
12	B4 - Mixed Use	4,542
13	SP2 - Infrastructure	659
14	RE1 - Public Recreation	11,151
15	SP3 - Tourist	10,698

** land proposed for transfer to Council under a VPA*

OUTSIDE CORRIDOR

PARCEL	PROPOSED LAND USE	AREA (m2)
16	B4 - Mixed Use	2,544
17	B4 - Mixed Use	376
18	B4 - Mixed Use	1,795
19	B4 - Mixed Use	732
20	B4 - Mixed Use	1,108

Appendix B. Proposed Land use Zoning (Source: Elton Consulting 2017)

Appendix C



DRAFT - 2/2/17

WITHIN CORRIDOR

PARCEL	PROPOSED MAX. HEIGHT	AREA (m2)
1	30m	3,370
2	30m*	408
3	30m	1,869
4	24m	900
5		2,839
6	18m	1,604
7	30m	295
8	30m	2,040
9	24m	988
10		467
11		386
12	14m	4,542
13	18m	659
14		11,151
15	10 - 15m	10,698

** land proposed for transfer to Council under a VPA*

OUTSIDE CORRIDOR

PARCEL	PROPOSED MAX. HEIGHT	AREA (m2)
16	30m	2,544
17	30m	376
18	30m	1,795
19	30m	732
20	24m	1,108

Appendix C. Proposed Maximum Building Heights (Source: Elton Consulting 2017)

Attachment H - Shadow Impact Analysis

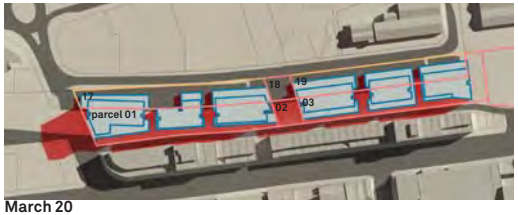
By Hassell, dated September 2016

SHADOW IMPACT ANALYSIS

A shadow impact analysis was conducted to assess the overshadowing impact of the proposed indicative building envelopes to publicly accessible open space at key locations along the corridor including Civic Lane, Civic Link, Darby Plaza and the Harbour Lawn. The analysis looks at 3 control times (9am, 12pm, and 3pm) for the equinox, summer and winter solstices.

Civic Lane

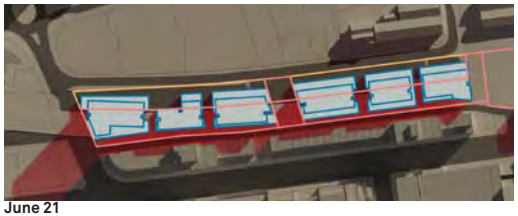
Significant overshadowing of Civic Lane occurs during the cooler months of the year, although proposed acessways between envelopes allow pockets of solar access to reach the lane at 12pm. The lane receives good solar access in summer and shading strategies may be required to mitigate the solar impact at this time. A decrease in building height to the southern edge of the envelopes may reduce overshadowing of the lane in the winter months. However, further analysis is required to test this.

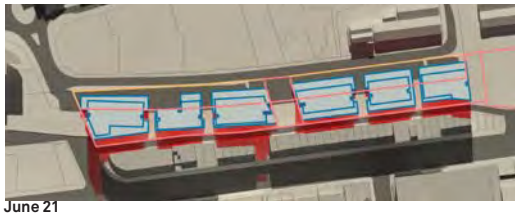


March 20
9am


March 20
12pm

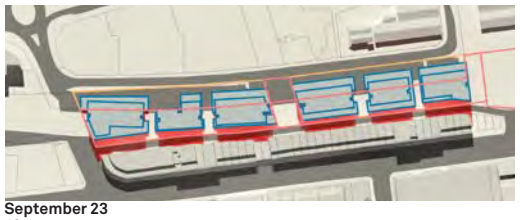

March 20
3pm


June 21
9am

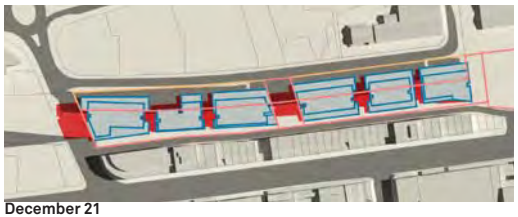

June 21
12pm


June 21
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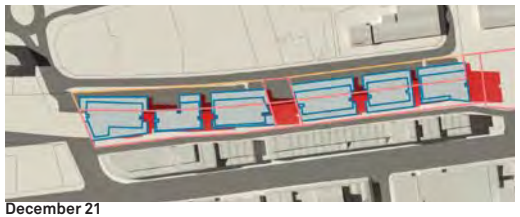

September 23
9am


September 23
12pm


September 23
3pm


December 21
9am


December 21
12pm


December 21
3pm

Indicative building envelope

Additional overshadowing from indicative building envelope

The shadow studies contained within this report are accurate to the implied limits of the supplied base information. HASSELL does not accept responsibility for the accuracy of information prepared by other parties.

Please note, proposed building envelopes used for this shadow analysis are indicative only and require further testing, analysis and approval. The envelopes have been modelled to the indicative heights specified on page 39 and are within the maximum FSR controls specified on page 38 of this report.

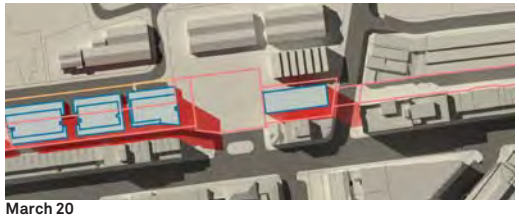
Civic Link

Throughout the year, especially during midday, little overshadowing occurs within Civic Link, creating an open space with high amenity and comfort during winter. Up to only 14% of the space (parcel 04) is additionally overshadowed in winter on the tested dates due to the proposed building envelopes. Shading strategies are advised to mitigate solar impact in summer. The analysis also demonstrates that no additional overshadowing of Wheeler Place occurs as a result of the proposed building envelopes and heights.



March 20
9am


March 20
12pm


March 20
3pm

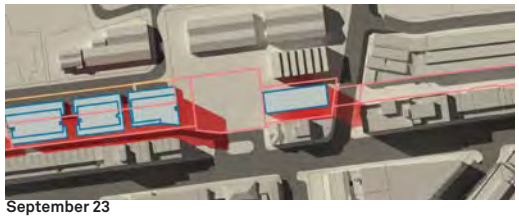

June 21
9am


June 21
12pm


June 21
3pm


September 23
9am


September
12pm


September 23
3pm


December 21
9am


December 21
12pm


December 21
3pm


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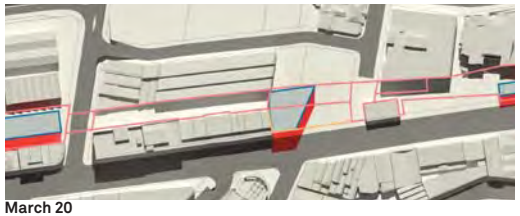
© 2016

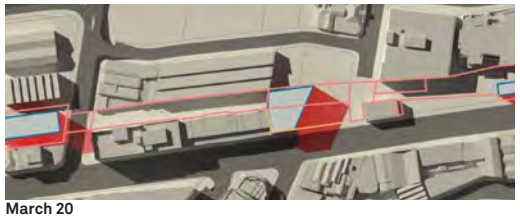
Darby Plaza

Darby Plaza receives good solar access in winter in the morning, however, by 3pm just over half of the plaza is overshadowed. A similar outcome occurs at March 20 and September 23, although the overshadowing at 3pm is more significant. A decrease in building height along the western plaza edge would lessen the overshadowing impact, although this requires further testing and analysis. In summer, the plaza is in full sun from the morning to midday, with approximately 60% overshadowing occuring in the afternoon at 3pm. Shading strategies are advised to mitigate solar impact in the morning to midday during summer.

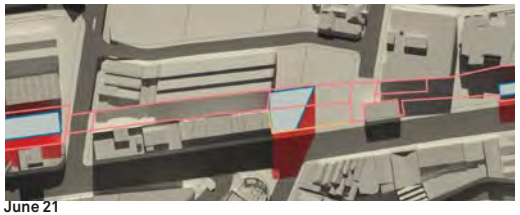


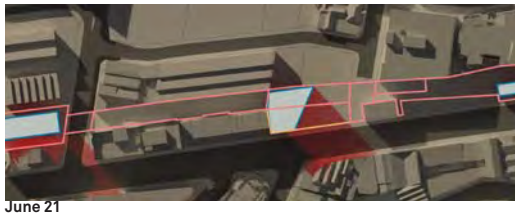
March 20
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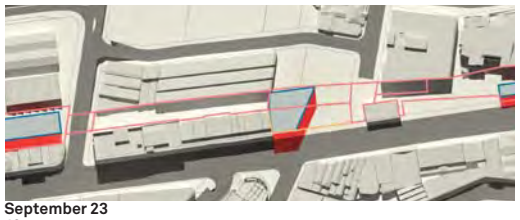

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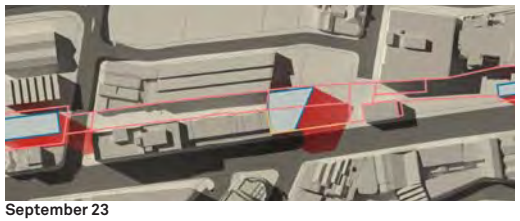

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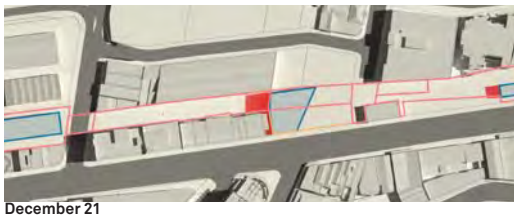

June 21
12pm


June 21
3pm


September 23
9am


September 23
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September 23
3pm


December 21
9am


December 21
12pm


December 21
3pm

Indicative building envelope

Additional overshadowing from indicative building envelope

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Harbour Lawn

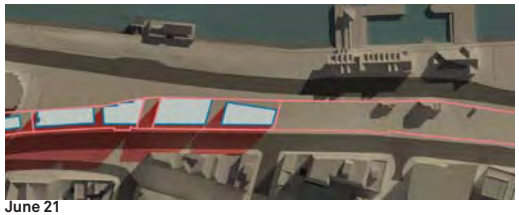
The proposed building envelopes create minimal overshadowing of the Harbour Lawn for most of the year, with a small amount occuring at the western end of the Lawn in the afternoon at 3pm.

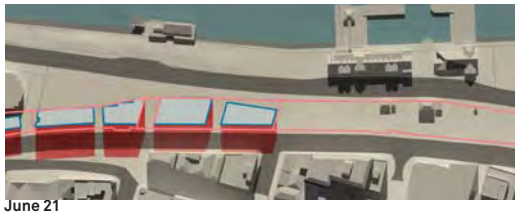


March 20
9am


March 20
12pm


March 20
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June 21
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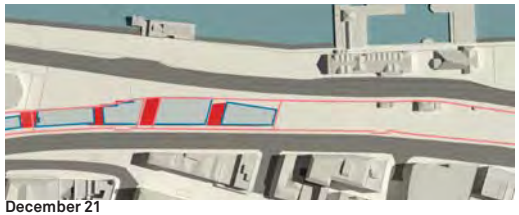

June 21
12pm


June 21
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September 23
9am


September 23
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September 23
3pm


December 21
9am


December 21
12pm


December 21
3pm

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Attachment I - Traffic Impact Assessment

By GHD, dated May 2017



UrbanGrowth NSW

Newcastle Urban Transformation and Transport Project
Rezoning of surplus rail corridor lands

Traffic Impact Assessment

May 2017

Executive summary

This report has examined the traffic implications of the proposed rezoning of the surplus rail corridor through the Newcastle CBD. This report is subject to, and must be read in conjunction with, the limitations and qualifications contained throughout the Report.

The proposed rezoning would provide for public recreation, a major attraction and several mixed use sites. Land that is the subject of the rezoning application includes the assumed potential for 400-500 residential units, and up to 5,000 m^2 Gross Floor Area of non-residential land use (most likely for employment-generating uses such as office and/or retail). Development on three adjacent and related sites, which do not form part of the rezoning application, has also been considered in this assessment.

Traffic impacts

Conservative estimates of expected traffic generation have been adopted, based on rates published by Roads and Maritime Services for a location in suburban Newcastle, and on the parking requirements outlined in the Newcastle Development Control Plan 2012. Daily traffic movements of almost 3,300 (2-way) have been estimated. However, with good access to the Newcastle CBD, light rail services, bus services and active transport connections, traffic generation from the proposed development sites will be substantially less than this conservative estimate.

Traffic modelling of the assumed traffic generation has been undertaken, using the traffic model developed for TfNSW to assess the traffic impacts of the Newcastle Light Rail project. The model was developed in collaboration between TfNSW, Roads and Maritime Services, Newcastle City Council and GHD. The base case models assume that the Light Rail is in place and operational.

The modelling shows that for forecast peak hour traffic conditions in 2018 and 2028 the additional traffic generated by the proposed rezoning could be accommodated within the road network, without any modifications or mitigation works beyond those already proposed by TfNSW in response to the Light Rail project.

Parking impacts

A Parking Strategy, developed by TfNSW, has considered the cumulative impacts of the Light Rail project and various known developments sites on public parking supply. A net loss of 407 spaces is expected, which would increase overall peak occupancy to 81% with current demand levels. The Strategy recommends demand management, rather than demand satisfaction, as the most appropriate approach into the future. The Parking Strategy concludes that the overall net loss of parking supply is manageable in the context of broader objectives of parking demand management and increased public transport use.

Pedestrian impacts

The proposal would maintain and enhance pedestrian connectivity between the CBD and the waterfront. The proposed development sites will enhance the public open space surrounding each site, with retail land uses activating building frontages to provide increased opportunity for movement, recreation and service transactions.

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Appendices

Appendix A - Intersection Operation Detailed Summary Results

This report: has been prepared by GHD for UrbanGrowth NSW and *may only be used and relied on by UrbanGrowth NSW for the purpose agreed between GHD and UrbanGrowth NSW as set out in section 1.1 of this report.*

GHD otherwise disclaims responsibility to any person other than UrbanGrowth NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by UrbanGrowth NSW and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has not been involved in the preparation of the Rezoning Application and has had no contribution to, or review of the Rezoning Application other than in the Traffic Impact Assessment. GHD shall not be liable to any person for any error in, omission from, or false or misleading statement in, any other part of the Rezoning Application.

1. Introduction

This report has been prepared to support the amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor land ('rail corridor land') between Worth Place and Watt Street in Newcastle city centre (Figure 1-1).



Figure 1-1 Rezoning study area

Source: Elton Consulting

The Newcastle Urban Transformation and Transport Program ('Program') has been established to deliver on NSW Government's more than $500 million commitment to revitalise the city centre through: the truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange; the provision of a new light rail line from Wickham to the Beach; and the delivery of a package of urban transformation initiatives.

The transformation element of the Program aims to bring people back to the city centre by strengthening connections between the city and the waterfront, creating employment opportunities, providing more public space and amenity, and delivering better transport.

The proposed rezoning of the rail corridor land forms a part of the delivery of urban transformation initiatives, comprising a package of transport, built form and public domain improvements.

1.1 Purpose of this report

This report outlines the potential traffic impacts arising from the proposed rezoning of land in the Newcastle City Centre, as part of the Program. It details the process used to undertake the assessment, including traffic generation and distribution, traffic modelling and reporting of model outputs. Other traffic impacts, including parking, site access, and pedestrian and bicycle issues, are also assessed.

Any future development of the rezoned land will be subject to further detailed investigation and assessment through the Development Application process.

1.2 Basis of assessment

The basis of the assessment for this project is the Newcastle City Centre Microsimulation Traffic Model, which was used by Transport for New South Wales (TfNSW) to model the impacts of the Newcastle Light Rail on the road network of the Newcastle CBD. This model was developed in collaboration between TfNSW, Roads and Maritime Services and GHD. Newcastle City Council was also consulted during this process.

The development of the model is detailed in Section 5.1. The spatial coverage of the model is shown in Figure 1-2.

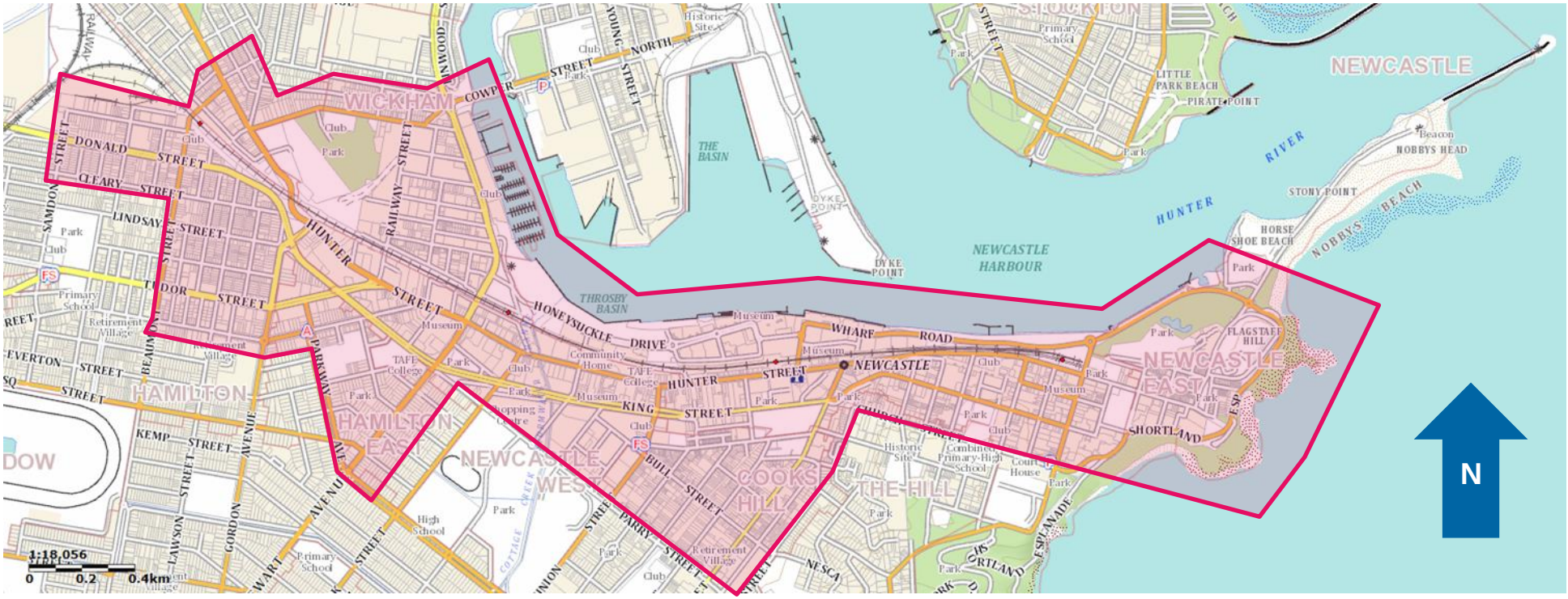


Figure 1-2 Study area for the Newcastle light rail traffic modelling

Source: https://maps.six.nsw.gov.au/

2. Newcastle urban transformation and transportation project

2.1 Newcastle urban transformation

The Newcastle Urban Renewal Strategy (NURS) sets out the NSW Government's long term approach and vision for the revitalisation of Newcastle city centre to the year 2036.

The NURS identifies three character precincts in Newcastle city centre (West End, Civic and East End), within which significant housing and employment opportunities, together with built form and public domain changes and improvements exist. The NURS describes these precincts as:

- East End: residential, retail, leisure and entertainment.
- Civic: the government, business and cultural hub of the city.
- West End: the proposed future business district including the western end of Honeysuckle (Cottage Creek).

UrbanGrowth NSW has been directed by NSW Government to deliver on NURS through the Program, in partnership with Transport for NSW (TfNSW), the Hunter Development Corporation (HDC) and Newcastle City Council (Council).

2.2 Proposed rezoning

UrbanGrowth NSW seeks to amend the Newcastle Local Environmental Plan 2012 (NLEP) to enable the delivery of the Program and the objectives of NURS planning outcomes.

2.2.1 Vision

The Program vision has been informed by feedback from the community, Council, government agencies and urban renewal experts.

> *Our vision is an activated city centre and waterfront that attracts people, new enterprises and tourism. Overtime, we see great opportunities to build on the strengths of the city centre to encourage innovative and enterprising industries to survive. In the longer term, we see an opportunity to strengthen Newcastle's position on the regional, national and international stage, with a view to stronger ties with Asia Pacific.*
>
> *UrbanGrowth NSW, 2015*

2.2.2 Program objectives

The Program is underpinned by five objectives which will drive successful urban transformation:

- **Bring people back to the city centre**
  - Re-imagine the city centre as an enhanced destination, supported by new employment, educational and housing opportunities and public domain that will attract people.
- **Connect the city to its waterfront**
  - Unite the city centre and the harbour to improve the experience of being in and moving around the city.

- **Help grow new jobs in the city centre**
  - Invest in initiatives that create jobs, with a focus on innovative industries, higher education and initiatives to encourage a range of businesses to the city centre.
- **Create great places linked to new transport**
  - Integrate urban transformation with new, efficient transport to activate Hunter and Scott Streets and return them to thriving main streets.
- **Creating economically sustainable public domain and community assets**
  - Leave a positive legacy for the people of Newcastle. Ensure that new public domain and community facilities can be maintained to a high standard into the future.
- **Preserve and enhance heritage and culture**
  - Respect, maintain and enhance the unique heritage and character of Newcastle city centre through the revitalisation activities.

2.2.3 Urban transformation concept plan

Surplus rail corridor land runs through the East End and Civic city centre precincts (established by NURS). Based on this vision and the results of extensive stakeholder and community engagement, an overall urban transformation concept plan ('concept plan') has been prepared for the surplus rail corridor (rezoning sites), as well as surrounding areas. The concept plan considers and integrates with the delivery of light rail. It is also coordinated with the proposed Hunter Street Mall development to create an interactive, synergised and cohesive city centre and foreshore area.

The concept plan (as shown in Figure 2-1) includes five key 'key moves', two that relate to the Civic precinct and three of which relate to the East End.

Civic link (Civic)

This area is the civic heart of Newcastle and includes some of the region's most important civic and cultural assets, including Civic Park, City Hall, Civic Theatre and Newcastle Museum. Current investment in the area includes the law courts development and the University of Newcastle NeW Space campus – both of which are under construction.

The focus of this key 'move' is to leverage best value from new investments by creating new open space and walking and cycling connections that link Newcastle's civic buildings to the waterfront and the light rail system.

- **Civic Green.** Creating a new civic focused public space linking Hunter Street to the Newcastle Museum that will provide direct visual and physical connection from Wheeler Place to the harbour, activate light rail on Hunter Street and meet the needs of the incoming legal and student populations.
- **Built form improvements.** Sensibly scaled mixed use development that forms part of the Honeysuckle development.

Darby Plaza (Civic)

Darby Street is Newcastle's premier 'eat street', offering a mix of shops, cafes, restaurants and night life. At present Darby Street ends at the intersection with Hunter Street, and this key 'move' seeks to create a new node of activity and linkage through to the harbour that complements the delivery of light rail.

- **Darby Plaza.** A new community focused public space including provision of new walking and cycling facilities from Hunter Street to the harbour.
- **Built form improvements.** Zoning of rail corridor land between Merewether Street and Argyle Street to allow for future mixed use development in conjunction with surrounding lands in the longer term.

Hunter Street revitalisation (East End)

Hunter Street features some of Newcastle's best heritage buildings and offers a mix of shops, cafes, restaurants and other local business. Hunter Street has experienced decline in recent years, and the opportunity exists to reinstate Hunter Street as the regions premier main street that complements the delivery of light rail.

- **Built form improvements.** Sensibly scaled mixed use development consistent with the adjoining land uses to create an activated street with 'two edges', celebrate heritage and create new linkages from Hunter Street to the waterfront, provide activation around light rail stops and improve walking and cycling facilities.

Entertainment precinct (East End)

This key 'move' aims to create a place where people can come to play, relax and reconnect with the harbour in a new public space stretching from Scott Street to the waterfront incorporating a new connection from Market Street to Queens Wharf. This key 'move' will assist to activate the area with a variety of activities to create an exciting place for the East End.

- **Recreational opportunities.** This precinct will incorporate the adaptive re-use of the signal box and provision of recreation opportunities for all ages and abilities. Public domain will be designed to provide a thoughtful series of character areas and experiences as one walks the length. The area will also provide opportunities for viewing and interpretation of heritage character that respect the unique qualities of place.

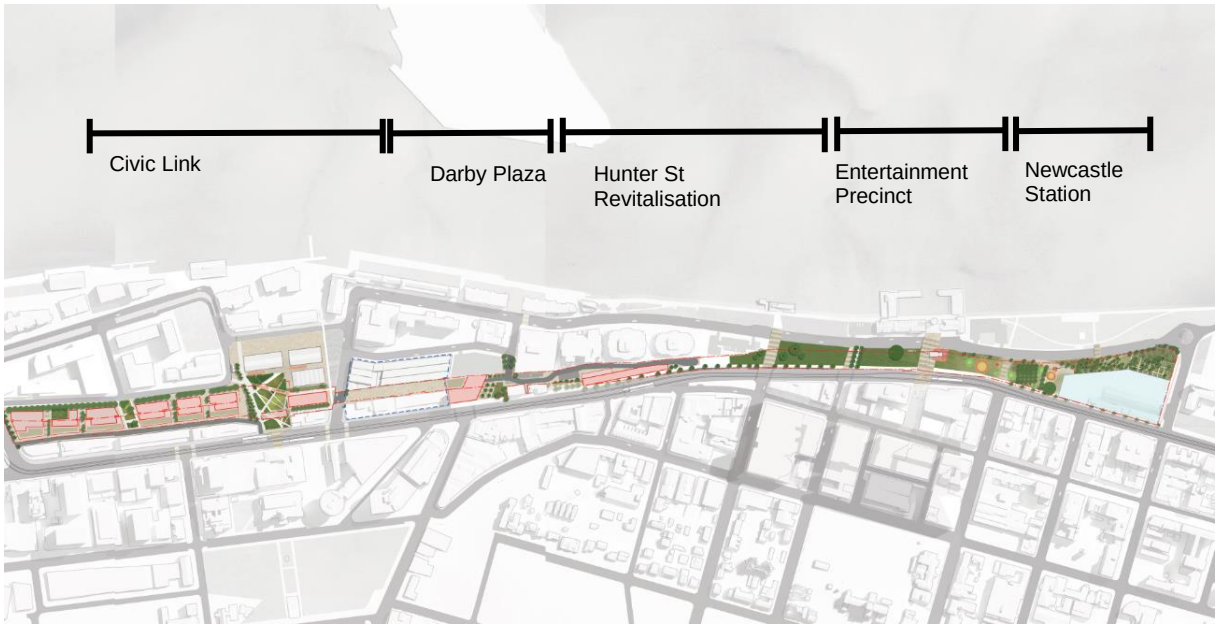
Newcastle Station (East End)

Newcastle Railway Station is proposed to be re-purposed into a hallmark destination and focal point for the new East End, accommodating enterprises and activities that attract visitors and stimulate the economy.

Refurbishment would fully respect and celebrate the heritage integrity of the Station, and could accommodate a range of different activities including community, retail, leisure and commercial uses.

2.2.4 Rezoning concept plan

The proposed rezoning of the surplus rail corridor lands is the focus of this report. Figure 2-1 defines the site rezoning area within the broader program planning outcomes.



Source: Elton Consulting

Figure 2-1 Rezoning concept plan

Amendments to the NLEP are required to deliver part of the concept plan. The proposed amendments are on surplus rail corridor land only.

Necessary amendments to the NLEP include:

- Amend the Land Use Zoning Map to introduce new B4 Mixed Use, SP3 Tourism and RE1 Public Recreation zones.
- Amend the Height of Building and Floor Space Ratio maps to facilitate development on select parcels of land.

The concept plan will also form the basis for updates to the Newcastle City Centre Development Control Plan design controls to guide development and public domain works for rezoning sites.

2.2.5 Proposed rezoning

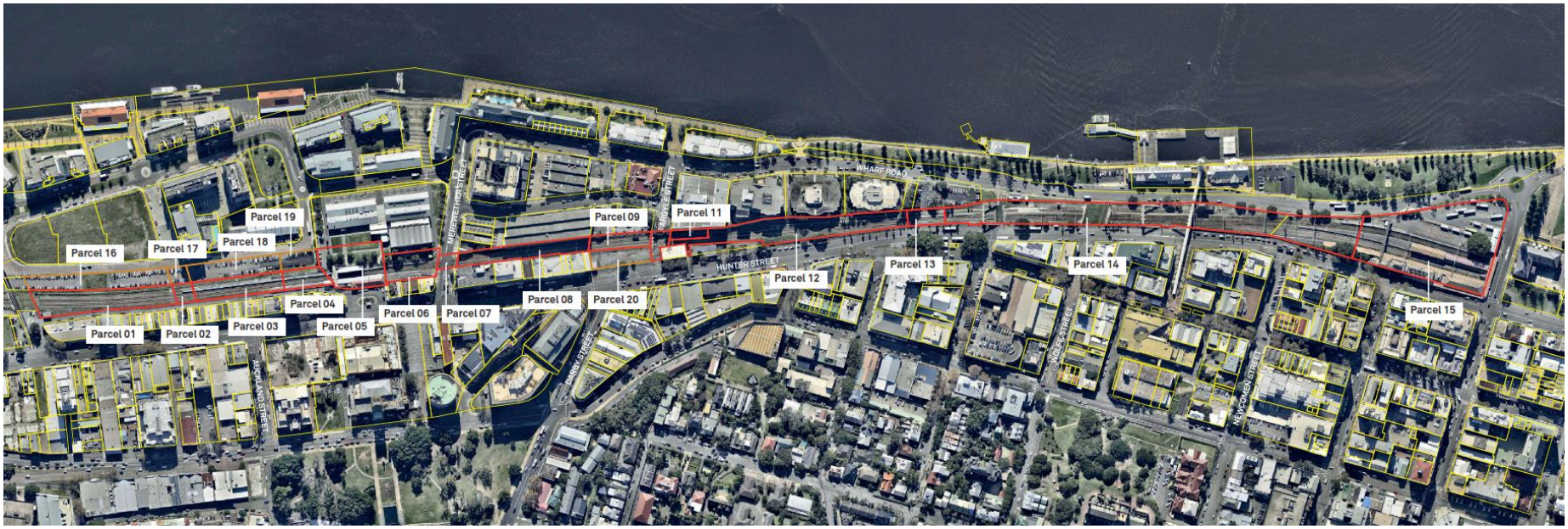
This planning proposal seeks to rezone rail corridor land (rezoning sites) to enable the delivery of the proposed urban uses established in the concept plan. The planning proposal concept plan includes public domain, entertainment, mixed use and commercial and residential development.

In general the proposed rezoning will provide a mix of uses with between 400-500 dwellings which will comprise a variety of styles and types, and around 5,000 m^2 of commercial, restaurant and other entertainment uses, as described in Table 2.1, and excluding any education or associated uses. An assumed development mix, as advised by Elton Consulting and used to assess the traffic generation for this assessment, is detailed in Section 4.2.

Proposed maximum building height and floor space ratio controls respect existing controls that apply to surrounding land.

This report has been based upon the proposed zoning under the Planning Proposal as submitted for Gateway determination, with the inclusion of Parcel 13. It is noted that this parcel has been removed from the current Planning Proposal in accordance with the Gateway determination as issued by the NSW Department of Planning and Environment. Nevertheless, for completeness, this report has considered the potential for some development occurring within this parcel in the future (subject to outcomes of a separate Planning Proposal). The recommendations of this report discuss whether there are any specific implications arising from this additional parcel.

The location of the proposed rezoning parcels is indicated in Figure 2-2 overleaf.



Source: Hassell

Figure 2-2 Rezoning explanatory map - Parcels

Table 2.1 Sites for rezoning – Proposed development summary

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 01 B4 Mixed Use 3,370m^2	Now parcel 01	3,370 m^2	B4 Mixed Use	FSR – 3:1	30m
Parcel 02 B4 Mixed Use 408 m^2	Now parcel 02	408 m^2	B4 Mixed Use	FSR – 3:1	30m
Parcel 03 B4 Mixed Use 3,146 m^2	Now parcel 03	1,869 m^2	B4 Mixed Use	FSR – 3:1	30m
	Now parcel 04	900 m^2	B4 Mixed Use	FSR – 3:1	24m
Parcel 04 RE1 Public Recreation 2,464 m^2	Now parcel 05 (and small corner of old 03 where western boundary of park realigned)	2,839 m^2	RE1 Public Recreation	N/A	N/A
Parcel 05 B4 Mixed Use 1,603 m^2	Now parcel 06	1,604 m^2	B4 Mixed Use	FSR – 3:1	18m
Parcel 06 B4 Mixed Use 295 m^2	Now parcel 07	295 m^2	B4 Mixed Use (road)	FSR – 2.5:1	30m
Parcel 07 B4 Mixed Use 2,040 m^2	Now parcel 08	2,040 m^2	B4 Mixed Use	FSR – 2.5:1	30m
Parcel 08 B4 Mixed Use 988 m^2	Now parcel 09	988 m^2	B4 Mixed Use	FSR – 4:1	24m
Parcel 09 B4 Mixed Use 467 m^2	Now parcel 10	467 m^2	RE1 Public Recreation	N/A	N/A
Parcel 10 SP2 Infrastructure 386 m^2	Now parcel 11	386 m^2	SP2 Infrastructure	N/A	N/A

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 11 B4 Mixed Use 4,542 m^2	Now parcel 12	4,542 m^2	B4 Mixed Use	FSR – 1.5:1	14m
Parcel 12 B4 Mixed Use 1,544 m^2	Now parcel 13 (and has been reduced in size)	659 m^2	SP2 Infrastructure	N/A	N/A
Parcel 13 RE1 Public Recreation 303 m^2	Now parcel 14 (new parcel 14 encompasses part of old parcel 12, and the whole of old parcel 13, 14 and 15)	11,151m^2	RE1 Public Recreation	N/A	N/A
Parcel 14 B4 Mixed Use 2,251 m^2					
Parcel 15 RE1 Public Recreation 7,713 m^2					
Parcel 16 SP3 Tourist 10,698 m^2	Now parcel 15	10,698m^2	SP3 Tourist	FSR – 1.5:1	10-15m

2.3 Newcastle light rail

The NSW Government is introducing light rail to Newcastle as part of a broader strategy to revitalise the Newcastle city centre. Light rail will travel from a new transport interchange at Wickham, through the Newcastle city centre to Pacific Park.

The truncation of heavy rail services at Wickham and the building of a new interchange are the first steps in delivering an urban renewal and transport solution for Newcastle.

Transport for NSW has been working closely with UrbanGrowth NSW, Newcastle City Council and Roads and Maritime Services in planning for light rail. Light rail will help improve public transport and access, reunite the city centre with its waterfront and improve the attractiveness of public spaces. The light rail route will travel east from the new transport interchange at Wickham along the existing rail corridor to Worth Place, before moving south to connect with Hunter Street and Scott Street before reaching Pacific Park, near the beach.

Initial geotechnical investigations have been completed and detailed design and environmental planning is well underway.

Transport for NSW and a combined team of Newcastle-based experts have prepared an environmental assessment for the Newcastle Light Rail project. The environmental assessment studies include heritage, visual and urban design, noise and vibration, social impacts, air quality and traffic, and access.

The Review of Environmental Factors has been approved and implementation has commenced.

2.3.1 Light rail alignment

The proposed alignment for the light rail is shown in Figure 2-3.

The six light rail stops on this alignment are located at:

- Wickham west of Stewart Avenue (terminus)
- Honeysuckle at Kuwami Place in the existing railway corridor
- Civic in Hunter Street
- Crown Street in Hunter Street
- Queens Wharf in Scott Street at Market Street
- Pacific Park on the south side of Scott Street between Pacific Street and Telford Street (terminus).

Light Rail services

The Light Rail service will operate with 10 minute headways in each direction, with travel times between Wickham and Pacific Park in the order of 12 minutes.

The Light Rail terminus is on the western side of Stewart Avenue at the new Wickham Interchange, requiring light rail vehicles to cross Stewart Avenue and access the existing rail corridor via Beresford Street. Additionally, with the new road connection at Steel Street the light rail vehicle will be required to cross Steel Street before accessing the Hunter Street dedicated Light Rail Lane at Worth Place. The Hunter Street dedicated lane continues until Market Street where the alignment becomes shared running with regular traffic until Pacific Street, where the light rail terminates at the terminus on the northern side of Pacific Park near Newcastle Beach.

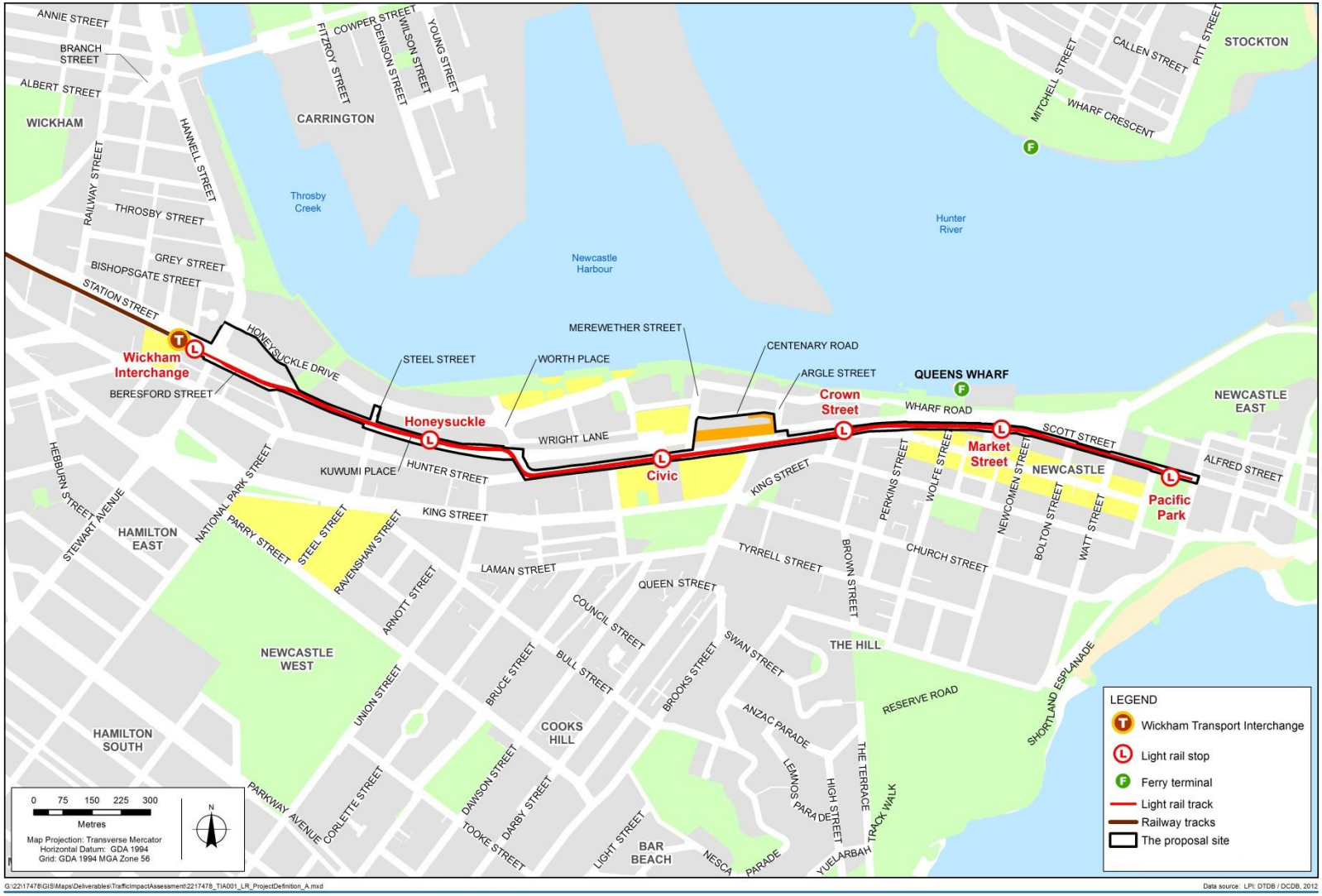


Figure 2-3 Proposed Newcastle light rail alignment and stop locations

3. Base conditions

The NUTTP rezoning proposal is being delivered in conjunction with the Newcastle Light Rail project. As such the Base or pre-development scenario for this study is the TfNSW Light Rail Proposal. The establishment of this Base scenario, including the light rail alignment and stop locations, and changes to the road network to accommodate light rail traffic impacts, has been the subject of separate discussions between TfNSW, RMS and Newcastle City Council, and a separate REF has been approved for that project.

3.1 Road network

Key elements of the road network relevant to the rezoning proposal are described below, including planned changes associated with the Light Rail project.

Hunter Street

Hunter Street is a sub-arterial road that runs in an east-west direction, running parallel to the former heavy rail line between Wickham and Newcastle. It is generally a two-way four lane undivided road. The former railway corridor runs parallel to Hunter Street on the road's northern side. Between Perkins Street and Bolton Street, most traffic uses the parallel Scott Street, with Hunter Street being a one-way westbound 10km/h shared zone through the 'Hunter Street Mall'. Hunter Street and Scott Street have a sign posted speed limit of 60 km/h and carries up to 1200 vehicles per hour in the peak period. Hunter Street provides access to residential and commercial properties and a local shopping and café precinct in the eastern mall area.

King and Parry Street

King Street is a sub-arterial road that runs parallel to Hunter Street. Between Union Street and Stewart Avenue, it is a four lane divided road, with peak volumes up to 1,400 vehicles per hour. The adjacent land-uses are generally commercial however there are also a number of hotels and residential apartment blocks along its length. To the west of the intersection with Stewart Avenue, King Street becomes Parry Street. At this location Parry Street is also a four lane divided road with a third west bound clearway lane in the afternoon. Parry Street connects with Donald Street, Hamilton and ultimately becomes Newcastle Road to the western suburbs and the M1 Motorway. The posted speed limit varies between 40 km/hr, 50 km/hr and 60 km/hr, reflecting the road configuration, adjacent land use and pedestrian activity levels.

Union Street

Union Street is a collector road that runs in a north-south direction between Hunter Street and The Junction, terminating at Mitchell Street, Merewether. Union Street is a two-lane carriageway with a speed limit that varies between 40km/h and 60km/h, and carries up to 800 vehicles per hour in the peak period. On-street parking is permitted along most of its length and provides direct access to a number of residential properties and The Junction shopping precinct.

Darby Street

Darby Street is a collector road that runs in a north-south direction between Hunter Street and Parkway Avenue. Between Bull Street and Queen Street, the sign posted speed limit is 40km/h and the road is characterised by a bar and café precinct, generating high levels of pedestrian activity. Darby Street is generally a two-lane carriageway that carries approximately 1000 vehicles per hour in the peak period.

Honeysuckle Drive and Wharf Road

Honeysuckle Drive runs generally east-west between the former heavy rail corridor and Newcastle Harbour. It becomes Workshop Way before changing to Wharf Road at Merewether Street. Honeysuckle Drive services the commercial office space, residential and restaurant/bar precincts that are adjacent to Newcastle Harbour. East of Merewether Street, there are several medium density residential and commercial developments. Peak period traffic volumes are up to 700 vehicles per hour, highest at the western end of the road. A 50 km/hr speed limit applies.

3.1.1 Road network changes with light rail

The concept for the light rail included the following changes to the road network:

- New traffic signals on Stewart Avenue at Beresford Street to allow safe crossing of Stewart Avenue by the light rail vehicles.
- East/West 'light rail only' dedicated lanes in Beresford Street.
- A westbound dedicated vehicle lane in Beresford Street.
- A new road connection between Hunter Street and Honeysuckle Drive, across the existing heavy rail corridor, at Steel Street with new traffic signals at the intersection of Steel Street and the light rail track.
- A signalised intersection at the new Steel Street connection at Honeysuckle Drive. Right turns from Honeysuckle Drive onto Steel Street are to be banned.
- A new road connection between Hunter Street and Honeysuckle Drive at Worth Place. The intersection of Worth Place and Hunter Street is to be left in / left out, with traffic signals to control light rail movements across Hunter Street.
- Changes to all the intersections along Hunter Street between Worth Place and Pacific Street to control all right turns across the light rail track through green / amber /red arrows.
- New traffics signals at the Wolfe Street/Scott Street intersection with the north approach being a new connection to Wharf Road.
- A new pedestrian crossing of Scott Street at Market Street, and Hunter Street at Civic.
- New traffics signals at the Scott Street/Pacific Street intersection to facilitate northbound left turning and eastbound right turning light rail vehicles accessing the eastern terminus at Pacific Park.
- Light rail with separated running in Hunter Street between Worth Place and Market Street.
- Light rail with shared running in Hunter Street between Market Street and Wolfe Street.

The following additional changes to the road network have also been included in this assessment, as outlined in the Newcastle Light Rail Associated Road Upgrades REF (TfNSW, 2016):

- Stewart Avenue / Hannell Street intersection upgrade, including new and extended turn lanes.
- Hunter Street / Steel Street intersection upgrade, including a new right turn lane and additional lanes on Hunter Street.
- King Street / Darby Street intersection upgrade, including extended turn lanes.

3.2 Bus services

All of the existing 30 bus routes that pass through the city centre terminate at Newcastle bus interchange adjacent to Newcastle station. When light rail is implemented, the bus network within the city centre would be reconfigured. The final arrangement would depend on the newly appointed network operator. However for the purposes of the Light Rail REF most bus routes were assumed to terminate in Hunter Street at Auckland Street. This is the bus network that has been assumed for this assessment, allowing a direct comparison to be made. It is however acknowledged that there may be some change in the bus network as the new operator reconfigures the network. The extent of any changes is unknown at this time.

3.3 Pedestrians and cyclists

Pedestrians are well catered for in and around the study area, with footpaths provided adjacent to most roadways. Since the termination of the former heavy rail line, a number of at-grade pedestrian connections have been made across the corridor, including at Steel Street, Kuwami Place, Worth Place, Civic Station, Argyle Street, Perkins Street and Wolfe Street.

On-road bike lanes are provided on several streets in the study area, including parts of Honeysuckle Drive, King Street, and Auckland Street.

Shared paths are also provided along the harbour through Honeysuckle and parallel to Wharf Road towards Nobbys Head.

3.4 Parking

On-street and off-street parking is provided within the study area, both by Newcastle City Council and private operators. Car parking is generally time restricted, with pay and display systems in operation.

Several parking studies and strategies have been completed for Newcastle in recent years, including by Council and TfNSW. The most recent study, the "Newcastle City Centre Parking Strategy" was released by TfNSW in April 2017, in the context of managing changes in parking associated with the Light Rail project and other developments. The Parking Strategy included the following key findings:

- Existing parking supply in the inner Newcastle area is 11,374 spaces, including on-street and off-street spaces.
  - Peak occupancy across all spaces was 78%, although there is variation from location to location. The majority of spare capacity occurs in fringe areas surrounding the CBD. This is consistent with recent studies by Council, which also concluded that parking demand has increased since previous surveys in 2014 (prior to the heavy rail truncation).
- Potential changes in parking supply are summarised in Table 3.1.

Table 3.1 Changes in parking supply

Timeframe	Change	Description
2017	247 potential temporary (up to five years) spaces created	V8 Supercars track works
2017-19	196 spaces created	New spaces identified in strategy development (Steel Lane, Worth Place and the Boat Harbour car park)
2017-19	475 spaces removed	Newcastle Light Rail and Wickham Transport Interchange projects
2018	254 spaces removed	Closure of Lee Wharf temporary car park

Timeframe	Change	Description
2018	365 new spaces created	Gibson Street car park expansion
2018	189 spaces removed	Closure of Wright Lane temporary car park
2020	297 spaces removed	Closure of Throsby Wharf temporary car park
	407 spaces net reduction compared to currently supply	

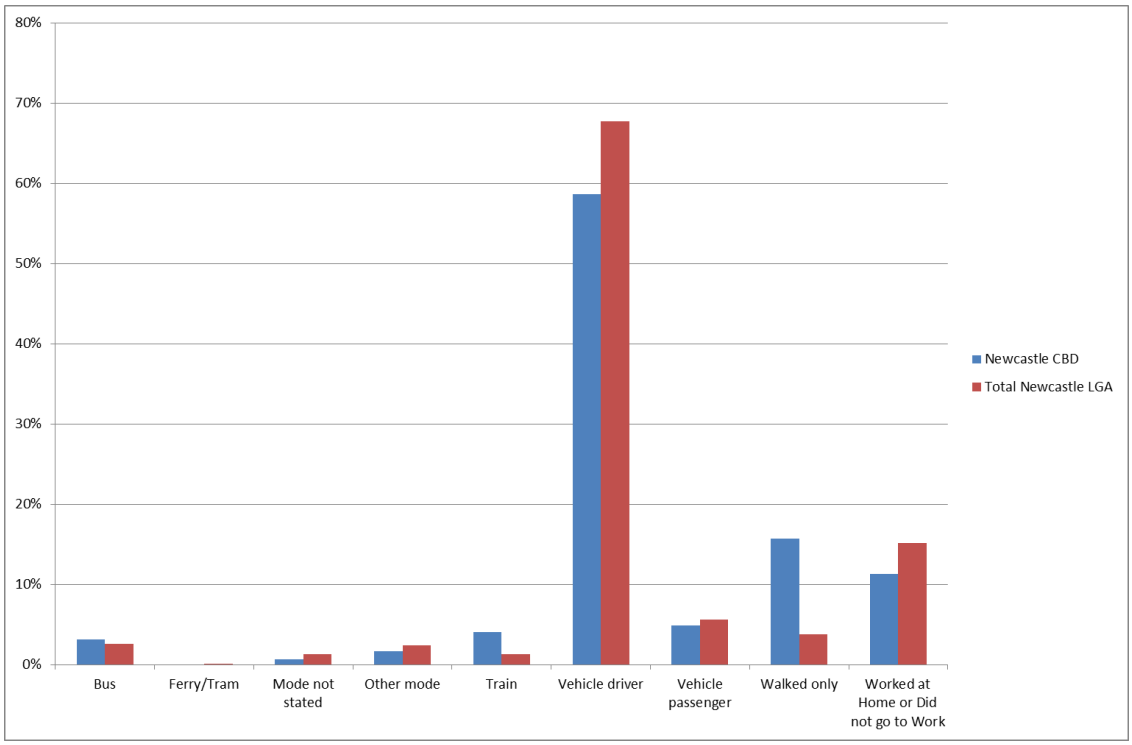
  - The progressive closure of existing temporary car parks at Lee Wharf and Throsby Wharf between 2018 and 2020 to allow for development of these sites, as well as at Wrights Lane (Parcels 16-19 adjacent to this current proposal), would result in the loss of 740 off-street spaces. These changes are not related to the light rail project, associated roadworks or transport interchange construction. Parking at these locations was planned to be temporary until economic and market conditions supported new development opportunities on these sites.
  - With creation of additional parking at various locations, the net reduction in parking would be 407 spaces (3.58% of current supply).
- Principles for improving parking in Newcastle.
  - People access, not parking supply, drives business activity.
    - Good parking policy is about managing demand.
    - Future increases in supply should be moderate and focused on customer and business needs.
    - Turnover should be improved through progressive relocation of all day parking outwards from the centre.
    - It is vital to better utilise current supply.
  - Prioritise short stay, high turnover parking over long stay, low turnover parking.
    - Utilise on-street parking for short stay use only.
    - Reduce time limits for on-street to maximise efficiency and turnover.
  - Parking must support overarching transport objectives.
    - Progressively increase use of public transport to reduce parking demand.
    - Incentivise increased provision of parking by private sector operators.
    - Cap off-street parking supply in the city east.
    - Discourage east-west commuter car trips through the city centre.
    - Intercept cars before entering city centre.

3.5 Travel behaviour

The majority of trips undertaken within Newcastle are made by car. The 2011/12 Household Travel Survey from the Bureau of Transport Statistics indicates that for residents of the Newcastle Local Government Area, 57% of trips are made as a vehicle driver, with 23% as a vehicle passenger. Walking accounts for 15% of trips, while all other modes combined make up only 5% of trips.

A breakdown of similar data included in the 2015 Newcastle Transport Strategy suggests that in Inner Newcastle, the car is still dominant but other modes may be becoming more popular.

Results of the 2011 Census Journey to Work data validate this observation. Figure 3-1 compares the mode of commute trips for residents of the Newcastle CBD with the whole Newcastle Local Government Area. For the CBD vehicle driver and passenger are less dominant and public transport and walking more popular. It is noted that the truncation of the heavy rail line since this data was collected may affect mode share to public transport in the CBD area. Similarly, the introduction of light rail is also expected to influence travel behaviour.



Data Source; Australian Bureau of Statistics

Figure 3-1 Journey to work mode share, 2011

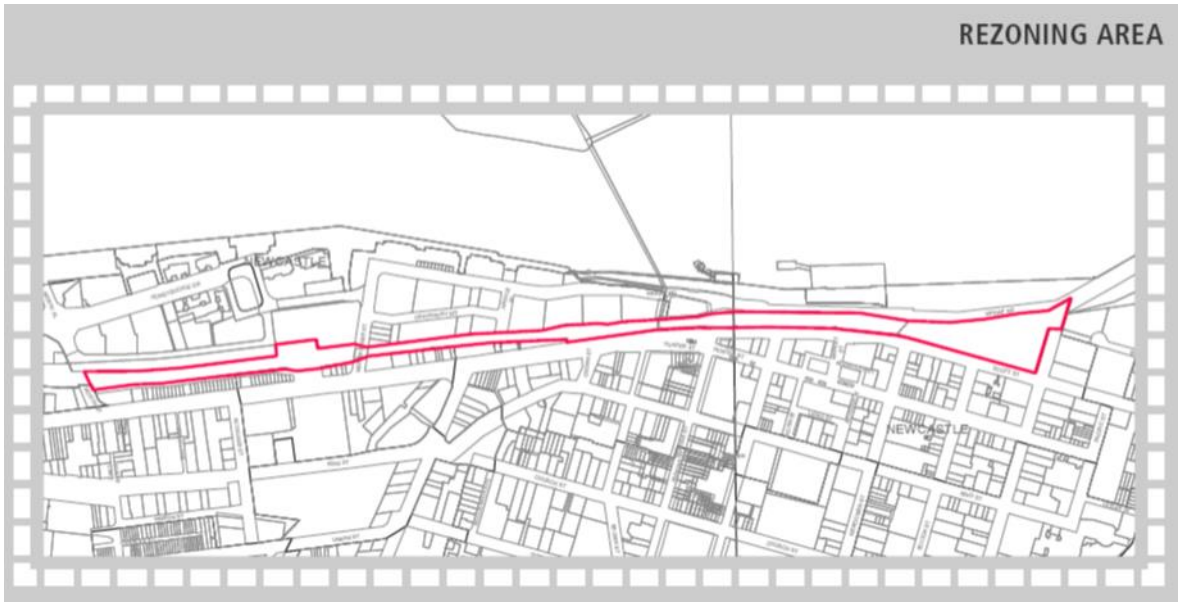
4. Rezoning proposal

4.1 Overview

The rezoning site is located in Newcastle city centre and comprises a collection of land holdings within the surplus rail corridor lands.

The site is approximately 2.1km in length generally bounded by Wharf Road to the north, Watt Street to the east, Hunter and Scott Streets to the south and Worth Street to the west. The site includes Civic and Newcastle Stations.

The site area subject to the rezoning is provided in Figure 4-1.



Source: Elton Consulting

Figure 4-1 Rezoning site area

4.2 Assumed development mix

Table 4.1 shows the assumed Gross Floor Area (GFA) that could be achieved on each land parcel. It has been assumed that 10% of GFA would be for non-residential uses, and that all sites can achieve a full GFA entitlement.

Future development applications will be subject to planning approval and public exhibition to determine final development outcomes.

Note that the subject of this rezoning proposal is only land within the existing rail corridor. However, the assessment includes three adjacent parcels where development could be influenced by this proposal. These are:

- Parcel 16, adjacent to Parcel 1 in Wright Lane
- Parcel 18, adjacent to Parcel 3 in Wright Lane
- Parcel 19, adjacent to Parcel 4 in Wright Lane
- Parcel 20, adjacent to Hunter Street opposite Darby Street

Table 4.1 Anticipated gross floor areas

Parcel	Gross Floor Area	
	Non-residential (m^2)	Residential (m^2)
01	1,100	9,100
03	600	5,050
04	270	2,400
06	480	4,300
08	500	4,600
09	400	3,500
12	690	6,100
Total	**4,040**	**35,494**

Source: Hassell

Within the above floor areas for non-residential land uses, it has been assumed that 50% would be used for retail purposes, and 50% for office uses, for the purpose of estimating parking requirements (see Section 4.4).

Table 4.2 shows the assumed mix of residential units on each site, with an average apartment size of 80 m^2 per apartment.

Table 4.2 Anticipated dwelling yield

Parcel	Number of dwellings				
	Total	Studio	1 bed	2 bed	3 bed
		20%	*35%*	*35%*	*10%*
Within the rail corridor					
01	114	23	40	40	11
03	63	13	22	22	6
04	30	6	11	11	3
06	54	11	19	19	5
08	57	11	20	20	6
09	44	9	16	16	4
12	77	15	27	27	8
Sub-total	***440***	***88***	***154***	***154***	***44***
Outside the rail corridor					
16	86	17	30	30	9
18	60	12	21	21	6
19	25	5	9	9	2
20	49	10	17	17	5
Sub-total	***220***	***44***	***77***	***77***	***22***
TOTAL	**660**	**132**	**231**	**231**	**66**

Source: Hassell

4.3 Site access

4.3.1 Vehicular access

Each site would be accessed separately, with a basement car park anticipated for each mixed-use development. A summary of access arrangements for each site is provided in Table 4.3.

Table 4.3 Vehicular access arrangements

Parcel	Vehicular access / Egress route	Minimum access widths
1 / 16	Site access onto Wright Lane to connect to Worth Place or Settlement Lane. Potential for service vehicle access via Civic Lane. No change proposed in Civic Lane (subject to Development Application).	Combined entry / exit 6.0 to 9.0 metres wide.
3 / 4 / 18 / 19	Site access onto Wright Lane to connect to Worth Place or Settlement Lane. Potential for service vehicle access via Civic Lane. No change proposed in Civic Lane (subject to Development Application).	Combined entry / exit 6.0 to 9.0 metres wide.
6	Access connects to Merewether Street (left-in / left-out only), replicating an existing laneway between Hunter Street properties and the railway station. Access to Hunter Street is via Workshop Way roundabout.	Combined entry / exit 3.0 to 5.5m wide.
8	Left-in / left-out access to Merewether Street. Access from Hunter Street via Workshop Way roundabout.	Combined entry / exit 3.0 to 5.5m wide.
9	Site access via Argyle Street.	Combined entry / exit 3.0 to 5.5m wide.
20	Site access via Argyle Street. No access off Hunter Street.	Combined entry / exit 3.0 to 5.5m wide.
12	Site access via Argyle Street. No access off Hunter Street.	Combined entry / exit 6.0 to 9.0 metres wide.
15	Entry from Watt Street, exit to Wharf Road, similar to existing bus layover area access and egress arrangements. Final configuration to be confirmed at Development Application stage.	Access geometry to be confirmed at Development Application stage.

Generally, Council has indicated a strong preference to avoid vehicle crossovers on Hunter Street and Scott Street, hence rear access has been assumed.

4.3.2 Access to public transport

Each of the rezoning sites is well situated with regard to public transport. Table 4.4 details the approximate walking distances between each of the rezoning sites and public transport services in Hunter Street.

Table 4.4 Approximate distances to public transport

Parcel	Walking distance to Proposed Light Rail stop	Walking distance to Proposed Bus Stop
1 / 16	300 m (Civic)	240 m
3 / 18	150 m (Civic)	215 m
4 / 19	110m (Civic)	180 m
6	80 m (Civic)	190 m
8	190 m (Civic)	300 m
9	220 m (Crown Street)	60 m
20	210 m (Crown Street)	50 m
12	30 m (Crown Street)	160 m
16	230 m (Market Place)	10 m

Pedestrian access around each of the development sites will be facilitated by the public open space that is proposed, that will connect to the existing footpath network.

4.4 Parking provision

The Newcastle Development Control Plan (DCP) 2012 outlines requirements for car parking for various land use categories. Requirements relevant to this proposal are shown in Table 4.5.

Table 4.5 Newcastle DCP 2012 parking requirements

Land use	Car parking	Bike parking	Motorbike parking
Residential Accommodation (Attached Dwellings, Multi Dwelling Housing, Residential Flat Buildings, Shop Top Housing)	(Refer to Note 1) Small (<75 m2 or 1 bedroom) average 0.6 spaces per dwelling Medium (75 m2 - 100m2 or 2 bedrooms) average 0.9 spaces per dwelling Large (>100 m2 or 3 bedrooms) average 1.4 spaces per dwelling 1 space for the first 3 dwellings plus 1 space for every 5 thereafter or part thereof for visitors		
Office	1 space per 60 m2 GFA	1 space per 200 m2 GFA (Class 2)	1 space per 20 car spaces
Restaurant or Café	1 space per 60 m2 GFA	1 space per 100 m2 GFA (Class 2)	1 space per 20 car spaces
Shops	1 space per 60 m2 GLFA	1 space per 200 m2 GFA (50% Class 2, 50% Class 3)	1 space per 20 car spaces

Note 1: Requirements are for the Newcastle City Centre and Renewal Corridors

The DCP also allows for departures from the above rates to be approved in certain circumstances, including:

- Shared use opportunities arising from the different hours of demand for various uses.
- Where a Green Travel Plan has been prepared and agreed between the Council and the owner / occupier.
- Access to public transport services, and likely modes of travel.
- Whether a car sharing scheme is proposed.
- Availability and accessibility of public parking facilities, including on-street and off-street spaces.
- Considering the impacts of providing on-site parking.

For these development sites, it is expected that the requirements on the DCP for on-site parking could be satisfied. However it is possible that within the framework of the DCP future Development Applications could propose reduce on-site parking provision primarily based on:

- Locality in the city centre and thus accessible to many different land uses.
- Access to public transport (see Section 4.3.2).
- Limited on-site capacity.

There is also the possibility that future Development Applications could include shared use parking, a Green Travel Plan and/or car share schemes which could reduce parking demand. The final parking requirement will be determined at the development application stage following public exhibition.

Table 4.6 shows the number of spaces required by the DCP for each land parcel, based on the anticipated dwelling yield and proposed non-residential floor area.

Table 4.6 DCP parking requirements

Parcel	Proposed zone	DCP parking requirement (no discount)
1 / 16 *	B4 Mixed Use	236
3 / 18 *	B4 Mixed Use	146
4 / 19 *	B4 Mixed Use	67
6	B4 Mixed Use	64
8	B4 Mixed Use	67
9	B4 Mixed Use	53
12	B4 Mixed Use	90
20 *	B4 Mixed Use	59
Total		**781**

** Includes part outside existing rail corridor*

4.5 Traffic generation and distribution

Traffic generation rates for the proposed development sites has been estimated based on information provided in the NSW RMS Guide to Traffic Generating Developments 2013 Update, and agreed with Council and RMS.

The Guide does not provide rates for the Newcastle CBD specifically, and the adopted traffic generation rate is as stated in the Guide for an existing site at Charlestown. Data for this site has been adopted in preference to an average across several sites, or to an alternative site in Sydney or elsewhere. It provides a conservatively high estimate of traffic generation for the proposed rezoning, given the greater accessibility to activity centres and public transport in the CBD, relative to Charlestown.

For the purposes of estimating the traffic impacts of the proposed rezoning, the adopted traffic generation rates are conservatively based on the full number of parking spaces required by the DCP for each site. The adopted rates are shown in Table 4.7 and are higher than alternative trip generation rates determined by measures such as vehicle trips per unit or per bedroom. This allows for some flexibility in the ultimate development of each site, where a more intense land use may be proposed by the developer of each site. The current concept has an assumed mix of unit sizes, and commercial / retail floorspace, which determines the car parking requirements. This may change as more detailed planning is undertaken for each development site (post-rezoning).

It has been assumed that non-residential land uses will be largely ancillary to the residential components of the development, with parking provided for tenants only. Traffic generation has been based on the parking supply for residential and non-residential uses, as determined by the quantity and type of residential units, and the floor area for non-residential uses.

Table 4.7 Adopted traffic generation rates

	Sample site – Charlestown
AM Peak Vehicle Trips per car space	0.37
PM Peak Vehicle Trips per car space	0.40
Daily Vehicle Trips per car space	4.18

Source: NSW RMS Guide to Traffic Generating Developments 2013 Update, Appendix B3

Table 4.8, overleaf, summarises the estimated traffic generation for each of the development sites.

4.5.1 Traffic distribution

The traffic generated by each of the development sites, as detailed in Table 4.8, was distributed throughout the study area shown in Figure 1-2. The distribution was weighted by existing traffic volume, such that areas of already high traffic volumes contributed to more of the traffic generated by the development sites than those areas with currently low traffic volume.

To reduce the potentially unrealistic number of short trips that this distribution could create, only the areas south of King Street, north of the Honeysuckle Drive / Hannell Street intersection and West of Stewart Avenue were considered to be origins or destinations for the development traffic.

Table 4.8 Traffic generation summary

Parcel	Residential Units					Non-residential		DCP Parking Requirements (number)	Traffic Generation per peak hour				
	Studio	1-bed	2-bed	3-bed	Total	Office GFA m^2	Retail GLFA m^2		AM - Inbound	AM – Outbound	PM - Inbound	PM – Outbound	Daily (2-way)
1 / 16	40	70	70	20	200	935	700	236	17	70	66	28	986
3 / 18	25	43	43	12	123	570	430	146	11	43	41	18	610
4 / 19	11	20	20	5	56	245	185	67	5	20	27	19	282
6	11	19	19	5	54	240	180	64	5	19	18	8	268
8	11	20	20	6	57	250	190	67	5	20	19	8	280
9	9	16	16	4	45	200	150	53	4	16	15	6	222
20	10	17	17	5	49	225	170	59	4	17	17	7	247
12	15	27	27	8	77	345	260	90	7	27	25	11	376
Total	**132**	**231**	**231**	**66**	**660**	**3,010**	**2,265**	**782**	**58**	**231**	**219**	**94**	**3271**

5. Assessment methodology

5.1 Microsimulation traffic model

The *Newcastle Urban Transformation and Transport Program* microsimulation model has been utilised to analyse the land rezoning proposed by UrbanGrowth NSW. The model has been developed using the Paramics microsimulation modelling package (version 6.7.2) with additional functionality provided by the CeeJazz suite of Plugins.

The modelling and assessment methodology has been agreed between UGNSW, TfNSW, Roads and Maritime Services and Newcastle City Council.

5.1.1 Previous modelling

GHD developed the NUTTP microsimulation model for Transport for NSW (TfNSW) to assess the traffic-related impacts associated with the implementation of light rail through the Newcastle City Centre. The model was based on a microsimulation traffic model for the Newcastle City Centre developed by Bitzios Consulting in 2009. An extensive update of the 2009 Newcastle City Centre microsimulation model was undertaken by GHD for existing traffic conditions (based on traffic surveys undertaken by SkyHigh in June 2014, prior to the truncation of the heavy rail line), with a further update based on traffic surveys undertaken by SkyHigh in March 2015 (post heavy rail truncation). The updated model was calibrated and validated according to the methodology set out in the Roads and Maritime *Traffic Modelling Guidelines, 2013.*

This model was developed in collaboration between TfNSW and Roads and Maritime Services, with consultation with Newcastle City Council.

Project model conditions

The Newcastle Urban Transformation is assumed to coincide with the opening of the Light Rail Network in 2018. Therefore the base conditions assumed for the traffic modelling included the current proposed light rail network and estimated 2018 traffic conditions. The Light Rail network includes several changes to the road network, as outlined in Section 3.1.1.

The Implementation of the Light Rail has an impact on several key transport systems within the Newcastle area, including the bus, cyclist and pedestrian networks. These are addressed in the REF for the Light Rail project, which includes a suite of mitigation measures agreed between TfNSW, Roads and Maritime Services and Newcastle City Council. These measures have been incorporated into the modelling for this project where appropriate.

5.2 Comparison with the Light Rail REF

Previous modelling (for the Light Rail REF, and the pre-Gateway assessment for this current rezoning proposal) assumed traffic growth in and around the Newcastle CBD to 2028 as informed by the Public Transport Project Model (using outputs supplied by TfNSW). This was the best information available at the time the previous modelling was undertaken, and included some assumed growth associated with future use of the former heavy rail corridor. As requested by Council and RMS, this current assessment is based on an updated forecast of growth in the CBD, reflecting the specific rezoning proposal detailed in this report, as well as updated information on specific development proposals elsewhere in the CBD.

Changes to traffic generation assumptions for specific development sites around the CBD, compared with the previous modelling, are summarised in Table 5.2.

The most appropriate way of comparing the traffic implications of the land use assumptions in each model is to look at the total volume of traffic in each model. This is detailed in Table 5.1.

Table 5.1 Comparison of Model Demand with Light Rail REF Model

	AM Peak Hour Model Demand	PM Peak Hour Model Demand
2028 Light Rail REF	20,348	20,919
2028 Rezoning Proposal	20,671	21,113
Difference	+323	+194

Note that in this context the total demand in each model is not relevant in and of itself, as it includes trips on the periphery of the model which are not necessarily critical to the assessment. However it can be seen that the amount of traffic assumed for the rezoning assessment is greater than had been previously assumed for the Light Rail REF. Both models assume a level of traffic-generating development in the CBD but the Rezoning model, based on specific development proposals rather than broad assumptions, includes slightly more traffic. This indicates that the current modelling can be used to confirm the traffic-related findings of the Light Rail REF. The following sections of this report also demonstrate that no further mitigation measures are required to accommodate the proposed Rezoning, beyond those already recommended for the Light Rail (refer Section 3.1.1).

Table 5.2 Specific Development Traffic Generation Assumptions

Location	Development type	Current Estimate						Previous Estimate net change		Proposed Modelled Change	
		AM new trips	PM new trips	AM displaced trips	PM displaced trips	AM net change	PM net change	AM	PM	AM	PM
Wickham	Residential / commercial	67	73	8	8	59	64	-117	-118	62	68
Honeysuckle Drive	Residential / commercial	151	163	176	176	-25	-13	0	0	0	0
King Street (west)	Hotel / aged care facility / commercial	56	73	21	22	35	51	9	39	35	51
Courthouse	Commercial	87	94	87	94	0	0	44	41	44	41
Gibson St	Car park	256	256	0	0	256	256	40	39	256	256
Foreshore	Car Park	57	57	0	0	57	57	5	3	57	57

Note: *At the time of preparation of this assessment, few details of proposed University of Newcastle development between Wright Lane and Honeysuckle Place were available. However it has been assumed that this development would, like the other recent university development in the CBD, provide minimal car parking and make use of the high frequency bus services in the area, as well as the future light rail. Therefore the traffic generating impacts of this development are expected to be small.*

5.3 Screenline volumes

For the purpose of assessing changes in traffic volumes as a result of the proposed rezoning, two screenlines have been established, each crossing Honeysuckle Drive / Wharf Road, Hunter Street and King Street. Screenline 1 is west of Union Street, while Screenline 2 is west of Darby Street. These are shown in Figure 5-1.

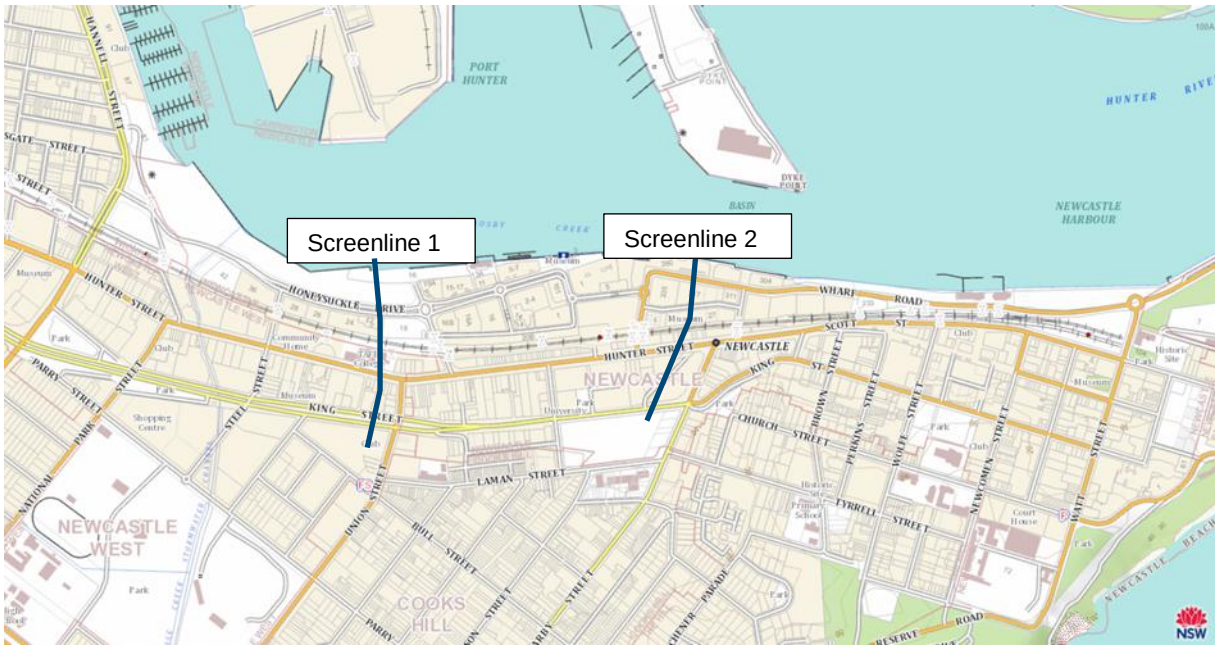


Figure 5-1 Screenline locations

Source: https://maps.six.nsw.gov.au/

5.4 Vehicle travel times

For the purpose of assessing changes in travel times as a result of the proposed rezoning, three routes through the network have been established, each on a major east/west route. Route 1 is vehicles travelling on Honeysuckle Drive, Route 2 is vehicles traveling on Hunter Street, while Route 3 is vehicles travelling on King Street. These are shown in Figure 5-2.

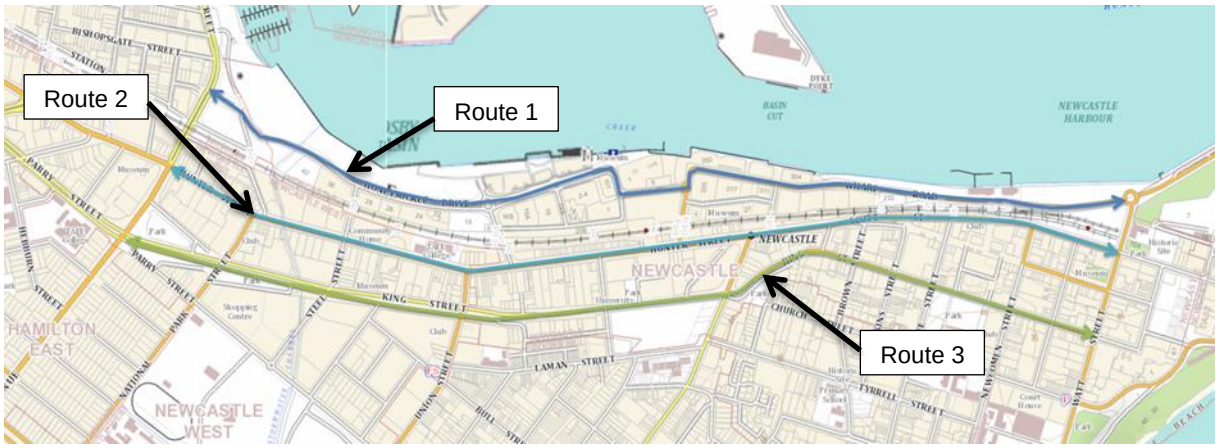


Figure 5-2 Travel route locations

Source: https://maps.six.nsw.gov.au/

5.5 Intersection performance

The assessment of intersection performance is based on criteria outlined in Table 5.3 as defined in the *Guide to Traffic Generating Developments* published by the NSW Roads and Maritime Services (RMS) in 2002. Intersection Levels of Service have been reported for the peak hour during the AM and PM peak periods (8 – 9 am and 5 – 6 pm).

Table 5.3 Intersection levels of service criteria for intersections

Level of service	Average delay per vehicle	Traffic signals and roundabouts	Give Way and Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity.
C	29 to 42	Satisfactory	Satisfactory, but accident study required.
D	43 to 56	Operating near capacity	Near capacity and accident study required.
E	57 to 70	At capacity; at signals, incidents will cause excessive delays; Roundabouts will require other control mode	At capacity, requires other control mode.
F	>70	Over capacity, unstable operation	Over capacity, unstable operation.

Source: Guide to Traffic Generating Developments, NSW RTA (2002)

Intersections have been modelled using the SIDRA Intersection modelling software. Version 6.1 allows for the analysis of intersections in a network situation, where downstream effects of any queueing are taken into account.

5.6 Network performance

To complement the intersection performance measures detailed in Table 5.3 a measure of transport efficiency has been adopted from Austroads. Austroads provides typical level of service criteria as summarised in Table 5.4 based on travel efficiency. Level of service for motor vehicles can be measured in terms of speed for an urban street in addition to the average delay for intersections.

Table 5.4 Level of Service Criteria for urban streets

Level of Service	Urban Streets Travel speed as a percentage of free flow speed
A	> 85%
B	67 – 85%
C	50 – 67%
D	40 – 50%
E	30 – 40%
F	≤ 30%

Source: Austroads, 2013

Travel speeds on certain routes have been extracted from the Paramics microsimulation model.

6. Impact assessment

6.1 Road network impacts

General observations of the traffic network performance in the Paramics model did not show any significant decreases in performance within the road network as a result of the proposed rezoning. The observations indicated that the proposed rezoning caused minor localised increases in traffic activity, however these increases were not significant enough to cause any major issues or require additional mitigation measures.

6.1.1 Traffic volumes

Changes in peak hour traffic volumes on each screenline (refer Section 5.3) are shown in the following tables.

Table 6.1 2018 AM peak – Screenline 1 volumes

Street	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
Honeysuckle	630	660	30	5%	410	460	50	12%
Hunter	640	650	10	2%	620	660	40	6%
King	1390	1420	30	2%	670	750	80	12%
Total	2660	2730	70	3%	1700	1870	170	10%

Table 6.2 2018 PM peak – Screenline 1 volumes

Street	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
Honeysuckle	550	610	60	11%	680	720	40	6%
Hunter	520	550	30	6%	890	890	0	0%
King	1190	1220	30	3%	1140	1150	10	1%
Total	2260	2380	120	5%	2710	2760	50	2%

Table 6.3 2028 AM peak – Screenline 1 volumes

Street	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
Honeysuckle	670	680	10	1%	420	480	60	14%
Hunter	710	770	60	8%	650	670	20	3%
King	1430	1480	50	3%	710	760	50	7%
Total	2810	2930	120	4%	1780	1910	130	7%

Table 6.4 2028 PM peak – Screenline 1 volumes

Street	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
Honeysuckle	490	630	140	29%	720	740	20	3%
Hunter	520	530	10	2%	950	940	-10	-1%
King	1190	1220	30	3%	1330	1320	-10	-1%
Total	2200	2380	180	8%	3000	3000	0	0%

Table 6.5 2018 AM peak – Screenline 2 volumes

Street	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
Honeysuckle	410	410	0	0%	60	60	0	0%
Hunter	430	490	60	14%	470	470	0	0%
King	740	780	40	5%	410	430	20	5%
Total	1580	1680	100	6%	940	960	20	2%

Table 6.6 2018 PM peak – Screenline 2 volumes

Street	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
Honeysuckle	390	370	-20	-5%	80	90	10	12%
Hunter	570	570	0	0%	610	630	20	3%
King	670	650	-20	-3%	570	570	0	0%
Total	1630	1590	-40	-2%	1260	1290	30	2%

Table 6.7 2028 AM peak – Screenline 2 volumes

Street	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
Honeysuckle	470	500	30	6%	60	60	0	0%
Hunter	450	550	100	22%	480	480	0	0%
King	760	770	10	1%	440	460	20	5%
Total	1680	1820	140	8%	980	1000	20	2%

Table 6.8 2028 PM peak – Screenline 2 volumes

Street	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
Honeysuckle	360	360	0	0%	80	80	0	0%
Hunter	560	590	30	5%	640	650	10	2%
King	680	670	-10	1%	630	640	10	2%
Total	1600	1620	20	1%	1350	1370	20	1%

These results show that changes in total traffic across each screenline are commensurate with the traffic generation from the proposed development sites. This analysis assumes that there isn't a significant volume of traffic switching from one route to another as a result of the additional traffic being added to the network.

6.1.2 Travel times

Changes in peak hour travel times on each route (refer Section 5.4) are shown in the following tables.

Table 6.9 2018 AM peak – Travel times

Route	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
1	03:15	03:17	0:02	1%	03:21	03:26	0:05	2%
2	04:54	05:02	0:08	3%	05:59	06:02	0:03	1%
3	04:53	04:52	-0:01	0%	06:51	07:51	1:00	15%

Table 6.10 2028 AM peak – Travel times

Route	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
1	03:17	03:19	0:02	1%	03:21	03:28	0:07	3%
2	04:59	05:17	0:18	6%	06:07	06:16	0:09	3%
3	06:07	05:54	-0:13	4%	07:10	08:16	1:06	15%

Table 6.11 2018 PM peak – Travel times

Route	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
1	03:29	03:30	-0:01	0%	04:06	04:35	0:29	12%
2	07:44	08:14	0:30	6%	05:57	05:58	0:01	0%
3	05:41	05:43	0:02	1%	06:10	06:13	0:03	1%

Table 6.12 2028 PM peak – Travel times

Route	Eastbound				Westbound			
	Base	With UGNSW	Change	% Change	Base	With UGNSW	Change	% Change
1	03:25	03:28	0:03	1%	04:50	04:26	-0:24	-8%
2	07:27	08:09	0:42	9%	06:08	06:27	0:19	5%
3	05:44	05:54	0:10	3%	07:44	08:34	0:50	11%

These results show that changes in travel times on each route, as a result of the increase in traffic generated by the proposed rezoning, are generally small. Analysing the efficiency of travel on these routes (see Section 5.6) the following table show that generally there is no decrease in travel efficiency, with Levels of Service values remaining similar between base conditions and with the proposed rezoning.

Table 6.13 AM peak – Travel efficiency

Route	Eastbound				Westbound			
	2018		2028		2018		2028	
	Base	With UGNSW	Base	With UGNSW	Base	With UGNSW	Base	With UGNSW
1	92% [LoS A]	91% [LoS A]	91% [LoS A]	91% [LoS A]	90% [LoS A]	89% [LoS A]	90% [LoS A]	88% [LoS A]
2	63% [LoS C]	57% [LoS C]	63% [LoS C]	56% [LoS C]	52% [LoS C]	48% [LoS D]	47% [LoS D]	47% [LoS D]
3	66% [LoS C]	66% [LoS C]	49% [LoS D]	54% [LoS C]	46% [LoS D]	40% [LoS E]	42% [LoS D]	36% [LoS E]

Table 6.14 PM peak – Travel efficiency

Route	Eastbound				Westbound			
	2018		2028		2018		2028	
	Base	With UGNSW	Base	With UGNSW	Base	With UGNSW	Base	With UGNSW
1	88% [LoS A]	88% [LoS A]	89% [LoS A]	88% [LoS A]	71% [LoS B]	66% [LoS C]	64% [LoS C]	68% [LoS B]
2	39% [LoS E]	35% [LoS E]	40% [LoS E]	36% [LoS E]	52% [LoS C]	52% [LoS C]	47% [LoS D]	46% [LoS D]
3	55% [LoS C]	55% [LoS C]	55% [LoS C]	54% [LoS C]	49% [LoS D]	49% [LoS D]	40% [LoS D]	36% [LoS E]

6.1.3 Intersection operation

SIDRA Intersection software was used to review the individual intersection performance within the network. The results of the analyses are shown in the following tables, with additional detail in Appendix A.

Table 6.15 2028 AM peak – Intersection delay [level of service] (degree of saturation)

Intersection	Without UrbanGrowth Development Traffic	With UrbanGrowth Development Traffic
Stewart Avenue / Hunter Street	34 seconds [C] (0.74)	33 seconds [C] (0.74)
Stewart Avenue / King Street	50 seconds [D] (0.97)	50 seconds [D] (0.99)
Steel Street / Hunter Street	26 seconds [B] (0.43)	27 seconds [B] (0.48)
Steel Street / King Street	20 seconds [B] (0.72)	12 seconds [A] (0.78)
Union Street / Hunter Street	31 seconds [C] (0.49)	35 seconds [C] (0.53)
Union Street / King Street	50 seconds [D] (0.95)	58 seconds [E] (1.04)
Darby Street / Hunter Street	37 seconds [C] (0.89)	35 seconds [C] (0.89)
Darby Street / King Street	29 seconds [C] (0.73)	30 seconds [C] (0.74)

Table 6.16 2028 PM peak – Intersection delay [level of service] (degree of saturation)

Intersection	Without UrbanGrowth Development Traffic	With UrbanGrowth Development Traffic
Stewart Avenue / Hunter Street	31 seconds [C] (0.84)	40 seconds [C] (0.92)
Stewart Avenue / King Street	41 seconds [C] (0.93)	42 seconds [C] (0.92)
Steel Street / Hunter Street	35 seconds [C] (0.74)	35 seconds [C] (0.76)
Steel Street / King Street	28 seconds [B] (0.79)	28 seconds [B] (0.79)
Union Street / Hunter Street	26 seconds [B] (0.51)	26 seconds [B] (0.54)
Union Street / King Street	>70 seconds [F] (1.16)	>70 seconds [F] (1.20)
Darby Street / Hunter Street	34 seconds [C] (0.91)	51 seconds [D] (0.99)
Darby Street / King Street	35 seconds [C] (0.79)	37 seconds [C] (0.83)

The results show that in most cases intersection performance remains generally steady with the inclusion of the proposed rezoning. It is noted that some of the variation in performance measures between scenarios is due to changes in signal phasing, and the resulting changes in relative capacity on each approach.

6.1.4 Local traffic impacts

Local areas will not be adversely impacted by the proposed rezoning, with the majority of traffic generated from the developments travelling to/from the major roads of Hunter Street, King Street, Union Street, Darby Street and Hannell Street.

6.2 Public transport

As discussed in Section 3.2, major changes to existing bus services in the CBD are proposed to coincide with the introduction of Light Rail. Changes will include bus route terminus locations, and changes to bus stops in Hunter Street.

Any changes to bus operations in the CBD are independent of, and are not required to facilitate, the proposed rezoning.

6.3 Pedestrians and cyclists

The proposed development sites will enhance the public open space surrounding each site, with retail land uses activating building frontages to provide increased opportunity for movement, recreation and service transactions.

The closure of the heavy rail service has allowed at-grade pedestrian access to be provided at several locations across the former rail corridor. Table 6.17 summarises the existing and proposed pedestrian infrastructure for movement between the Newcastle CBD, across Hunter Street / Scott Street, across the former heavy rail corridor, and across Honeysuckle Drive / Wharf Road to the waterfront.

Table 6.17 Pedestrian access between CBD and waterfront

Location	Hunter Street / Scott Street crossing	Former Rail Corridor Crossing	Honeysuckle Drive / Wharf Road crossing
Steel Street	Existing traffic signals	At-grade crossing of Light Rail	Uncontrolled crossing, pedestrian refuge in median.
Kuwami Place	No formal pedestrian provision	At-grade crossing at Light Rail stop	Uncontrolled crossing, pedestrian refuge in median.
Worth Place	New signalised intersection as part of Light Rail project	At-grade crossing of Light Rail	Uncontrolled crossing, pedestrian refuge in median.
Civic Link	New signalised crossing at Light Rail stop	Public open space	Pedestrian (zebra) crossings of Workshop Way.
Merewether Street	Existing traffic signals	Existing Merewether Street footpaths	Pedestrian (zebra) crossing of Workshop Way.
Argyle Street	Existing traffic signals at Darby Street	Public access through development site	Existing pedestrian (zebra) crossing with refuge island.
Perkins Street	TBC	Public open space	Existing pedestrian (zebra) crossing.
Wolfe Street	TBC	Public open space	Existing pedestrian (zebra) crossing to be relocated to Market Street.
Market Street	New signalised crossing at Light Rail stop	Public open space	Relocated pedestrian (zebra) crossing.
Newcomen Street	TBC	Public open space	Pedestrian (zebra) crossings at Market Street and west of Watt Street.
Watt Street	Existing traffic signals	Existing Watt Street footpaths	Existing pedestrian (zebra) crossing east of Watt Street.

Civic Link will be a particular focus of pedestrian connectivity, with pathways connecting between Hunter Street and the foreshore. A light rail stop is proposed for Hunter Street adjacent to Civic Link, with a signalised pedestrian crossing linking the footpath with the light rail platforms.

Footpaths would be maintained alongside existing roadways.

The proposed rezoning would have no impact on existing bicycle infrastructure including on-road bike lanes and off-road pathways.

6.4 Parking

The proposed rezoning will not directly impact on any existing off-street public parking. However, two existing off-street parking areas are on land adjacent to the rezoning that is also likely to be redeveloped (Parcels 16-19). There are currently 189 spaces off Wrights Lane, with a mixture of 2 hour, 4 hour and 8 hour restrictions (pay and display).

The Newcastle Transport Program Parking Strategy (see Section 3.4) considered the implications of the removal of these spaces in its assessment. The Wrights Lane parking areas represent 16% of the total number of spaces to be removed in the near future as a result of the Light Rail project and various development sites.

The Parking Strategy concludes that the overall net loss of parking supply, including the 189 spaces affected by this proposal, is manageable in the context of broader objectives of parking demand management and increased public transport use.

7. Conclusions

This study has examined the traffic implications of the proposed rezoning of the previous heavy rail corridor through the Newcastle CBD.

The proposed rezoning would provide for several mixed-use sites, as well as sites for public recreation. For the purpose of this assessment, the rezoning application includes the assumed potential for some 440 residential units, and 4,040 m^2 Gross Floor Area of non-residential land use (most likely office and/or retail). Development on three adjacent and related sites, which do not form part of the rezoning application, has also been considered in this assessment.

Key findings of the assessment include:

- The proposed rezoning would generate up to an additional 3,300 vehicle movements (2-way) each day across all the development sites. This is expected to be an overestimate of actual generation, with a high mode share to public and active transport expected due to the locations of the development sites relative to light rail, bus services and the Newcastle CBD and Honeysuckle activity areas.
- Traffic modelling indicates that for forecast peak hour traffic conditions in 2018 and 2028, the additional traffic generated by the rezoning will not have a significant impact on the operation of the road network. The mitigation measures proposed as part of the light rail project will be sufficient to manage the changes in traffic conditions that are expected.
- On-site parking would be provided on each development site in accordance with the requirements of the Newcastle Development Control Plan 2012. The DCP allows for variation in parking provision for reasons including access to public transport, and a reduction in parking supply may be considered at the Development Application stage for each site.
- A Parking Strategy, developed by TfNSW, has considered the cumulative impacts of the Light Rail project, this current proposal and various developments sites on public parking supply. A net loss of 407 spaces is expected, which would increase overall peak occupancy to 81% with current demand levels. The Strategy recommends demand management, rather than demand satisfaction, as the most appropriate approach into the future. The Parking Strategy concludes that the overall net loss of parking supply, including the 189 spaces affected by this proposal, is manageable in the context of broader objectives of parking demand management and increased public transport use.
- The proposal would maintain and enhance pedestrian connectivity between the CBD and the waterfront. The proposed development sites will enhance the public open space surrounding each site, with retail land uses activating building frontages to provide increased opportunity for movement, recreation and service transactions.

Appendices

Appendix A - Intersection Operation Detailed Summary Results

A1 2028 AM with Light Rail

MOVEMENT SUMMARY

Site: 3 [Hunter]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Stewart Avenue
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stuart Avenue South													
1	L2	72	0.0	72	0.0	0.109	35.8	LOS C	3.2	22.7	0.82	0.75	20.5
2	T1	1088	0.7	1088	0.7	0.569	35.7	LOS C	18.7	131.4	0.93	0.80	14.6
Approach		1160	0.7	1160	0.7	0.569	35.7	LOS C	18.7	131.4	0.92	0.80	15.0
East: Hunter Street East													
4	L2	71	1.7	71	1.7	0.171	21.9	LOS B	4.5	33.0	0.53	0.56	24.2
5	T1	245	7.0	245	7.0	0.171	17.0	LOS B	4.5	33.0	0.51	0.46	32.7
6	R2	242	0.4	242	0.4	0.709	48.2	LOS D	12.9	90.9	0.94	0.83	13.7
Approach		558	3.5	558	3.5	0.709	31.2	LOS C	12.9	90.9	0.70	0.63	21.6
North: Stewart Avenue North													
7	L2	328	0.5	328	0.5	0.351	15.0	LOS B	8.4	59.3	0.48	0.71	14.8
8	T1	917	0.5	917	0.5	0.723	31.1	LOS C	15.3	107.7	0.86	0.76	8.6
Approach		1245	0.5	1245	0.5	0.723	26.9	LOS B	15.3	107.7	0.76	0.75	9.6
West: Hunter Street West													
10	L2	313	2.1	313	2.1	0.736	52.9	LOS D	16.8	119.8	0.95	0.85	9.0
11	T1	463	5.1	463	5.1	0.460	40.9	LOS C	10.5	76.5	0.82	0.72	11.5
Approach		776	3.9	776	3.9	0.736	45.7	LOS D	16.8	119.8	0.87	0.78	10.3
All Vehicles		3739	1.7	3739	1.7	0.736	34.2	LOS C	18.7	131.4	0.82	0.75	13.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.9 %
Number of Iterations: 17 (maximum specified: 20)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	38	24.1	LOS C	0.1	0.1	0.63	0.63
P2	East Full Crossing	84	31.6	LOS D	0.2	0.2	0.73	0.73
P3	North Full Crossing	67	45.2	LOS E	0.2	0.2	0.87	0.87
P4	West Full Crossing	76	30.9	LOS D	0.2	0.2	0.72	0.72
All Pedestrians		265	33.8	LOS D			0.75	0.75

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 4 [Parry]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Stewart Avenue with King Street and Parry Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stuart Avenue (S)													
1	L2	112	0.0	112	0.0	0.168	33.5	LOS C	4.4	30.9	0.72	0.74	30.3
2	T1	962	1.1	962	1.1	0.968	79.4	LOS F	39.0	275.9	1.00	1.22	17.2
3	R2	491	1.1	491	1.1	0.888	71.7	LOS F	16.3	115.2	1.00	0.99	18.3
Approach		1564	1.1	1564	1.1	0.968	73.7	LOS F	39.0	275.9	0.98	1.11	18.2
East: King Street													
4	L2	118	1.3	118	1.3	0.381	22.5	LOS B	13.3	94.4	0.70	0.72	41.8
5	T1	889	1.3	889	1.3	0.381	29.0	LOS C	17.5	123.8	0.80	0.72	24.8
6	R2	148	0.0	148	0.0	0.799	74.8	LOS F	4.8	33.3	1.00	0.82	9.7
Approach		1156	1.2	1156	1.2	0.799	34.3	LOS C	17.5	123.8	0.81	0.74	23.7
North: Stuart Avenue (N)													
7	L2	71	2.3	71	2.3	0.878	72.1	LOS F	19.6	138.2	1.00	0.94	8.9
8	T1	552	0.6	552	0.6	0.878	67.2	LOS E	19.7	138.9	1.00	0.94	22.9
9	R2	220	1.1	220	1.1	0.895	77.3	LOS F	7.2	50.7	1.00	0.90	10.9
Approach		842	0.9	842	0.9	0.895	70.3	LOS E	19.7	138.9	1.00	0.93	19.1
West: Parry Street													
10	L2	89	0.0	89	0.0	0.078	6.0	LOS A	0.1	0.7	0.02	0.55	33.1
11	T1	1416	0.5	1416	0.5	0.897	24.3	LOS B	37.8	265.5	0.84	0.83	14.3
12	R2	135	0.4	135	0.4	0.728	69.5	LOS E	4.2	29.5	1.00	0.79	21.0
Approach		1640	0.4	1640	0.4	0.897	27.0	LOS B	37.8	265.5	0.81	0.81	16.2
All Vehicles		5202	0.9	5202	0.9	0.968	49.7	LOS D	39.0	275.9	0.89	0.90	19.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.9 %
Number of Iterations: 17 (maximum specified: 20)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	26	33.8	LOS D	0.1	0.1	0.75	0.75
P2	East Full Crossing	27	54.2	LOS E	0.1	0.1	0.95	0.95
P3	North Full Crossing	7	31.5	LOS D	0.0	0.0	0.73	0.73
P4	West Full Crossing	12	48.6	LOS E	0.0	0.0	0.90	0.90
All Pedestrians		73	43.6	LOS E			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 5 [Hunter Steel]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Steel Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Steel Street (S)													
1	L2	14	0.0	14	0.0	0.058	51.7	LOS D	0.8	5.6	0.87	0.67	7.1
2	T1	48	0.0	48	0.0	0.289	49.8	LOS D	3.7	25.7	0.91	0.72	7.1
3	R2	24	0.0	24	0.0	0.289	54.5	LOS D	3.7	25.7	0.91	0.73	7.1
Approach		86	0.0	86	0.0	0.289	51.4	LOS D	3.7	25.7	0.90	0.72	7.1
East: Hunter Street (E)													
4	L2	28	0.0	28	0.0	0.193	16.6	LOS B	6.9	50.2	0.57	0.52	31.7
5	T1	426	4.7	426	4.7	0.193	5.9	LOS A	6.9	50.2	0.28	0.25	39.0
6	R2	215	0.0	215	0.0	0.434	57.2	LOS E	12.5	87.2	1.00	0.84	13.9
Approach		669	3.0	669	3.0	0.434	22.8	LOS B	12.5	87.2	0.52	0.45	24.5
North: Steel Street (N)													
7	L2	56	0.0	56	0.0	0.064	22.8	LOS B	1.8	12.3	0.58	0.67	9.6
8	T1	31	0.0	31	0.0	0.431	51.9	LOS D	4.7	32.7	0.95	0.76	4.6
9	R2	55	0.0	55	0.0	0.431	56.2	LOS D	4.7	32.7	0.95	0.76	4.6
Approach		141	0.0	141	0.0	0.431	42.1	LOS C	4.7	32.7	0.80	0.73	5.8
West: Hunter Street (W)													
10	L2	34	0.0	34	0.0	0.424	29.1	LOS C	12.4	89.8	0.66	0.59	17.9
11	T1	664	4.0	664	4.0	0.424	21.3	LOS B	12.4	89.8	0.59	0.52	19.6
12	R2	26	0.0	26	0.0	0.189	63.0	LOS E	1.5	10.5	0.97	0.71	9.1
Approach		724	3.7	724	3.7	0.424	23.2	LOS B	12.4	89.8	0.61	0.53	18.8
All Vehicles		1621	2.9	1621	2.9	0.434	26.2	LOS B	12.5	89.8	0.61	0.53	19.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.9 %
Number of Iterations: 17 (maximum specified: 20)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	71	23.5	LOS C	0.2	0.2	0.63	0.63
P2	East Full Crossing	38	54.2	LOS E	0.1	0.1	0.95	0.95
P3	North Full Crossing	21	24.7	LOS C	0.0	0.0	0.64	0.64
P4	West Full Crossing	4	54.2	LOS E	0.0	0.0	0.95	0.95
All Pedestrians		134	33.4	LOS D			0.73	0.73

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 9 [King Steel]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Steel Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Steel (S)													
1	L2	9	0.0	9	0.0	0.068	40.5	LOS C	0.4	2.8	0.95	0.66	13.4
2	T1	37	0.0	37	0.0	0.287	40.0	LOS C	4.8	33.9	0.87	0.71	13.1
3	R2	61	1.3	61	1.3	0.287	44.5	LOS D	4.8	33.9	0.87	0.71	13.1
Approach		107	0.7	107	0.7	0.287	42.6	LOS D	4.8	33.9	0.88	0.71	13.2
East: King Street (E)													
4	L2	21	0.0	21	0.0	0.022	18.5	LOS B	0.4	3.1	0.38	0.64	35.4
5	T1	866	2.0	866	2.0	0.545	28.3	LOS B	19.9	141.9	0.85	0.75	24.5
6	R2	6	0.0	6	0.0	0.029	18.4	LOS B	0.2	1.1	0.67	0.65	30.8
Approach		894	1.9	894	1.9	0.545	28.0	LOS B	19.9	141.9	0.84	0.74	24.9
North: Steel Street (N)													
7	L2	23	2.1	23	2.1	0.335	45.2	LOS D	4.5	31.8	1.00	0.84	8.2
8	T1	20	0.0	20	0.0	0.335	40.7	LOS C	4.5	31.8	1.00	0.84	16.8
9	R2	63	0.0	63	0.0	0.335	45.2	LOS D	4.5	31.8	1.00	0.84	8.2
Approach		106	0.5	106	0.5	0.335	44.3	LOS D	4.5	31.8	1.00	0.84	10.2
West: King Street (W)													
10	L2	61	1.9	61	1.9	0.063	10.8	LOS A	0.6	4.4	0.19	0.62	35.2
11	T1	1443	1.2	1443	1.2	0.723	12.1	LOS A	26.1	184.6	0.53	0.48	33.6
12	R2	167	0.0	167	0.0	0.352	16.9	LOS B	3.0	21.1	0.55	0.72	34.4
Approach		1672	1.1	1672	1.1	0.723	12.5	LOS A	26.1	184.6	0.52	0.51	33.8
All Vehicles		2779	1.3	2779	1.3	0.723	19.9	LOS B	26.1	184.6	0.65	0.61	27.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.9 %
Number of Iterations: 17 (maximum specified: 20)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	34	26.0	LOS C	0.1	0.1	0.66	0.66
P2	East Full Crossing	83	54.3	LOS E	0.3	0.3	0.95	0.95
P3	North Full Crossing	8	16.0	LOS B	0.0	0.0	0.52	0.52
P4	West Full Crossing	54	46.0	LOS E	0.2	0.2	0.88	0.88
All Pedestrians		179	44.7	LOS E			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 10 [Hunter Union]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Union
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Union Street													
1	L2	179	0.5	179	0.5	0.305	37.1	LOS C	7.8	54.9	0.79	0.77	6.4
3	R2	274	8.5	274	8.5	0.481	7.7	LOS A	1.9	14.4	0.13	0.55	21.2
Approach		453	5.3	453	5.3	0.481	19.3	LOS B	7.8	54.9	0.39	0.64	11.2
East: Hunter Street (E)													
4	L2	49	6.1	49	6.1	0.195	53.1	LOS D	2.8	20.9	1.00	0.79	6.8
5	T1	497	4.3	497	4.3	0.491	51.7	LOS D	14.2	103.0	1.00	0.84	7.0
Approach		546	4.4	546	4.4	0.491	51.9	LOS D	14.2	103.0	1.00	0.84	7.0
West: Hunter Street (W)													
11	T1	495	5.3	495	5.3	0.470	16.8	LOS B	15.6	114.0	0.59	0.52	28.4
12	R2	236	0.0	236	0.0	0.390	34.5	LOS C	11.3	79.3	0.89	0.83	19.5
Approach		731	3.6	731	3.6	0.470	22.5	LOS B	15.6	114.0	0.68	0.62	24.8
All Vehicles		1729	4.3	1729	4.3	0.491	30.9	LOS C	15.6	114.0	0.71	0.70	15.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.9 %
Number of Iterations: 17 (maximum specified: 20)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	5	11.7	LOS B	0.0	0.0	0.44	0.44
P2	East Full Crossing	32	34.5	LOS D	0.1	0.1	0.76	0.76
P4	West Full Crossing	42	34.6	LOS D	0.1	0.1	0.76	0.76
All Pedestrians		79	33.0	LOS D			0.74	0.74

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1 [King Union]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Union Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Union Street (S)													
1	L2	143	0.0	143	0.0	0.950	79.6	LOS F	26.6	187.7	1.00	1.16	16.4
2	T1	219	1.2	219	1.2	0.950	75.0	LOS F	26.6	187.7	1.00	1.16	16.4
3	R2	135	0.0	135	0.0	0.556	42.2	LOS C	6.2	43.7	0.96	0.80	23.5
Approach		497	0.5	497	0.5	0.950	67.4	LOS E	26.6	187.7	0.99	1.06	17.9
East: King Street (E)													
4	L2	89	1.5	89	1.5	0.189	42.8	LOS D	4.1	28.9	0.82	0.75	30.4
5	T1	571	0.4	571	0.4	0.909	67.2	LOS E	20.1	141.3	1.00	1.06	14.3
6	R2	57	0.0	57	0.0	0.459	66.9	LOS E	3.4	23.7	1.00	0.75	14.3
Approach		717	0.5	717	0.5	0.909	64.1	LOS E	20.1	141.3	0.98	1.00	16.6
North: Union Street (N)													
7	L2	133	0.0	133	0.0	0.503	58.9	LOS E	13.4	94.4	1.00	0.84	4.5
8	T1	98	0.7	98	0.7	0.503	54.6	LOS D	13.4	94.4	1.00	0.84	21.1
9	R2	52	7.3	52	7.3	0.313	43.0	LOS D	2.4	17.6	1.00	0.74	6.0
Approach		282	1.6	282	1.6	0.503	54.5	LOS D	13.4	94.4	1.00	0.82	12.5
West: King Street (W)													
10	L2	179	5.3	179	5.3	0.182	14.4	LOS A	2.9	21.0	0.30	0.65	34.6
11	T1	756	0.8	756	0.8	0.465	20.9	LOS B	14.0	98.4	0.60	0.53	29.0
12	R2	582	0.0	582	0.0	0.896	66.5	LOS E	37.7	264.2	1.00	0.95	24.2
Approach		1517	1.0	1517	1.0	0.896	37.6	LOS C	37.7	264.2	0.72	0.70	26.2
All Vehicles		3013	0.9	3013	0.9	0.950	50.4	LOS D	37.7	264.2	0.85	0.84	20.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.9 %
Number of Iterations: 17 (maximum specified: 20)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	31	46.9	LOS E	0.1	0.1	0.88	0.88
P2	East Full Crossing	17	50.5	LOS E	0.1	0.1	0.92	0.92
P3	North Full Crossing	22	23.5	LOS C	0.0	0.0	0.63	0.63
P4	West Full Crossing	16	53.2	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		85	42.7	LOS E			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 16 [Hunter Darby]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Darby Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Darby Street													
1	L2	98	0.4	98	0.4	0.092	15.4	LOS B	2.5	17.6	0.47	0.62	17.7
3	R2	139	4.8	139	4.8	0.281	40.2	LOS C	6.4	46.6	0.83	0.75	23.5
Approach		237	3.0	237	3.0	0.281	30.0	LOS C	6.4	46.6	0.68	0.70	22.4
East: Hunter Street (E)													
4	L2	176	1.2	176	1.2	0.382	44.9	LOS D	8.6	60.6	0.88	0.79	20.0
5	T1	409	7.7	409	7.7	0.889	55.6	LOS D	25.6	188.9	0.97	1.03	17.5
Approach		585	5.8	585	5.8	0.889	52.4	LOS D	25.6	188.9	0.94	0.96	18.1
West: Hunter Street (W)													
11	T1	342	10.5	342	10.5	0.299	15.7	LOS B	12.0	90.3	0.67	0.58	36.0
12	R2	141	0.0	141	0.0	0.276	40.4	LOS C	5.7	39.7	0.73	0.74	10.9
Approach		483	7.4	483	7.4	0.299	22.9	LOS B	12.0	90.3	0.69	0.63	29.0
All Vehicles		1305	5.9	1305	5.9	0.889	37.4	LOS C	25.6	188.9	0.80	0.79	22.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.9 %
Number of Iterations: 17 (maximum specified: 20)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	36.1	LOS D	0.2	0.2	0.78	0.78
P2	East Full Crossing	38	40.1	LOS E	0.1	0.1	0.82	0.82
P4	West Full Crossing	80	40.2	LOS E	0.2	0.2	0.82	0.82
All Pedestrians		184	38.7	LOS D			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: 13 [King Darby]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Darby
Signals - Fixed Time Isolated Cycle Time = 90 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Darby St (S)													
1	L2	272	0.0	272	0.0	0.226	6.2	LOS A	3.0	20.8	0.38	0.58	30.9
2	T1	132	1.9	132	1.9	0.512	40.7	LOS C	5.6	39.8	0.98	0.78	13.4
3	R2	321	0.0	321	0.0	0.707	38.5	LOS C	13.4	94.0	0.97	0.86	20.8
Approach		724	0.3	724	0.3	0.707	26.8	LOS B	13.4	94.0	0.75	0.74	21.2
SouthEast: RoadName													
21b	L3	1	0.0	1	0.0	0.001	8.3	LOS A	0.0	0.1	0.31	0.54	33.6
Approach		1	0.0	1	0.0	0.001	8.3	LOS A	0.0	0.1	0.31	0.54	33.6
East: King St (E)													
4	L2	122	0.0	122	0.0	0.669	34.5	LOS C	8.3	58.6	0.98	0.89	22.6
5	T1	333	1.1	333	1.1	0.669	36.7	LOS C	9.3	65.8	0.99	0.87	15.3
Approach		455	0.8	455	0.8	0.669	36.1	LOS C	9.3	65.8	0.98	0.87	17.6
North: Darby St (N)													
7	L2	23	0.0	23	0.0	0.035	13.2	LOS A	0.5	3.3	0.54	0.59	29.7
8	T1	156	0.6	156	0.6	0.602	41.4	LOS C	6.7	47.4	0.99	0.81	17.3
9	R2	135	0.0	135	0.0	0.230	20.7	LOS B	3.6	25.2	0.77	0.73	14.7
Approach		314	0.3	314	0.3	0.602	30.4	LOS C	6.7	47.4	0.86	0.76	17.4
West: King St (W)													
10	L2	101	2.7	101	2.7	0.524	24.2	LOS B	13.7	97.5	0.79	0.72	22.2
11	T1	527	1.5	527	1.5	0.728	25.5	LOS B	14.6	102.6	0.86	0.85	25.8
12	R2	187	0.0	187	0.0	0.728	36.1	LOS C	14.6	102.6	0.96	1.06	23.0
Approach		816	1.3	816	1.3	0.728	27.8	LOS B	14.6	102.6	0.87	0.88	24.8
All Vehicles		2309	0.8	2309	0.8	0.728	29.5	LOS C	14.6	102.6	0.85	0.82	21.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.9 %
Number of Iterations: 17 (maximum specified: 20)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P5	SouthEast Full Crossing	49	0.7	LOS A	0.0	0.0	0.18	0.18
P2	East Full Crossing	24	39.2	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	16	35.6	LOS D	0.0	0.0	0.89	0.89
P4	West Full Crossing	35	39.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		124	23.4	LOS C			0.63	0.63

A2 2028 AM with Proposed Rezoning

MOVEMENT SUMMARY

Site: 3 [Hunter]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Stewart Avenue
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stuart Avenue South													
1	L2	72	0.0	72	0.0	0.107	33.3	LOS C	3.0	21.3	0.77	0.74	21.4
2	T1	1124	0.7	1124	0.7	0.576	32.1	LOS C	18.6	131.0	0.89	0.78	15.8
Approach		1196	0.7	1196	0.7	0.576	32.1	LOS C	18.6	131.0	0.89	0.77	16.2
East: Hunter Street East													
4	L2	73	1.7	73	1.7	0.184	18.7	LOS B	3.8	27.4	0.42	0.49	26.5
5	T1	262	7.0	262	7.0	0.184	13.1	LOS A	3.8	27.4	0.39	0.37	36.0
6	R2	242	0.4	242	0.4	0.743	46.0	LOS D	12.8	90.2	0.93	0.82	14.2
Approach		577	3.6	577	3.6	0.743	27.7	LOS B	12.8	90.2	0.62	0.58	23.2
North: Stewart Avenue North													
7	L2	357	0.5	357	0.5	0.407	15.2	LOS B	9.3	65.7	0.49	0.71	14.7
8	T1	917	0.5	917	0.5	0.717	30.3	LOS C	15.3	107.7	0.85	0.75	8.8
Approach		1274	0.5	1274	0.5	0.717	26.1	LOS B	15.3	107.7	0.75	0.74	9.8
West: Hunter Street West													
10	L2	313	2.1	313	2.1	0.736	52.9	LOS D	16.8	119.8	0.95	0.85	9.0
11	T1	541	5.1	541	5.1	0.537	41.9	LOS C	12.7	92.5	0.85	0.75	11.2
Approach		854	4.0	854	4.0	0.736	45.9	LOS D	16.8	119.8	0.88	0.79	10.3
All Vehicles		3900	1.8	3900	1.8	0.743	32.5	LOS C	18.6	131.0	0.80	0.74	14.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 3.0 %
Number of Iterations: 20 (maximum specified: 20)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	38	24.7	LOS C	0.1	0.1	0.64	0.64
P2	East Full Crossing	84	30.9	LOS D	0.2	0.2	0.72	0.72
P3	North Full Crossing	67	45.2	LOS E	0.2	0.2	0.87	0.87
P4	West Full Crossing	76	30.2	LOS D	0.2	0.2	0.71	0.71
All Pedestrians		265	33.5	LOS D			0.74	0.74

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 4 [Parry]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Stewart Avenue with King Street and Parry Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stuart Avenue (S)													
1	L2	112	0.0	112	0.0	0.168	33.5	LOS C	4.4	30.9	0.72	0.74	30.3
2	T1	980	1.1	980	1.1	0.987	88.3	LOS F	42.0	296.9	1.00	1.27	15.9
3	R2	491	1.1	491	1.1	0.888	71.7	LOS F	16.3	115.2	1.00	0.99	18.3
Approach		1582	1.1	1582	1.1	0.987	79.3	LOS F	42.0	296.9	0.98	1.15	17.2
East: King Street													
4	L2	143	1.3	143	1.3	0.393	19.3	LOS B	12.1	85.4	0.59	0.65	43.8
5	T1	913	1.3	912	1.3	0.393	19.6	LOS B	18.1	128.1	0.54	0.51	30.4
6	R2	148	0.0	148	0.0	0.799	74.8	LOS F	4.8	33.3	1.00	0.82	9.7
Approach		1204	1.2	1204	1.2	0.799	26.4	LOS B	18.1	128.1	0.60	0.56	27.8
North: Stuart Avenue (N)													
7	L2	74	2.3	74	2.3	0.882	73.0	LOS F	19.8	139.5	1.00	0.95	8.8
8	T1	552	0.6	552	0.6	0.882	67.8	LOS E	19.9	140.0	1.00	0.95	22.8
9	R2	221	1.1	221	1.1	0.900	77.6	LOS F	7.2	51.1	1.00	0.91	10.9
Approach		846	0.9	846	0.9	0.900	70.8	LOS F	19.9	140.0	1.00	0.94	19.0
West: Parry Street													
10	L2	89	0.0	89	0.0	0.079	6.0	LOS A	0.1	0.7	0.02	0.55	33.0
11	T1	1416	0.5	1416	0.5	0.898	24.4	LOS B	37.9	266.5	0.84	0.83	14.2
12	R2	140	0.4	140	0.4	0.756	69.8	LOS E	4.4	30.8	1.00	0.80	20.9
Approach		1645	0.4	1645	0.4	0.898	27.3	LOS B	37.9	266.5	0.81	0.81	16.2
All Vehicles		5278	0.9	5277[N1]	0.9	0.987	49.7	LOS D	42.0	296.9	0.84	0.87	19.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 3.0 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	26	33.8	LOS D	0.1	0.1	0.75	0.75
P2	East Full Crossing	27	54.2	LOS E	0.1	0.1	0.95	0.95
P3	North Full Crossing	7	31.5	LOS D	0.0	0.0	0.73	0.73
P4	West Full Crossing	12	48.6	LOS E	0.0	0.0	0.90	0.90
All Pedestrians		73	43.6	LOS E			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 5 [Hunter Steel]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Steel Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Steel Street (S)													
1	L2	14	0.0	14	0.0	0.049	56.1	LOS D	1.0	6.7	1.00	0.71	6.6
2	T1	49	0.0	49	0.0	0.245	55.0	LOS D	4.1	28.8	1.00	0.78	6.5
3	R2	24	0.0	24	0.0	0.245	59.8	LOS E	4.1	28.8	1.00	0.78	6.5
Approach		87	0.0	87	0.0	0.245	56.5	LOS E	4.1	28.8	1.00	0.77	6.5
East: Hunter Street (E)													
4	L2	33	0.0	32	0.0	0.222	15.2	LOS B	5.0	36.3	0.39	0.38	33.0
5	T1	456	4.7	454	4.8	0.222	7.4	LOS A	5.0	36.3	0.27	0.25	37.0
6	R2	218	0.0	217	0.0	0.483	59.3	LOS E	12.7	88.6	1.00	0.84	13.6
Approach		706	3.1	703[N1]	3.1	0.483	23.8	LOS B	12.7	88.6	0.50	0.44	24.0
North: Steel Street (N)													
7	L2	58	0.0	58	0.0	0.066	22.3	LOS B	1.8	12.6	0.57	0.67	9.8
8	T1	37	0.0	37	0.0	0.468	49.4	LOS D	5.6	39.2	0.94	0.77	4.8
9	R2	67	0.0	67	0.0	0.468	53.6	LOS D	5.6	39.2	0.94	0.77	4.8
Approach		162	0.0	162	0.0	0.468	41.5	LOS C	5.6	39.2	0.81	0.73	5.9
West: Hunter Street (W)													
10	L2	35	0.0	35	0.0	0.474	31.0	LOS C	14.5	104.6	0.70	0.63	17.1
11	T1	729	4.0	729	4.0	0.474	20.6	LOS B	14.5	104.6	0.61	0.54	20.0
12	R2	33	0.0	33	0.0	0.211	61.9	LOS E	1.9	13.2	0.98	0.73	9.3
Approach		797	3.7	797	3.7	0.474	22.7	LOS B	14.5	104.6	0.63	0.55	19.0
All Vehicles		1753	2.9	1750[N1]	2.9	0.483	26.6	LOS B	14.5	104.6	0.61	0.53	18.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 3.0 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	71	24.1	LOS C	0.2	0.2	0.64	0.64
P2	East Full Crossing	38	51.4	LOS E	0.1	0.1	0.93	0.93
P3	North Full Crossing	21	25.4	LOS C	0.0	0.0	0.65	0.65
P4	West Full Crossing	4	51.3	LOS E	0.0	0.0	0.93	0.93
All Pedestrians		134	32.9	LOS D			0.73	0.73

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 9 [King Steel]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Steel Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Steel (S)													
1	L2	13	0.0	13	0.0	0.091	40.7	LOS C	0.5	3.8	0.96	0.67	13.3
2	T1	34	0.0	34	0.0	0.298	40.1	LOS C	4.7	33.2	0.89	0.72	13.1
3	R2	62	1.3	62	1.3	0.298	44.6	LOS D	4.7	33.2	0.89	0.72	13.1
Approach		108	0.7	108	0.7	0.298	42.8	LOS D	4.7	33.2	0.90	0.72	13.1
East: King Street (E)													
4	L2	21	0.0	21	0.0	0.018	14.7	LOS B	0.4	2.8	0.35	0.63	38.2
5	T1	882	2.0	877	2.0	0.429	12.4	LOS A	11.8	84.3	0.43	0.38	36.8
6	R2	6	0.0	6	0.0	0.030	10.3	LOS A	0.1	0.4	0.24	0.61	39.2
Approach		909	1.9	904 N1	1.9	0.429	12.4	LOS A	11.8	84.3	0.43	0.39	36.8
North: Steel Street (N)													
7	L2	23	2.1	23	2.1	0.506	50.2	LOS D	7.9	55.6	1.00	0.87	7.7
8	T1	72	0.0	72	0.0	0.506	45.7	LOS D	7.9	55.6	1.00	0.87	15.9
9	R2	63	0.0	63	0.0	0.506	50.2	LOS D	7.9	55.6	1.00	0.87	7.7
Approach		158	0.3	158	0.3	0.506	48.2	LOS D	7.9	55.6	1.00	0.87	11.9
West: King Street (W)													
10	L2	61	1.9	61	1.9	0.063	8.3	LOS A	0.3	2.3	0.10	0.60	39.0
11	T1	1551	1.2	1551	1.2	0.775	6.4	LOS A	22.8	161.0	0.39	0.36	42.4
12	R2	167	0.0	167	0.0	0.461	15.4	LOS B	3.3	23.0	0.49	0.70	35.5
Approach		1779	1.1	1779	1.1	0.775	7.3	LOS A	22.8	161.0	0.39	0.40	41.1
All Vehicles		2955	1.3	2950 N1	1.3	0.775	12.4	LOS A	22.8	161.0	0.45	0.43	34.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 3.0 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	34	18.2	LOS B	0.1	0.1	0.55	0.55
P2	East Full Crossing	83	54.3	LOS E	0.3	0.3	0.95	0.95
P3	North Full Crossing	8	16.0	LOS B	0.0	0.0	0.52	0.52
P4	West Full Crossing	54	46.0	LOS E	0.2	0.2	0.88	0.88
All Pedestrians		179	43.2	LOS E			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 10 [Hunter Union]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Union
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Union Street													
1	L2	181	0.5	178	0.5	0.304	37.5	LOS C	7.3	51.6	0.75	0.75	6.3
3	R2	299	8.5	294	8.6	0.517	30.4	LOS C	11.6	87.1	0.72	0.76	7.8
Approach		480	5.5	472[N1]	5.5	0.517	33.1	LOS C	11.6	87.1	0.73	0.76	7.2
East: Hunter Street (E)													
4	L2	77	6.1	77	6.1	0.314	54.6	LOS D	4.5	32.9	1.00	0.81	6.6
5	T1	525	4.3	525	4.3	0.507	51.5	LOS D	15.1	109.4	1.00	0.85	7.0
Approach		602	4.5	602	4.5	0.507	51.9	LOS D	15.1	109.4	1.00	0.84	7.0
West: Hunter Street (W)													
11	T1	561	5.3	561	5.3	0.533	17.7	LOS B	20.3	148.8	0.68	0.61	27.8
12	R2	246	0.0	246	0.0	0.421	39.0	LOS C	12.6	88.3	0.95	0.88	18.1
Approach		807	3.7	807	3.7	0.533	24.2	LOS B	20.3	148.8	0.76	0.69	23.9
All Vehicles		1889	4.4	1882[N1]	4.4	0.533	35.3	LOS C	20.3	148.8	0.83	0.76	13.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 3.0 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	5	11.3	LOS B	0.0	0.0	0.43	0.43
P2	East Full Crossing	32	34.5	LOS D	0.1	0.1	0.76	0.76
P4	West Full Crossing	42	34.6	LOS D	0.1	0.1	0.76	0.76
All Pedestrians		79	33.0	LOS D			0.74	0.74

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: 1 [King Union]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Union Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Union Street (S)													
1	L2	143	0.0	143	0.0	1.036	134.4	LOS F	35.4	249.7	1.00	1.40	11.1
2	T1	228	1.2	228	1.2	1.036	129.9	LOS F	35.4	249.7	1.00	1.40	11.1
3	R2	135	0.0	135	0.0	0.642	45.4	LOS D	6.4	45.1	0.99	0.83	22.6
Approach		506	0.6	506	0.6	1.036	108.7	LOS F	35.4	249.7	1.00	1.25	12.8
East: King Street (E)													
4	L2	89	1.5	89	1.5	0.177	41.1	LOS C	4.0	28.2	0.80	0.75	31.0
5	T1	599	0.4	599	0.4	0.889	62.6	LOS E	20.0	140.6	1.00	1.03	15.1
6	R2	58	0.0	58	0.0	0.559	66.3	LOS E	3.5	24.6	1.00	0.79	14.4
Approach		746	0.5	746	0.5	0.889	60.3	LOS E	20.0	140.6	0.98	0.98	17.3
North: Union Street (N)													
7	L2	133	0.0	133	0.0	0.594	59.8	LOS E	14.0	97.9	1.00	0.84	4.5
8	T1	118	0.7	118	0.7	0.594	55.5	LOS D	14.0	97.9	1.00	0.84	21.0
9	R2	72	7.3	72	7.3	0.233	40.2	LOS C	3.5	26.3	0.88	0.73	6.4
Approach		322	1.9	322	1.9	0.594	53.9	LOS D	14.0	97.9	0.97	0.82	13.0
West: King Street (W)													
10	L2	194	5.3	194	5.3	0.200	20.4	LOS B	5.0	36.6	0.48	0.70	29.4
11	T1	783	0.8	783	0.8	0.508	24.3	LOS B	18.9	133.2	0.77	0.67	26.8
12	R2	582	0.0	582	0.0	0.896	71.1	LOS F	37.0	258.7	1.00	0.93	23.3
Approach		1559	1.1	1559	1.1	0.896	41.3	LOS C	37.0	258.7	0.82	0.77	24.8
All Vehicles		3134	0.9	3134	0.9	1.036	58.0	LOS E	37.0	258.7	0.90	0.90	18.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 3.0 %
Number of Iterations: 20 (maximum specified: 20)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	31	45.1	LOS E	0.1	0.1	0.87	0.87
P2	East Full Crossing	17	52.3	LOS E	0.1	0.1	0.93	0.93
P3	North Full Crossing	22	24.1	LOS C	0.0	0.0	0.63	0.63
P4	West Full Crossing	16	54.2	LOS E	0.1	0.1	0.95	0.95
All Pedestrians		85	42.8	LOS E			0.84	0.84

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 16 [Hunter Darby]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Darby Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Darby Street													
1	L2	98	0.4	98	0.4	0.093	15.9	LOS B	2.6	18.0	0.48	0.63	17.4
3	R2	139	4.8	139	4.8	0.332	44.8	LOS D	6.8	49.6	0.88	0.77	22.3
Approach		237	3.0	237	3.0	0.332	32.9	LOS C	6.8	49.6	0.71	0.71	21.4
East: Hunter Street (E)													
4	L2	209	1.0	209	1.0	0.440	44.8	LOS D	10.3	72.8	0.89	0.80	20.0
5	T1	409	7.7	409	7.7	0.887	54.5	LOS D	25.3	186.8	0.96	1.02	17.7
Approach		619	5.4	619	5.4	0.887	51.2	LOS D	25.3	186.8	0.94	0.95	18.4
West: Hunter Street (W)													
11	T1	387	9.2	387	9.2	0.316	11.8	LOS A	11.5	86.0	0.57	0.50	38.8
12	R2	187	0.0	187	0.0	0.327	30.8	LOS C	6.8	47.9	0.66	0.73	13.3
Approach		575	6.2	574 N1	6.2	0.327	18.0	LOS B	11.5	86.0	0.60	0.58	31.5
All Vehicles		1431	5.4	1430 N1	5.4	0.887	34.8	LOS C	25.3	186.8	0.77	0.76	22.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 3.0 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	35.4	LOS D	0.2	0.2	0.77	0.77
P2	East Full Crossing	38	44.3	LOS E	0.1	0.1	0.86	0.86
P4	West Full Crossing	80	44.4	LOS E	0.2	0.2	0.86	0.86
All Pedestrians		184	41.1	LOS E			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: 13 [King Darby]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Darby
Signals - Fixed Time Isolated Cycle Time = 90 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Darby St (S)													
1	L2	272	0.0	272	0.0	0.222	5.9	LOS A	2.8	19.7	0.36	0.57	31.2
2	T1	139	1.9	139	1.9	0.541	40.8	LOS C	5.9	42.2	0.98	0.78	13.4
3	R2	321	0.0	321	0.0	0.741	40.5	LOS C	13.9	97.1	0.98	0.89	20.3
Approach		732	0.4	732	0.4	0.741	27.7	LOS B	13.9	97.1	0.75	0.75	20.8
SouthEast: RoadName													
21b	L3	1	0.0	1	0.0	0.001	8.3	LOS A	0.0	0.1	0.31	0.54	33.6
Approach		1	0.0	1	0.0	0.001	8.3	LOS A	0.0	0.1	0.31	0.54	33.6
East: King St (E)													
4	L2	127	0.0	127	0.0	0.674	34.4	LOS C	8.4	59.0	0.98	0.90	22.6
5	T1	333	1.1	333	1.1	0.674	36.8	LOS C	9.4	66.5	0.99	0.87	15.3
Approach		460	0.8	460	0.8	0.674	36.1	LOS C	9.4	66.5	0.99	0.88	17.6
North: Darby St (N)													
7	L2	24	0.0	24	0.0	0.037	13.7	LOS A	0.5	3.5	0.55	0.59	29.4
8	T1	182	0.6	182	0.6	0.703	43.1	LOS D	8.2	57.5	1.00	0.88	16.8
9	R2	185	0.0	185	0.0	0.330	22.1	LOS B	5.2	36.5	0.82	0.76	14.1
Approach		392	0.3	391	0.3	0.703	31.4	LOS C	8.2	57.5	0.89	0.80	16.7
West: King St (W)													
10	L2	101	2.7	101	2.7	0.519	23.5	LOS B	13.7	97.7	0.78	0.71	22.5
11	T1	549	1.5	549	1.5	0.722	24.7	LOS B	14.8	104.4	0.85	0.85	26.1
12	R2	187	0.0	187	0.0	0.722	34.9	LOS C	14.8	104.4	0.95	1.05	23.4
Approach		838	1.3	838	1.3	0.722	26.9	LOS B	14.8	104.4	0.86	0.88	25.2
All Vehicles		2422	0.8	2422	0.8	0.741	29.6	LOS C	14.8	104.4	0.86	0.83	21.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 3.0 %
Number of Iterations: 20 (maximum specified: 20)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P5	SouthEast Full Crossing	49	0.7	LOS A	0.0	0.0	0.18	0.18
P2	East Full Crossing	24	39.2	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	16	34.7	LOS D	0.0	0.0	0.88	0.88
P4	West Full Crossing	35	39.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		124	23.3	LOS C			0.63	0.63

A3 2028 PM with Light Rail

MOVEMENT SUMMARY

Site: 3 [Hunter]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Stewart Avenue
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stuart Avenue South													
1	L2	94	0.0	92	0.0	0.094	24.8	LOS B	3.6	25.2	0.73	0.74	25.4
2	T1	921	0.7	900	0.8	0.279	15.5	LOS B	12.0	84.5	0.62	0.53	25.5
Approach		1015	0.7	991 N1	0.7	0.279	16.3	LOS B	12.0	84.5	0.63	0.55	25.5
East: Hunter Street East													
4	L2	99	1.7	98	1.8	0.431	41.8	LOS C	10.7	77.7	0.92	0.80	15.9
5	T1	378	7.0	374	7.0	0.431	35.5	LOS C	12.7	94.4	0.90	0.77	23.0
6	R2	225	0.4	223	0.4	0.844	66.6	LOS E	14.2	99.4	1.00	0.95	10.7
Approach		702	4.1	694 N1	4.2	0.844	46.4	LOS D	14.2	99.4	0.93	0.83	17.3
North: Stewart Avenue North													
7	L2	200	0.5	200	0.5	0.144	8.4	LOS A	3.0	21.0	0.28	0.64	22.1
8	T1	1305	0.5	1303	0.5	0.823	24.7	LOS B	15.3	107.7	0.83	0.80	10.4
Approach		1505	0.5	1503 N1	0.5	0.823	22.6	LOS B	15.3	107.7	0.76	0.78	11.1
West: Hunter Street West													
10	L2	141	2.1	141	2.1	0.715	64.6	LOS E	8.3	59.4	1.00	0.83	7.5
11	T1	411	5.1	411	5.1	0.816	60.8	LOS E	12.5	91.0	1.00	0.91	8.2
Approach		552	4.3	552	4.3	0.816	61.8	LOS E	12.5	91.0	1.00	0.89	8.0
All Vehicles		3774	1.8	3739 N1	1.8	0.844	31.1	LOS C	15.3	107.7	0.79	0.74	14.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 30.7 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	38	39.3	LOS D	0.1	0.1	0.81	0.81
P2	East Full Crossing	84	18.2	LOS B	0.2	0.2	0.55	0.55
P3	North Full Crossing	67	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	76	17.7	LOS B	0.1	0.1	0.54	0.54
All Pedestrians		265	30.2	LOS D			0.69	0.69

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 4 [Parry]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Stewart Avenue with King Street and Parry Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stuart Avenue (S)													
1	L2	57	0.0	57	0.0	0.066	13.3	LOS A	0.8	5.3	0.25	0.63	42.0
2	T1	584	1.1	584	1.1	0.477	24.5	LOS B	10.8	76.0	0.67	0.57	33.9
3	R2	285	1.1	285	1.1	0.929	72.0	LOS F	9.4	66.5	1.00	0.95	18.3
Approach		926	1.1	926	1.1	0.929	38.4	LOS C	10.8	76.0	0.75	0.69	27.2
East: King Street													
4	L2	442	1.3	415	1.4	0.752	20.7	LOS B	21.8	154.4	0.69	0.82	42.1
5	T1	1311	1.3	1231	1.4	0.752	25.6	LOS B	25.1	177.9	0.59	0.59	26.4
6	R2	381	0.0	358	0.0	0.889	75.8	LOS F	11.5	80.5	1.00	0.91	9.6
Approach		2134	1.1	2003 N1	1.2	0.889	33.5	LOS C	25.1	177.9	0.68	0.70	25.3
North: Stuart Avenue (N)													
7	L2	92	2.3	91	2.3	0.877	54.3	LOS D	32.2	227.0	0.99	0.98	11.6
8	T1	927	0.6	926	0.6	0.877	47.1	LOS D	32.2	227.0	0.95	0.94	28.1
9	R2	281	1.1	281	1.1	0.914	66.1	LOS E	8.8	62.5	1.00	0.88	12.3
Approach		1300	0.8	1298 N1	0.8	0.914	51.7	LOS D	32.2	227.0	0.97	0.93	23.9
West: Parry Street													
10	L2	53	0.0	53	0.0	0.042	5.9	LOS A	0.1	0.4	0.02	0.55	33.5
11	T1	966	0.5	966	0.5	0.894	38.1	LOS C	29.6	207.7	0.94	0.92	10.0
12	R2	311	0.4	311	0.4	0.774	60.7	LOS E	9.2	64.6	1.00	0.85	22.8
Approach		1329	0.4	1329	0.4	0.894	42.1	LOS C	29.6	207.7	0.92	0.89	15.4
All Vehicles		5689	0.9	5558 N1	0.9	0.929	40.6	LOS C	32.2	227.0	0.82	0.80	23.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 30.7 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	26	46.0	LOS E	0.1	0.1	0.88	0.88
P2	East Full Crossing	27	43.4	LOS E	0.1	0.1	0.85	0.85
P3	North Full Crossing	7	43.4	LOS E	0.0	0.0	0.85	0.85
P4	West Full Crossing	12	43.4	LOS E	0.0	0.0	0.85	0.85
All Pedestrians		73	44.3	LOS E			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 5 [Hunter Steel]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Steel Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Steel Street (S)													
1	L2	23	0.0	23	0.0	0.024	18.9	LOS B	0.6	4.3	0.49	0.63	15.3
2	T1	62	0.0	61	0.0	0.113	31.4	LOS C	3.3	23.0	0.84	0.67	10.6
3	R2	9	0.0	9	0.0	0.113	36.0	LOS C	3.3	23.0	0.84	0.67	10.6
Approach		95	0.0	94[N1]	0.0	0.113	28.8	LOS C	3.3	23.0	0.76	0.66	11.4
East: Hunter Street (E)													
4	L2	76	0.0	75	0.0	0.422	28.9	LOS C	9.8	70.7	0.62	0.58	23.1
5	T1	528	4.7	521	4.8	0.422	16.7	LOS B	9.8	70.7	0.48	0.43	28.0
6	R2	393	0.0	387	0.0	0.742	43.7	LOS D	20.3	142.1	0.94	0.86	16.8
Approach		997	2.5	983[N1]	2.6	0.742	28.3	LOS B	20.3	142.1	0.67	0.61	21.9
North: Steel Street (N)													
7	L2	137	0.0	137	0.0	0.099	8.8	LOS A	2.2	15.2	0.30	0.62	19.1
8	T1	99	0.0	99	0.0	0.716	36.9	LOS C	13.7	95.6	0.87	0.81	6.2
9	R2	177	0.0	177	0.0	0.716	41.2	LOS C	13.7	95.6	0.87	0.81	6.2
Approach		413	0.0	413	0.0	0.716	29.4	LOS C	13.7	95.6	0.68	0.75	7.9
West: Hunter Street (W)													
10	L2	38	0.0	38	0.0	0.733	58.8	LOS E	13.0	93.3	1.00	0.87	10.1
11	T1	401	4.0	401	4.0	0.733	54.2	LOS D	13.0	94.3	1.00	0.87	10.2
12	R2	72	0.0	72	0.0	0.446	39.9	LOS C	3.0	21.2	0.72	0.70	13.1
Approach		511	3.1	510	3.1	0.733	52.5	LOS D	13.0	94.3	0.96	0.85	10.5
All Vehicles		2015	2.0	2000[N1]	2.1	0.742	34.7	LOS C	20.3	142.1	0.75	0.70	15.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 30.7 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	71	48.7	LOS E	0.2	0.2	0.90	0.90
P2	East Full Crossing	38	32.3	LOS D	0.1	0.1	0.73	0.73
P3	North Full Crossing	21	50.5	LOS E	0.1	0.1	0.92	0.92
P4	West Full Crossing	4	32.3	LOS D	0.0	0.0	0.73	0.73
All Pedestrians		134	43.8	LOS E			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 9 [King Steel]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Steel Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Steel (S)													
1	L2	118	0.0	118	0.0	0.762	54.0	LOS D	5.2	36.4	1.00	0.93	10.8
2	T1	34	0.0	34	0.0	0.201	34.6	LOS C	3.3	23.6	0.83	0.68	14.6
3	R2	40	1.3	40	1.3	0.201	39.2	LOS C	3.3	23.6	0.83	0.68	14.6
Approach		192	0.3	192	0.3	0.762	47.5	LOS D	5.2	36.4	0.93	0.83	12.0
East: King Street (E)													
4	L2	55	0.0	49	0.0	0.048	17.4	LOS B	1.1	7.4	0.39	0.65	36.1
5	T1	1508	2.0	1364	2.2	0.778	16.7	LOS B	27.6	196.5	0.66	0.60	32.3
6	R2	12	0.0	10	0.0	0.042	23.5	LOS B	0.3	2.0	0.79	0.67	27.2
Approach		1575	1.9	1423 N1	2.1	0.778	16.8	LOS B	27.6	196.5	0.65	0.60	32.5
North: Steel Street (N)													
7	L2	24	2.1	24	2.1	0.755	58.5	LOS E	14.4	100.8	0.95	0.93	6.5
8	T1	40	0.0	40	0.0	0.755	54.0	LOS D	14.4	100.8	0.95	0.93	13.9
9	R2	207	0.0	207	0.0	0.755	58.6	LOS E	14.4	100.8	0.95	0.93	6.5
Approach		272	0.2	271 N1	0.2	0.755	57.9	LOS E	14.4	100.8	0.95	0.93	7.8
West: King Street (W)													
10	L2	22	1.9	22	1.9	0.026	25.9	LOS B	0.8	5.8	0.68	0.69	22.3
11	T1	1058	1.2	1058	1.2	0.739	30.0	LOS C	32.7	231.4	0.91	0.82	20.4
12	R2	176	0.0	176	0.0	0.795	35.0	LOS C	6.0	41.8	0.95	0.89	24.8
Approach		1256	1.1	1256	1.1	0.795	30.6	LOS C	32.7	231.4	0.91	0.83	21.2
All Vehicles		3294	1.3	3141 N1	1.4	0.795	27.7	LOS B	32.7	231.4	0.80	0.73	22.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 30.7 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	34	22.2	LOS C	0.1	0.1	0.61	0.61
P2	East Full Crossing	83	51.5	LOS E	0.3	0.3	0.93	0.93
P3	North Full Crossing	8	19.8	LOS B	0.0	0.0	0.58	0.58
P4	West Full Crossing	54	40.9	LOS E	0.2	0.2	0.83	0.83
All Pedestrians		179	41.3	LOS E			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 10 [Hunter Union]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Union
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Union Street													
1	L2	254	0.5	240	0.5	0.503	33.5	LOS C	9.8	68.8	0.74	0.76	7.0
3	R2	196	8.5	186	8.8	0.399	46.5	LOS D	9.9	74.5	0.96	0.82	5.4
Approach		449	4.0	426[N1]	4.1	0.503	39.2	LOS C	9.9	74.5	0.83	0.78	6.2
East: Hunter Street (E)													
4	L2	52	6.1	52	6.1	0.110	29.5	LOS C	2.0	14.8	0.70	0.71	11.0
5	T1	749	4.3	749	4.3	0.512	29.6	LOS C	17.4	126.0	0.84	0.73	11.1
Approach		801	4.4	801	4.4	0.512	29.6	LOS C	17.4	126.0	0.83	0.73	11.0
West: Hunter Street (W)													
11	T1	335	5.3	335	5.3	0.288	5.4	LOS A	4.0	29.4	0.22	0.20	40.2
12	R2	212	0.0	212	0.0	0.411	20.5	LOS B	6.4	45.1	0.56	0.72	25.9
Approach		546	3.2	546	3.2	0.411	11.2	LOS A	6.4	45.1	0.36	0.40	33.1
All Vehicles		1797	3.9	1773[N1]	4.0	0.512	26.2	LOS B	17.4	126.0	0.68	0.64	15.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 30.7 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	5	8.4	LOS A	0.0	0.0	0.38	0.38
P2	East Full Crossing	32	40.1	LOS E	0.1	0.1	0.82	0.82
P4	West Full Crossing	42	40.1	LOS E	0.1	0.1	0.82	0.82
All Pedestrians		79	38.0	LOS D			0.79	0.79

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: 1 [King Union]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Union Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Union Street (S)													
1	L2	278	0.0	278	0.0	1.156	201.9	LOS F	50.0	351.2	1.00	1.63	7.9
2	T1	158	1.2	158	1.2	1.156	197.3	LOS F	50.0	351.2	1.00	1.63	7.9
3	R2	76	0.0	76	0.0	0.182	43.6	LOS D	3.7	25.8	0.84	0.72	23.1
Approach		512	0.4	512	0.4	1.156	177.0	LOS F	50.0	351.2	0.98	1.49	8.7
East: King Street (E)													
4	L2	102	1.5	100	1.5	0.106	21.2	LOS B	2.9	20.8	0.54	0.70	38.8
5	T1	1078	0.4	1059	0.4	1.098	172.6	LOS F	60.6	425.4	1.00	1.65	6.5
6	R2	131	0.0	128	0.0	0.440	51.1	LOS D	6.7	46.9	0.92	0.80	17.5
Approach		1311	0.4	1288[N1]	0.4	1.098	148.7	LOS F	60.6	425.4	0.96	1.49	8.1
North: Union Street (N)													
7	L2	54	0.0	54	0.0	0.863	36.7	LOS C	11.6	81.5	0.91	0.82	7.4
8	T1	162	0.7	162	0.7	0.863	32.5	LOS C	11.6	81.5	0.91	0.82	27.8
9	R2	46	7.3	46	7.3	0.254	61.9	LOS E	2.8	20.5	1.00	0.72	4.3
Approach		262	1.7	262	1.7	0.863	38.5	LOS C	11.6	81.5	0.93	0.80	21.1
West: King Street (W)													
10	L2	160	5.3	160	5.3	0.317	35.4	LOS C	7.2	52.9	1.00	0.81	21.4
11	T1	658	0.8	658	0.8	0.699	53.6	LOS D	22.2	156.4	1.00	0.86	16.1
12	R2	438	0.0	438	0.0	1.132	166.9	LOS F	48.6	340.0	1.00	1.27	13.3
Approach		1256	1.1	1256	1.1	1.132	90.8	LOS F	48.6	340.0	1.00	1.00	14.6
All Vehicles		3340	0.8	3317[N1]	0.8	1.156	122.5	LOS F	60.6	425.4	0.97	1.25	10.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 30.7 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	31	36.1	LOS D	0.1	0.1	0.78	0.78
P2	East Full Crossing	17	54.2	LOS E	0.1	0.1	0.95	0.95
P3	North Full Crossing	22	38.4	LOS D	0.1	0.1	0.80	0.80
P41	West Stage 1	53	32.9	LOS D	0.1	0.1	0.90	0.90
P42	West Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		175	42.6	LOS E			0.89	0.89

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 16 [Hunter Darby]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Darby Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Darby Street													
1	L2	75	0.5	75	0.5	0.095	24.6	LOS B	2.5	17.9	0.62	0.67	13.3
3	R2	107	6.3	107	6.3	0.483	57.7	LOS E	6.0	44.6	0.98	0.78	19.4
Approach		182	3.9	182	3.9	0.483	44.2	LOS D	6.0	44.6	0.83	0.73	18.1
East: Hunter Street (E)													
4	L2	271	0.8	271	0.8	0.359	30.8	LOS C	10.9	76.6	0.74	0.77	24.6
5	T1	602	5.2	602	5.2	0.910	47.6	LOS D	36.4	264.4	0.88	0.96	19.3
Approach		873	3.9	873	3.9	0.910	42.4	LOS C	36.4	264.4	0.84	0.90	20.6
West: Hunter Street (W)													
11	T1	308	11.6	306	11.7	0.215	3.4	LOS A	3.2	24.7	0.21	0.18	46.1
12	R2	277	0.0	274	0.0	0.554	35.5	LOS C	11.9	83.1	0.78	0.78	12.0
Approach		585	6.1	580 N1	6.2	0.554	18.6	LOS B	11.9	83.1	0.48	0.46	29.3
All Vehicles		1640	4.7	1635 N1	4.7	0.910	34.1	LOS C	36.4	264.4	0.71	0.73	22.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 30.7 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	22.9	LOS C	0.1	0.1	0.62	0.62
P2	East Full Crossing	38	54.2	LOS E	0.1	0.1	0.95	0.95
P4	West Full Crossing	80	54.3	LOS E	0.3	0.3	0.95	0.95
All Pedestrians		184	43.0	LOS E			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: 13 [King Darby]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Darby
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Darby St (S)													
1	L2	362	0.0	362	0.0	0.442	9.3	LOS A	7.5	52.4	0.48	0.64	27.7
2	T1	129	1.9	129	1.9	0.230	34.6	LOS C	5.7	40.7	0.80	0.65	14.9
3	R2	137	0.0	137	0.0	0.280	24.2	LOS B	4.5	31.5	0.78	0.74	25.3
Approach		628	0.4	628	0.4	0.442	17.8	LOS B	7.5	52.4	0.61	0.66	23.5
SouthEast: RoadName													
21b	L3	1	0.0	1	0.0	0.001	10.0	LOS A	0.0	0.1	0.32	0.54	32.4
Approach		1	0.0	1	0.0	0.001	10.0	LOS A	0.0	0.1	0.32	0.54	32.4
East: King St (E)													
4	L2	179	0.0	179	0.0	0.788	46.9	LOS D	15.6	109.4	1.00	0.97	19.3
5	T1	440	1.1	440	1.1	0.788	49.7	LOS D	18.7	131.9	1.00	0.94	12.6
Approach		619	0.8	619	0.8	0.788	48.9	LOS D	18.7	131.9	1.00	0.95	14.8
North: Darby St (N)													
7	L2	25	0.0	25	0.0	0.028	9.7	LOS A	0.5	3.2	0.40	0.54	32.2
8	T1	295	0.6	293	0.6	0.777	42.1	LOS C	15.3	107.8	0.89	0.83	17.1
9	R2	226	0.0	225	0.0	0.370	23.8	LOS B	7.8	54.9	0.74	0.74	13.4
Approach		546	0.3	544 N1	0.3	0.777	33.0	LOS C	15.3	107.8	0.80	0.78	16.6
West: King St (W)													
10	L2	52	2.7	52	2.7	0.533	32.1	LOS C	18.3	130.0	0.81	0.72	19.2
11	T1	481	1.5	481	1.5	0.741	33.9	LOS C	18.3	130.0	0.85	0.82	23.3
12	R2	183	0.0	183	0.0	0.741	53.9	LOS D	15.8	111.4	0.99	1.11	18.7
Approach		716	1.2	716	1.2	0.741	38.9	LOS C	18.3	130.0	0.88	0.89	21.8
All Vehicles		2511	0.7	2508 N1	0.7	0.788	34.8	LOS C	18.7	131.9	0.83	0.82	19.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 30.7 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P5	SouthEast Full Crossing	49	0.5	LOS A	0.0	0.0	0.13	0.13
P2	East Full Crossing	24	37.6	LOS D	0.1	0.1	0.79	0.79
P3	North Full Crossing	16	49.5	LOS E	0.0	0.0	0.91	0.91
P4	West Full Crossing	35	37.7	LOS D	0.1	0.1	0.79	0.79
All Pedestrians		124	24.4	LOS C			0.54	0.54

A4 2028 PM with Proposed Rezoning

MOVEMENT SUMMARY

Site: 3 [Hunter]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Stewart Avenue
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stuart Avenue South													
1	L2	98	0.0	95	0.0	0.098	25.7	LOS B	3.9	27.5	0.76	0.75	24.9
2	T1	967	0.7	942	0.8	0.293	16.8	LOS B	12.9	91.0	0.68	0.59	24.3
Approach		1065	0.7	1038 N1	0.7	0.293	17.6	LOS B	12.9	91.0	0.69	0.61	24.4
East: Hunter Street East													
4	L2	99	1.7	98	1.8	0.461	42.9	LOS D	10.5	76.5	0.93	0.81	15.5
5	T1	389	7.0	384	7.1	0.461	36.5	LOS C	13.8	102.8	0.91	0.78	22.7
6	R2	262	0.4	258	0.4	0.925	77.2	LOS F	18.2	127.8	1.00	1.05	9.6
Approach		751	4.0	740 N1	4.0	0.925	51.5	LOS D	18.2	127.8	0.95	0.88	16.0
North: Stewart Avenue North													
7	L2	205	0.5	201	0.5	0.143	8.1	LOS A	2.9	20.3	0.27	0.64	22.5
8	T1	1319	0.5	1289	0.5	0.904	42.0	LOS C	15.3	107.7	0.91	0.99	6.6
Approach		1524	0.5	1490 N1	0.5	0.904	37.4	LOS C	15.3	107.7	0.82	0.94	7.3
West: Hunter Street West													
10	L2	165	2.1	165	2.1	0.908	75.1	LOS F	11.0	78.2	1.00	0.96	6.6
11	T1	434	5.1	434	5.1	0.919	70.5	LOS E	14.5	106.2	1.00	1.02	7.2
Approach		599	4.2	599	4.2	0.919	71.8	LOS F	14.5	106.2	1.00	1.00	7.0
All Vehicles		3939	1.8	3866 N1	1.8	0.925	40.1	LOS C	18.2	127.8	0.84	0.85	12.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 13.3 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	38	39.3	LOS D	0.1	0.1	0.81	0.81
P2	East Full Crossing	84	18.2	LOS B	0.2	0.2	0.55	0.55
P3	North Full Crossing	67	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	76	17.7	LOS B	0.1	0.1	0.54	0.54
All Pedestrians		265	30.2	LOS D			0.69	0.69

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 4 [Parry]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Stewart Avenue with King Street and Parry Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stuart Avenue (S)													
1	L2	57	0.0	57	0.0	0.067	13.9	LOS A	0.8	5.7	0.26	0.63	41.5
2	T1	628	1.1	628	1.1	0.526	25.9	LOS B	12.2	86.5	0.71	0.61	33.1
3	R2	325	1.1	325	1.1	0.883	65.9	LOS E	10.2	72.4	1.00	0.91	19.4
Approach		1011	1.1	1011	1.1	0.883	38.1	LOS C	12.2	86.5	0.78	0.71	27.3
East: King Street													
4	L2	442	1.3	410	1.4	0.760	20.4	LOS B	20.8	147.7	0.67	0.82	42.4
5	T1	1311	1.3	1217	1.4	0.760	25.8	LOS B	24.8	175.9	0.58	0.60	26.2
6	R2	381	0.0	353	0.0	0.878	75.1	LOS F	11.3	79.1	1.00	0.90	9.7
Approach		2134	1.1	1980 N1	1.2	0.878	33.5	LOS C	24.8	175.9	0.68	0.70	25.3
North: Stuart Avenue (N)													
7	L2	106	2.3	105	2.3	0.921	61.8	LOS E	35.9	253.3	1.00	1.04	10.3
8	T1	954	0.6	939	0.6	0.921	48.7	LOS D	35.9	253.3	0.96	0.99	27.6
9	R2	281	1.1	277	1.1	0.751	61.1	LOS E	8.2	57.7	1.00	0.84	13.1
Approach		1341	0.9	1321 N1	0.9	0.921	52.4	LOS D	35.9	253.3	0.97	0.96	23.7
West: Parry Street													
10	L2	55	0.0	55	0.0	0.044	5.9	LOS A	0.1	0.4	0.02	0.55	33.4
11	T1	966	0.5	966	0.5	0.920	42.4	LOS C	31.2	219.4	0.97	0.98	9.1
12	R2	325	0.4	325	0.4	0.811	61.6	LOS E	9.8	68.7	1.00	0.87	22.6
Approach		1346	0.4	1346	0.4	0.920	45.5	LOS D	31.2	219.4	0.94	0.93	14.7
All Vehicles		5832	0.9	5658 N1	0.9	0.921	41.6	LOS C	35.9	253.3	0.83	0.82	22.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 13.3 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	26	46.9	LOS E	0.1	0.1	0.88	0.88
P2	East Full Crossing	27	44.3	LOS E	0.1	0.1	0.86	0.86
P3	North Full Crossing	7	44.2	LOS E	0.0	0.0	0.86	0.86
P4	West Full Crossing	12	44.2	LOS E	0.0	0.0	0.86	0.86
All Pedestrians		73	45.2	LOS E			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 5 [Hunter Steel]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Steel Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Steel Street (S)													
1	L2	26	0.0	26	0.0	0.027	20.0	LOS B	0.7	5.1	0.52	0.64	14.7
2	T1	62	0.0	61	0.0	0.119	33.9	LOS C	3.4	24.0	0.88	0.70	10.0
3	R2	9	0.0	9	0.0	0.119	38.4	LOS C	3.4	24.0	0.88	0.70	10.0
Approach		98	0.0	96[N1]	0.0	0.119	30.6	LOS C	3.4	24.0	0.78	0.69	10.9
East: Hunter Street (E)													
4	L2	85	0.0	84	0.0	0.453	28.4	LOS B	10.8	77.8	0.62	0.59	23.3
5	T1	579	4.7	570	4.8	0.453	16.2	LOS B	10.8	77.8	0.48	0.43	28.4
6	R2	394	0.0	387	0.0	0.742	42.7	LOS D	20.3	142.1	0.94	0.86	17.0
Approach		1058	2.6	1041[N1]	2.6	0.742	27.0	LOS B	20.3	142.1	0.66	0.60	22.4
North: Steel Street (N)													
7	L2	137	0.0	137	0.0	0.100	9.1	LOS A	2.2	15.7	0.31	0.62	18.7
8	T1	99	0.0	99	0.0	0.758	40.7	LOS C	14.0	97.9	0.89	0.85	5.7
9	R2	177	0.0	177	0.0	0.758	45.0	LOS D	14.0	97.9	0.89	0.85	5.7
Approach		413	0.0	413	0.0	0.758	32.1	LOS C	14.0	97.9	0.70	0.77	7.4
West: Hunter Street (W)													
10	L2	65	0.0	65	0.0	0.742	58.7	LOS E	13.7	98.3	1.00	0.89	10.1
11	T1	401	4.0	401	4.0	0.742	54.1	LOS D	13.8	99.9	1.00	0.89	10.2
12	R2	80	0.0	80	0.0	0.458	38.6	LOS C	3.3	23.3	0.71	0.70	13.4
Approach		546	2.9	546	2.9	0.742	52.4	LOS D	13.8	99.9	0.96	0.86	10.5
All Vehicles		2115	2.1	2096[N1]	2.1	0.758	34.8	LOS C	20.3	142.1	0.75	0.71	15.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 13.3 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	71	47.8	LOS E	0.2	0.2	0.89	0.89
P2	East Full Crossing	38	33.8	LOS D	0.1	0.1	0.75	0.75
P3	North Full Crossing	21	49.5	LOS E	0.1	0.1	0.91	0.91
P4	West Full Crossing	4	33.8	LOS D	0.0	0.0	0.75	0.75
All Pedestrians		134	43.7	LOS E			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 9 [King Steel]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Steel Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Steel (S)													
1	L2	118	0.0	118	0.0	0.762	53.4	LOS D	5.1	35.9	1.00	0.92	10.9
2	T1	34	0.0	34	0.0	0.212	34.0	LOS C	3.6	25.1	0.82	0.68	14.7
3	R2	45	1.3	45	1.3	0.212	38.5	LOS C	3.6	25.1	0.82	0.68	14.7
Approach		197	0.3	197	0.3	0.762	46.7	LOS D	5.1	35.9	0.93	0.83	12.2
East: King Street (E)													
4	L2	72	0.0	62	0.0	0.061	18.0	LOS B	1.4	9.5	0.40	0.66	35.8
5	T1	1508	2.0	1314	2.2	0.768	17.3	LOS B	26.0	185.4	0.66	0.60	31.8
6	R2	12	0.0	10	0.0	0.041	24.5	LOS B	0.3	2.0	0.83	0.68	26.5
Approach		1592	1.9	1386[N1]	2.1	0.768	17.4	LOS B	26.0	185.4	0.65	0.60	32.0
North: Steel Street (N)													
7	L2	24	2.1	24	2.1	0.754	55.9	LOS D	14.4	100.9	0.93	0.91	6.8
8	T1	42	0.0	42	0.0	0.754	51.4	LOS D	14.4	100.9	0.93	0.91	14.4
9	R2	214	0.0	213	0.0	0.754	56.0	LOS D	14.4	100.9	0.93	0.91	6.8
Approach		280	0.2	279[N1]	0.2	0.754	55.3	LOS D	14.4	100.9	0.93	0.91	8.1
West: King Street (W)													
10	L2	31	1.9	31	1.9	0.036	25.2	LOS B	1.1	7.7	0.64	0.69	22.7
11	T1	1074	1.2	1073	1.2	0.767	29.6	LOS C	32.5	230.2	0.90	0.81	20.5
12	R2	178	0.0	178	0.0	0.788	34.1	LOS C	6.0	42.0	0.93	0.88	25.1
Approach		1282	1.1	1282	1.1	0.788	30.1	LOS C	32.5	230.2	0.90	0.82	21.4
All Vehicles		3351	1.3	3143[N1]	1.4	0.788	27.8	LOS B	32.5	230.2	0.79	0.73	22.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 13.3 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	34	22.8	LOS C	0.1	0.1	0.62	0.62
P2	East Full Crossing	83	50.6	LOS E	0.3	0.3	0.92	0.92
P3	North Full Crossing	8	20.4	LOS C	0.0	0.0	0.58	0.58
P4	West Full Crossing	54	40.1	LOS E	0.1	0.1	0.82	0.82
All Pedestrians		179	40.8	LOS E			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 10 [Hunter Union]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Union
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Union Street													
1	L2	258	0.5	241	0.6	0.521	33.9	LOS C	9.9	69.9	0.74	0.76	6.9
3	R2	219	8.5	205	8.8	0.455	46.3	LOS D	10.9	81.9	0.95	0.82	5.4
Approach		477	4.2	447[N1]	4.4	0.521	39.6	LOS C	10.9	81.9	0.84	0.79	6.1
East: Hunter Street (E)													
4	L2	71	6.1	71	6.1	0.154	29.3	LOS C	2.8	20.9	0.72	0.73	11.1
5	T1	806	4.3	806	4.3	0.536	29.1	LOS C	19.3	140.0	0.85	0.74	11.2
Approach		877	4.4	877	4.4	0.536	29.1	LOS C	19.3	140.0	0.84	0.74	11.2
West: Hunter Street (W)													
11	T1	349	5.3	349	5.3	0.296	5.3	LOS A	4.2	31.0	0.23	0.20	40.3
12	R2	212	0.0	212	0.0	0.437	21.0	LOS B	6.7	46.6	0.58	0.72	25.6
Approach		561	3.3	561	3.3	0.437	11.2	LOS A	6.7	46.6	0.36	0.40	33.2
All Vehicles		1915	4.0	1884[N1]	4.1	0.536	26.3	LOS B	19.3	140.0	0.70	0.65	15.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 13.3 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	5	8.1	LOS A	0.0	0.0	0.37	0.37
P2	East Full Crossing	32	40.9	LOS E	0.1	0.1	0.83	0.83
P4	West Full Crossing	42	40.9	LOS E	0.1	0.1	0.83	0.83
All Pedestrians		79	38.7	LOS D			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: 1 [King Union]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Union Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Union Street (S)													
1	L2	278	0.0	278	0.0	1.196	235.6	LOS F	55.6	390.4	1.00	1.74	6.9
2	T1	167	1.2	167	1.2	1.196	231.0	LOS F	55.6	390.4	1.00	1.74	6.9
3	R2	76	0.0	76	0.0	0.178	43.5	LOS D	3.7	25.7	0.84	0.71	23.1
Approach		521	0.4	521	0.4	1.196	206.2	LOS F	55.6	390.4	0.98	1.59	7.7
East: King Street (E)													
4	L2	125	1.5	122	1.6	0.128	21.4	LOS B	3.6	25.7	0.55	0.71	38.7
5	T1	1078	0.4	1049	0.4	1.142	210.2	LOS F	66.1	464.4	1.00	1.79	5.5
6	R2	137	0.0	133	0.0	0.517	52.3	LOS D	7.1	49.9	0.94	0.81	17.2
Approach		1340	0.4	1304[N1]	0.5	1.142	176.4	LOS F	66.1	464.4	0.95	1.59	7.1
North: Union Street (N)													
7	L2	54	0.0	54	0.0	0.863	42.8	LOS D	12.1	85.0	0.95	0.85	6.4
8	T1	162	0.7	162	0.7	0.863	38.5	LOS C	12.1	85.0	0.95	0.85	25.7
9	R2	59	7.3	59	7.3	0.300	57.1	LOS E	3.3	24.4	0.95	0.72	4.7
Approach		275	2.0	275	2.0	0.863	43.4	LOS D	12.1	85.0	0.95	0.82	19.2
West: King Street (W)													
10	L2	180	5.3	180	5.3	0.363	35.7	LOS C	8.1	59.2	1.00	0.82	21.3
11	T1	685	0.8	685	0.8	0.762	55.6	LOS D	23.9	168.2	1.00	0.88	15.6
12	R2	438	0.0	438	0.0	1.132	168.5	LOS F	48.6	339.9	1.00	1.27	13.2
Approach		1303	1.2	1303	1.2	1.132	90.8	LOS F	48.6	339.9	1.00	1.00	14.5
All Vehicles		3439	0.8	3403[N1]	0.8	1.196	137.4	LOS F	66.1	464.4	0.97	1.30	9.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 13.3 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	31	36.9	LOS D	0.1	0.1	0.78	0.78
P2	East Full Crossing	17	54.2	LOS E	0.1	0.1	0.95	0.95
P3	North Full Crossing	22	39.2	LOS D	0.1	0.1	0.81	0.81
P41	West Stage 1	53	32.4	LOS D	0.1	0.1	0.90	0.90
P42	West Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		175	42.7	LOS E			0.89	0.89

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 16 [Hunter Darby]

Network: 1 [Stewart Avenue and Hannell]

Intersection of Hunter Street and Darby Street
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Darby Street													
1	L2	75	0.5	75	0.5	0.112	27.4	LOS B	2.7	19.1	0.66	0.68	12.3
3	R2	123	5.5	123	5.5	0.551	58.3	LOS E	7.0	51.3	0.99	0.79	19.3
Approach		198	3.6	198	3.6	0.551	46.6	LOS D	7.0	51.3	0.86	0.75	17.9
East: Hunter Street (E)													
4	L2	271	0.8	271	0.8	0.354	28.2	LOS B	10.4	73.2	0.71	0.76	25.7
5	T1	646	4.9	646	4.9	0.987	78.8	LOS F	50.5	365.5	0.90	1.20	13.8
Approach		917	3.7	917	3.7	0.987	63.9	LOS E	50.5	365.5	0.84	1.07	15.9
West: Hunter Street (W)													
11	T1	314	11.4	311	11.5	0.219	3.4	LOS A	3.3	24.7	0.20	0.18	46.1
12	R2	303	0.0	300	0.0	0.889	61.3	LOS E	18.0	125.9	0.94	0.94	7.7
Approach		617	5.8	611 N1	5.8	0.889	31.8	LOS C	18.0	125.9	0.56	0.55	22.4
All Vehicles		1732	4.4	1726 N1	4.4	0.987	50.6	LOS D	50.5	365.5	0.75	0.85	17.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 13.3 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	20.5	LOS C	0.1	0.1	0.58	0.58
P2	East Full Crossing	38	54.2	LOS E	0.1	0.1	0.95	0.95
P4	West Full Crossing	80	54.3	LOS E	0.3	0.3	0.95	0.95
All Pedestrians		184	42.1	LOS E			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: 13 [King Darby]

Network: 1 [Stewart Avenue and Hannell]

Intersection of King Street and Darby
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Darby St (S)													
1	L2	365	0.0	365	0.0	0.675	11.6	LOS A	10.0	70.3	0.63	0.72	25.7
2	T1	147	1.9	147	1.9	0.262	34.9	LOS C	6.6	46.9	0.81	0.66	14.8
3	R2	145	0.0	145	0.0	0.314	25.2	LOS B	4.9	34.3	0.81	0.75	24.9
Approach		658	0.4	658	0.4	0.675	19.8	LOS B	10.0	70.3	0.71	0.71	22.5
SouthEast: RoadName													
21b	L3	1	0.0	1	0.0	0.001	10.6	LOS A	0.0	0.1	0.33	0.54	32.0
Approach		1	0.0	1	0.0	0.001	10.6	LOS A	0.0	0.1	0.33	0.54	32.0
East: King St (E)													
4	L2	179	0.0	179	0.0	0.823	49.7	LOS D	15.5	109.2	1.00	1.01	18.7
5	T1	464	1.1	464	1.1	0.823	51.4	LOS D	21.6	152.6	1.00	0.97	12.4
Approach		643	0.8	643	0.8	0.823	50.9	LOS D	21.6	152.6	1.00	0.98	14.4
North: Darby St (N)													
7	L2	27	0.0	27	0.0	0.032	11.1	LOS A	0.6	3.9	0.43	0.56	31.1
8	T1	312	0.6	310	0.6	0.833	46.9	LOS D	17.3	121.8	0.90	0.90	16.0
9	R2	226	0.0	225	0.0	0.389	24.6	LOS B	8.0	55.9	0.76	0.75	13.1
Approach		565	0.3	562 N1	0.3	0.833	36.3	LOS C	17.3	121.8	0.82	0.82	15.9
West: King St (W)													
10	L2	52	2.7	52	2.7	0.570	32.0	LOS C	20.2	143.5	0.82	0.73	19.2
11	T1	494	1.5	494	1.5	0.792	33.5	LOS C	20.2	143.5	0.85	0.81	23.4
12	R2	203	0.0	203	0.0	0.792	58.9	LOS E	16.3	114.2	1.00	1.16	17.8
Approach		748	1.2	748	1.2	0.792	40.3	LOS C	20.2	143.5	0.89	0.90	21.4
All Vehicles		2616	0.7	2613 N1	0.7	0.833	36.9	LOS C	21.6	152.6	0.86	0.86	18.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Network Model Accuracy Level (largest change in degree of saturation for any lane): 13.3 %
Number of Iterations: 20 (maximum specified: 20)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P5	SouthEast Full Crossing	49	0.5	LOS A	0.0	0.0	0.13	0.13
P2	East Full Crossing	24	37.6	LOS D	0.1	0.1	0.79	0.79
P3	North Full Crossing	16	50.4	LOS E	0.0	0.0	0.92	0.92
P4	West Full Crossing	35	37.7	LOS D	0.1	0.1	0.79	0.79
All Pedestrians		124	24.5	LOS C			0.55	0.55

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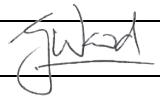
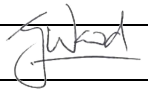
Level 3 GHD Tower 24 Honeysuckle Drive Newcastle NSW 2300
PO Box 5403 Hunter Region Mail Centre NSW 2310
T: (02) 4979 9999 F: (02) 4979 9988 E: ntlmail@ghd.com

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Attachment J - Social Impact Assessment

By Elton Consulting, dated 8 March 2017



Newcastle Urban Transformation and Transport Program – Rezoning of Surplus Rail Corridor Lands: Social Impact Assessment

Client:
UrbanGrowth NSW

Date:
8 March 2017

Final report

Contact:
Jenny Vozoff
jenny@elton.com.au
02 9387 2600

Sydney
02 9387 2600

Level 6
332 – 342 Oxford Street
Bondi Junction NSW 2022

www.elton.com.au
consulting@elton.com.au
Sydney | Canberra | Darwin
ABN 56 003 853 101

Prepared by	Jenny Vozoff and Erin Alexandre
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Executive Summary

UrbanGrowth NSW (UGNSW) is seeking an amendment to Newcastle Local Environmental Plan 2012 (NLEP) to enable the delivery of an urban renewal vision for Newcastle city centre.

This Social Impact Assessment (SIA) has been prepared to support the amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor land ('rail corridor land') between Worth Place and Watt Street in Newcastle city centre (Figure 1). It aims to contribute to positive social outcomes of the Urban Renewal Concept Plan prepared by HASSELL Architects on behalf of UGNSW.

This SIA considers the social and social infrastructure impacts of the land uses proposed in the Urban Renewal Concept Plan for the rail corridor, in terms of the impacts on, and implications for, stakeholder groups within the Newcastle community.

Specific issues examined within this SIA include:

» What will be the social impacts and benefits of the proposed rezoning of the rail corridor and how will it contribute to meeting social objectives

» How proposed land uses within the rezoning area will impact on demand for social infrastructure within the urban renewal area.

This study was undertaken in accordance with the *Social Impact Assessment Policy for Development Applications* (City of Newcastle, November 1999). Social impacts are assessed according to the impact categories listed in the policy's Social and Economic Effects Matrix.

Newcastle City Council and NSW government social planning policies and strategies provide context to the consideration of social issues and impacts, as does an analysis of community characteristics and existing social infrastructure within and near Newcastle's city centre. The assessment also examines outcomes and feedback from community consultations undertaken by Newcastle City Council and UrbanGrowth NSW for a range of recent projects and planning initiatives relevant to this proposal.

The rezoning proposal would support mixed use development, providing dwellings in a range of sizes and price ranges. The anticipated yield provides for between 400 and 500 new dwellings, mostly one and two bedroom apartments and a sizeable number of studio apartments. In total, this proposal would result in an estimated 640-800 new residents.

The size and composition of this new community are not expected to differ significantly from existing residents in the Newcastle city centre, given the relatively young and affluent population in the area at present.

The main benefits of the proposed rezoning for the local community, wider Newcastle community, business and visitors are expected to be:

» Provision of a range of dwelling styles, mixed uses (retail, office and business) and open spaces to revitalise this important city area

» A diversity in dwelling prices, including 5% affordable housing, that will appeal to a broad cross-section of households

» Improvements to the public domain, including access to the Harbour area from the city and surrounding streets, new areas of open space and new pedestrian and cycling linkages, with the potential for community health benefits

» Stimulation and revitalisation of local economic activity, during the day, evening, night-time and weekends

» Preservation and enhancement of unique and valued heritage

» New community uses and activities around the Newcastle Station precinct.

However, the analysis has highlighted the following issues that may have the potential to create some social impacts:

» Impacts of the forecast additional population and employment levels on community services and facilities

» Community perceptions of risk, such as the potential for displacement, social exclusion and perceptions of crime and safety

» Potential for displacement as a result of property value increases

» Construction impacts.

Recommendations for additional measures over and above those incorporated into the rezoning and Urban Renewal Concept Plans that would minimise or manage these potential impacts include:

» Continuing discussions and liaison with social infrastructure providers (particularly the City of Newcastle Council, Department of Education and NSW Health) to ensure capacity issues, plans for future growth and service delivery can best accommodate the needs of this additional population and workforce

» Ensure clear signage to help people navigate through the city, including signage for major community destinations and heritage areas and around pedestrian, cyclist and public transport networks

» Liaison between UrbanGrowth NSW, the City of Newcastle Council and other key stakeholders to explore opportunities for programs or activities to foster community integration and interaction, such as activities and classes, further education, heritage and environmental groups or educational talks, which would be open to all local residents and employees

» Liaison with NSW Police and the City of Newcastle in relation to public safety and adherence to Crime Prevention Through Environmental Design (CPTED) principles in design

» UrbanGrowth NSW to work with the City of Newcastle Council and other interest groups to ensure at risk or vulnerable groups or individuals are identified and targeted as part of the stakeholder engagement strategy, so that any unintended consequences of the renewal can be addressed

» UrbanGrowth NSW continues to implement its communications and community engagement strategy as further planning for the Urban Renewal Concept Plan and implementation occurs.

1 Introduction

1.1 Study purpose

This report has been prepared to support the amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor land ('rail corridor land') between Worth Place and Watt Street in Newcastle city centre (Figure 1).

Figure 1 Rezoning study area



Source: Hassell

The Newcastle Urban Transformation and Transport Program ('Program') has been established to deliver on NSW Government's more than $500m commitment to revitalise the city centre through: the truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange; the provision of a new light rail line from Wickham to the Beach; and the delivery of a package of urban transformation initiatives.

The transformation element of the Program aims to bring people back to the city centre by strengthening connections between the city and the waterfront, creating employment opportunities, providing more public space and amenity, and delivering better transport.

The proposed rezoning of the rail corridor land forms a part of the delivery of urban transformation initiatives, comprising a package of transport, built form and public domain improvements. The proposed rezoning is described in detail in Section 3.

1.2 Purpose of this report

This SIA considers the social and social infrastructure impacts of the land uses proposed in the Urban Renewal Concept Plan for the rail corridor, in terms of the impacts on, and implications for, stakeholder groups within the Newcastle community. For the purpose of this report, social infrastructure includes community facilities, open space and recreation facilities, and health and education facilities and services.

In particular, this SIA examines:

» What will be the social impacts and benefits of the proposed rezoning of the rail corridor and how will it contribute to meeting the social objectives identified for Newcastle city centre (as identified in the primary strategic policy for this locality, the Newcastle Urban Renewal Strategy - NURS). In particular, the SIA considers the potential impacts and benefits with regard to the needs that the rezoning is intended to address, its suitability in relation to identified needs and uses, activation of the spaces, location, accessibility and connectivity, safety considerations and contributions to the urban domain and city centre

» How proposed land uses within the rezoning area will impact on demand for social infrastructure within the urban renewal area.

The Urban Renewal Concept Plan identifies three key precincts for Newcastle's city centre renewal: West, Civic and East. For example, Civic Precinct has been identified as the centre for civic, cultural, legal and educational facilities required to meet the needs generated by forecast population and employment growth. This SIA also considers how the land uses proposed along the disused rail corridor, and within each precinct, might impact on the proposed facilities, including issues of access and connectivity and the sections of the population that will benefit from the proposals. It also makes recommendations for measures to enhance the social benefits of the proposals.

1.3 Newcastle Council Social Impact Assessment Guidelines

This study has been undertaken in accordance with the *Social Impact Assessment Policy for Development Applications* (City of Newcastle, November 1999). Although quite dated now, the Policy and associated *Guidance Notes* set out Council's expectations and requirements for social impact assessments within the Newcastle Local Government Area (LGA). The social impacts of the proposed rezoning are assessed according to the impact categories listed in the policy's Social and Economic Effects Matrix.

1.4 Assessment process

This SIA has been prepared on the basis of information available in February 2017. The assessment process has included:

» Analysis of documentation describing the proposed rezoning and Rezoning Concept Plan, prepared by HASSELL Architects

» Examination of maps and plans

» Review of Newcastle City Council documents and plans

» Discussions with representatives from the City of Newcastle

» Review of Australian Bureau of Statistics Census data for 2011

» Consideration of outcomes of the Revitalising Newcastle community engagement process

» Desktop research.

2 Policy and planning context

2.1 Policy Context

Key policy documents which set the context for the SIA are described briefly below:

Newcastle Urban Renewal Strategy (NURS) and 2014 Update

The Newcastle Urban Renewal Strategy (NURS) sets out the NSW Government's long term approach and vision for the revitalisation of Newcastle city centre to the year 2036.

The NURS identifies three character precincts in Newcastle city centre (West End, Civic and East End), within which significant housing and employment opportunities, together with built form and public domain changes and improvements exist. The NURS describes these precincts as:

- East End: residential, retail, leisure and entertainment
- Civic: the government, business and cultural hub of the city
- West End: the proposed future business district including the western end of Honeysuckle (Cottage Creek)

UrbanGrowth NSW has been directed by NSW Government to deliver on NURS through the Program, in partnership with Transport for NSW (TfNSW), the Hunter Development Corporation (HDC) and the City of Newcastle Council (Council).

This SIA considers the impacts of the proposed rezoning against the objectives and principles which underpin the NURS. It is noted, however, that the NURS pre-dates the Transport for NSW announcement about the truncation of heavy rail at Wickham and the light rail project.

Urban Growth NSW's Sustainability Report 2013

UrbanGrowth NSW aims to create connected, socially viable and vibrant places. This means minimising relative inequalities, supporting diversity and promoting access to opportunities.

The approach to social sustainability is based on the internationally recognised 'social determinants of health' and their application to land use. A key objective is to ensure that new development minimises inequality and does not have a negative social impact on existing and future communities. Socially sustainable developments are considered to be those which:

- Provide opportunity for mixed communities with diversity in housing and land use. Mixed communities ensure effective use of existing housing and infrastructure, support local economic development, and provide for different life-stage groups.
- Provide homes that will enable ageing in place. This will enable people to remain in their existing area as they get older, maintaining established networks and effectively using the housing and infrastructure provided.
- Provide homes for moderate income households. Access to affordable housing is essential to overall social well-being and UrbanGrowth NSW is committed to this objective.
- Integrate socially, culturally and physically with the existing community. Inclusive development promotes social and cultural harmony while providing improved access to existing services, infrastructure and community networks.

» Ensure access between new and existing areas. This allows access to existing services and infrastructure while supporting healthy/active lifestyles and sustainable transport options.

» Contribute towards community infrastructure which addresses community needs. These needs include lifelong learning, community health, transport, food, employment, information/technology, community safety, public art and social support services.

» Benefit the existing community members as well as the new. This ensures sustainability through the better use and coordination of existing and future resources.

Hunter Regional Plan 2016 - 2036

The *Hunter Regional Plan* is a 20-year plan for the Upper and Lower Hunter and the Great Lakes region. The Plan has been developed after considering community and stakeholder consultation conducted around a discussion paper (Lower Hunter) released in 2014 and a draft plan released in 2015. The Plan outlines key directions associated with the following four goals:

» a leading regional economy in Australia

» a biodiversity-rich natural environment

» thriving communities

» greater housing choice and jobs

Relevant directions and associated actions include:

» Grow Greater Newcastle as Australia's next metropolitan city

  > Focus development to create compact communities that allow 95 per cent of people to live within 30 minutes of a strategic centre.

» Revitalise Newcastle City Centre

  > Promote the growth and renewal of Newcastle City Centre through local strategies and controls.

  > Develop local housing strategies for student and visitor accommodation and social and affordable housing.

  > Focus investment in developing infrastructure to alleviate pinch points, delivering large-scale renewal projects including site amalgamation and remediation; enhance the public domain and relevant services to make it easier to get around the city centre, recognising Wickham as the public transport gateway into the centre; and lead by example and partner with other organisations to deliver landmark infrastructure projects

» Create healthy built environments through good design

  > Enhance the quality of neighbourhoods by integrating recreational walking and cycling networks into the design of new communities to encourage physical activity

» Enhance access to recreational facilities and connect open spaces

» Revitalise existing communities

  > Identify opportunities for urban redevelopment or renewal in urban locations with access to public transport and services in the Greater Newcastle metropolitan area and where there may no longer be a need for employment land

  > Promote new housing opportunities in urban areas to maximise the use of existing infrastructure

» Promote housing diversity

» Grow centres and renewal corridors

  > Concentrate growth in strategic centres, local centres and urban renewal corridors to support economic and population growth and a mix of uses

  > Consider improvements to the public transport network when planning new renewal corridors and precincts.

Newcastle 2030: Newcastle Community Strategic Plan

The *Newcastle 2030 Community Strategic Plan* (the Strategic Plan) was developed through a process of intensive community engagement undertaken in 2009-2011. The consultation identified the needs, aspirations and priorities of the Newcastle community. The Strategic Plan identifies seven strategic directions, six of which are relevant to social planning for the site within Newcastle:

» Connected city

» Liveable and distinctive built environment

» Vibrant and activated public places

» Caring and inclusive community

» Smart and innovative city

» A protected and enhanced environment.

Key issues identified in the Strategic Plan were:

» A growing and ageing population (largest proportional increases to be among residents aged 70-74 and 20-34)

» Environmental challenges

» Urban renewal to meet housing and employment needs

» Revitalising the city centre including increased pedestrian connectivity, vibrant public spaces and key commercial and tourism initiatives.

Newcastle Community Assets and Open Space Policy

The Community Assets and Open Space Policy (Newcastle City Council, 2012) acknowledges that the community has expressed a strong need for a network of vibrant and activated places and spaces across the LGA.

Its Guiding Principles are:

» Accessibility and connectedness

» Equity and opportunity

» Safety and security

» Sense of place and well-being.

Relevant community asset and open space outcomes include to:

» Encourage social connections, community participation and promote health and well being

» Create multi-purpose, functional, safe and innovative places and spaces that are equitably distributed across the local government area

» Create diverse places and spaces that accommodate a range of uses that are responsive to changing trends, aspirations and community needs

» Promote co-location of community assets and open space to maximise the opportunity for long-term community connections and economies of scale.

Newcastle Disability Access and Inclusion Plan 2016 - 2019

The Newcastle City Council's Disability Access and Inclusion Plan is a four year framework outlining the key strategies and action areas to be delivered by Council in its commitment to disability access and inclusion within the Newcastle LGA.

Relevant strategies and actions outlined in this Plan include:

- Contribute towards liveable and accessible public places
  - Implement a strategic approach to include community input at concept design stage on identified projects in public places
  - Advocate for access and inclusion to be a guiding principle in relevant public domain masterplans
- Advocate for improved access and inclusion outcomes in 'whole of government' policy settings
  - Advocate for access and inclusion to be a guiding principle for Newcastle City Centre urban renewal project
  - Work with UrbanGrowth to ensure improved outcomes for people with a disability within Newcastle City Centre
  - Continue to advocate for the delivery of accessible and affordable housing in the Newcastle local government area
  - Continue to advocate for universal housing design in the delivery of new housing stock
  - Collaborate with Transport for NSW for improved transport equity within the Newcastle local government area.

Newcastle Community Engagement Policy

The City of Newcastle Community Engagement Policy (Newcastle City Council, 2013) is to be used as a reference for the delivery of all community engagement, designed to supplement and support statutory responsibilities and is supported by the Community Engagement Framework which identifies engagement practices and relevant tools and structures Council will utilise to ensure effective engagement.

Principles outlined in the Community Engagement Policy:

- Be accessible and inclusive
- Actively seek input into Council's decision making
- Be open and transparent
- Council recognises and abides the practices developed by the International Association for Public Participation.

Newcastle City Council Cultural Strategy 2016 - 2019

The Cultural Strategy 2016-2019 is a four year framework detailing the priorities for Council's investment in arts and culture in Newcastle. Relevant strategies and actions outlined in this Strategy include:

- Enhance Newcastle's public space through public art
  - Re-establish a public art program based on Council's endorsed policy
- Advocate to UrbanGrowth for the inclusion of an arts space in their development plans for the city

- > Explore opportunity for a contemporary arts space to be included in city revitalisation plans addressing need for housing for small to medium sector, rehearsal space and presentation of contemporary work.

City of Newcastle Social Strategy 2016-2019

The City of Newcastle Social Strategy is a four year framework outlining key priorities and actions to be delivered by Council in its commitment to investing in, promoting and delivering community development outcomes in Newcastle. Relevant initiatives outlined in this Strategy include:

- » Develop public art throughout our urban centres that highlights the creativity and stories of Newcastle
- » Promote the benefits of public transport, walking and cycling
- » Increase opportunities for active and passive recreational use of the city's parks, inland pools and Blackbutt Reserve through the provision of attractive, safe and accessible spaces and amenities
- » Provide welcoming facilities and open space that provide for a range of ages and combination of uses and can easily be adapted to suit the changing needs of our community
- » Support the renewal of the city centre and the strengthening of other commercial and urban centres.

Newcastle Transport Strategy (2016)

The Newcastle Transport Strategy provides direction to guide Council's actions and decision making on transport matters in order to contribute to the community's vision for a 'connected city'.

Relevant strategies outlined in the document include:

- » Develop a network of safe, linked cycle and pedestrian paths integrated with key destinations and green space
- » Plan for cyclists and pedestrians in planning for new developments
- » Manage and plan our transport networks to maximise accessibility
- » Enhance transport links to and within Newcastle
- » Consider the need for all modes of transport in planning for new development and infrastructure networks

Safe Newcastle – Alcohol Management Strategy for the City of Newcastle 2010-2013

This document outlines a strategy that seeks to reduce alcohol-related harm and anti-social activities in the Newcastle Local Government Area. Objectives of the Strategy that are relevant to this study include:

- » Create a safe enjoyable evening environment
- » Ensure the LGA entertainment areas are safe and inviting
- » Restore public perception of a safe city.

The Strategy recommends a number infrastructure and transportation measures to address some of the contributing factors related to alcohol-related harm and anti-social behaviour in the LGA. Relevant recommendations include:

- » Effectively apply the principles of CPTED to all licensed premises' development applications
- » Revise late night public toilet options

» Implement a street lighting improvement plan

» Identify and create clearly identified safe pedestrian routes within the City and include the following features - improved lighting, transport routes, good surveillance and ensure police presence

» Advocate for improvement and assist in the implementation of bus and rail transport options, including: secure bus shuttle service; and buses schedule to reflect licensed premises closing time

» Advocate for improvement in taxi transport options, including: secure taxis ranks; additional taxi services particularly on Wednesday, Friday and Saturday nights; and support implementation of appropriate infrastructure (such as guard rails)

This Strategy is currently being revised and updated by the City of Newcastle.

3 The Proposal

3.1 Proposed rezoning

UrbanGrowth NSW seeks to amend the Newcastle Local Environmental Plan 2012 (NLEP) to enable the delivery of the Program and the objectives of NURS planning outcomes.

Vision

The Program vision has been informed by feedback from the community, Council, government agencies and urban renewal experts.

> *Our vision is an activated city centre and waterfront that attracts people, new enterprises and tourism. Over time, we see great opportunities to build on the strengths of the city centre to encourage innovative and enterprising industries to thrive. In the longer term, we see an opportunity to strengthen Newcastle's position on the regional, national and international stage, with a view to stronger ties with the Asia Pacific.*
>
> *UrbanGrowth NSW, 2015*

Program objectives

The Program is underpinned by six objectives which will drive successful urban revitalisation:

1. **Bring people back to the city centre**

   Re-imagine the city centre as an enhanced destination, supported by new employment, educational and housing opportunities and public domain, that will attract people.

2. **Connect the city to its waterfront**

   Unite the city centre and the harbour to improve the experience of being in and moving around the city.

3. **Help grow new jobs in the city centre**

   Invest in initiatives that create jobs, with a focus on innovative industries, higher education and initiatives to encourage a range of businesses to the city centre.

4. **Create great places linked to new transport**

   Integrate urban transformation with new, efficient transport to activate Hunter and Scott Streets and return them to thriving main streets.

5. **Creating economically sustainable public domain and community assets**

   Leave a positive legacy for the people of Newcastle. Ensure that new public domain and community facilities can be maintained to a high standard into the future.

6. **Preserve and enhance heritage and culture**

   Respect, maintain and enhance the unique heritage and character of Newcastle city centre through the revitalisation activities.

Urban transformation proposed concept plan

Surplus rail corridor land runs through the East End and Civic city centre precincts as established by NURS.

Based on this vision and the results of extensive stakeholder and community engagement, an overall urban transformation concept plan (the concept plan) has been prepared for the surplus rail corridor (rezoning sites), as well as surrounding areas.

The concept plan considers and integrates with the delivery of light rail. It is also coordinated with the proposed Hunter Street Mall development to create an interactive, synergised and cohesive city centre and foreshore area.

The concept plan (as shown in Figure 2) includes five 'key moves', two that relate to the Civic precinct and three of which relate to the East End.

1. **Civic link (Civic)**

This area is the civic heart of Newcastle and includes some of the region's most important civic and cultural assets, including Civic Park, City Hall, Civic Theatre and Newcastle Museum. Current investment in the area includes the law courts development and the, soon to be completed, University of Newcastle NeW Space campus.

The focus of this key move is to leverage best value from new investments by creating new open space and walking and cycling connections that link Newcastle's civic buildings to the waterfront and the light rail system.

- **Civic Green.** Creating a new civic focused public space linking Hunter Street to the Newcastle Museum that will provide direct visual and physical connection from Wheeler Place to the harbour, activate light rail on Hunter Street and meet the needs of the incoming legal and student populations
- **Built form improvements.** Sensibly scaled mixed use development that forms part of the Honeysuckle development.

2. **Darby Plaza (Civic)**

Darby Street is Newcastle's premier 'eat street', offering a mix of shops, cafes, restaurants and night life. At present Darby Street ends at the intersection with Hunter Street, and this key move seeks to create a new node of activity and linkage through to the harbour that complements the delivery of light rail.

- **Darby Plaza** A new community focused public space including provision of new walking and cycling facilities from Hunter Street to the harbour.
- **Built form improvements.** Zoning of rail corridor land between Merewether Street and Argyle Street to allow for future mixed use development in conjunction with surrounding lands in the longer term.

3. **Hunter Street Revitalisation (East End)**

Hunter Street features some of Newcastle's best heritage buildings and offers a mix of shops, cafes, restaurants and other local business. Hunter Street has experienced decline in recent years, and the opportunity exists to reinstate Hunter Street as the regions premier main street that complements the delivery of light rail.

- **Built form improvements.** Sensibly scaled mixed use development consistent with the adjoining land uses to create an activated street with 'two edges', celebrate heritage and create new linkages from Hunter Street to the waterfront, provide activation around light rail stops and improve walking and cycling facilities.

4. Entertainment Precinct (East End)

This key 'move' aims to create a place where people can come to play, relax and reconnect with the harbour in a new public space stretching from Scott Street to the waterfront incorporating a new connection from Market Street to Queens Wharf. This key move will also assist to activate the area to create an exciting place for the East End.

- **Recreational opportunities.** This precinct will incorporate the adaptive re-use of the signal box and provision of recreation opportunities for all ages and abilities. Public domain will be designed to provide a thoughtful series of character areas and experiences as one traverses its length. The area will also provide opportunities for viewing and interpretation of heritage character that respect the unique qualities of place.

5. Newcastle Station (East End)

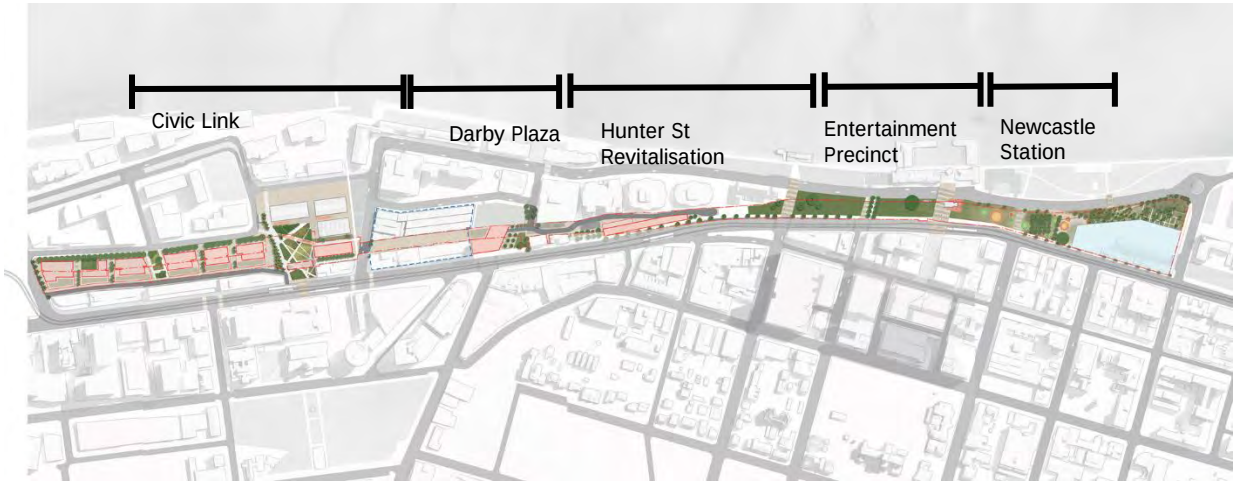
Newcastle Railway Station is proposed to be re-purposed into a hallmark destination and focal point for the new East End, accommodating enterprises and activities that attract visitors and stimulate the economy.

Refurbishment would fully respect and celebrate the heritage integrity of the Station, and could accommodate a range of different activities including community, retail, leisure and commercial uses.

Rezoning concept plan

The proposed rezoning of the surplus rail corridor lands is the focus of this report. The rezoning area is indicated in Figure 2 by a red dotted line, with the plan also indicating the general precinct areas and the indicative built form for the parcels.

Figure 2 Rezoning concept plan



Source: Hassell

Amendments to the NLEP are required to deliver part of the concept plan. The proposed amendments are on surplus rail corridor land only.

Necessary amendments to the NLEP 2012 include:

- amending the Land Use Zoning Map to introduce B4 Mixed Use, SP3 Tourism and RE1 Public Recreation zones to sites along the corridor
- amending the Height of Building and Floor Space Ratio maps to apply appropriate development standards to selected parcels of land

The approach taken to the amendments is to support the NURS planning approach and to remain consistent with surrounding planning controls in terms of zones, floor space ratio (FSR) and height.

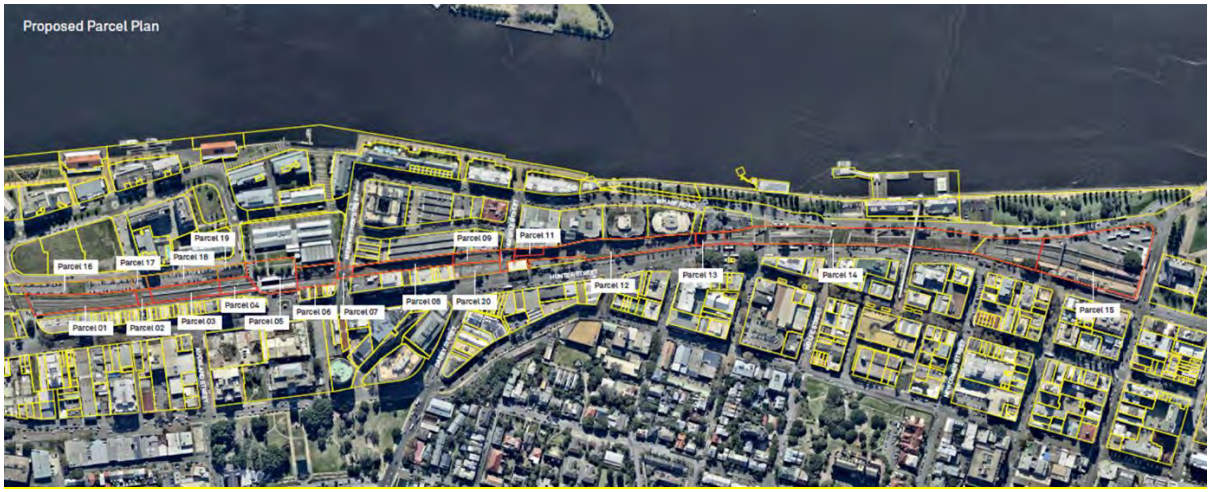
The concept plan will also form the basis for updates to the Newcastle City Centre Development Control Plan design controls to guide development and public domain works for rezoning sites.

Proposed Rezoning

This planning proposal seeks to rezone rail corridor land (rezoning sites) to enable the delivery of the proposed urban uses established in the concept plan.

The location of the land affected by the proposed rezoning is identified in the map in Figure 3.

Figure 3 Rezoning explanatory map – Parcels



Source: Hassell

The planning proposal concept plan includes public domain, entertainment, mixed use and commercial and residential development.

In general, the proposed rezoning will provide a mix of uses enabling between 400-500 dwellings which will comprise a variety of styles and types, and around 5,000m^2 of commercial, restaurant and other entertainment uses and excluding any education or associated uses. Details of the proposed rezoning sites, floor areas and dwelling yields are provided in Appendix A.

Proposed maximum building height and floor space ratio controls respect existing controls that apply to surrounding land.

3.2 Relationship to other projects

Light rail

The NSW Government has proposed light rail to Newcastle as part of a strategy to revitalise the Newcastle city centre. Light rail will travel from a new transport interchange at Wickham, through the Newcastle city centre to Pacific Park in the east.

The truncation of heavy rail services at Wickham and the building of a new interchange are the first steps in delivering an urban renewal and transport solution for Newcastle.

Transport for NSW has been working closely with UrbanGrowth NSW, Newcastle City Council and Roads and Maritime Services in planning for light rail. Light rail will help improve public transport and access, reunite the city centre with its waterfront and improve the attractiveness of public

spaces. The light rail route will travel east from the new transport interchange at Wickham along the existing rail corridor to Worth Place, before moving south to connect with Hunter Street and Scott Street before reaching Pacific Park, near the beach.

Initial geotechnical investigations have been completed and detailed design and environmental planning is well underway. Hunter Street Mall

A 15,000m^2 landholding within Newcastle's Hunter Street Mall was compiled by UrbanGrowth NSW and joint venture partners GPT Group. The site has recently been sold and the developer will commence redevelopment of the Mall sites.

The project ambitions are to:

- revitalise Hunter Street Mall
- leverage the State Government's investment in light rail
- provide an urban renewal catalyst for the East End Precinct, in support of Government's broader Urban Transformation and Transport Program.
- provide for a staged development, broadly bounded by Hunter, King, Perkins and Newcomen Streets, which will include a mixed use development comprising approximately:
  - 4,900m^2 GFA retail premises
  - 2,700m^2 GFA commercial premises
  - 47,800m^2 GFA residential uses comprising residential flat buildings and shop top housing.
- car parking with a capacity for approximately 491 vehicles to be accessed from King, Perkins, Wolfe, Thorn, Laing, Morgan and Newcomen Streets, and
- service vehicular access from Perkins, Thorn, Laing and Morgan Streets.

4 Community characteristics

4.1 Introduction

In order to consider the potential social impacts of the Planning Proposal, it is important to have a good understanding of the social profile of the area it will affect. While the proposal assessed in this SIA is for lands associated with the Rezoning Concept Plan for the Newcastle Urban Transformation and Transport Program (prepared by HASSELL Architects, 2017), the intention of the Program is to create benefits for the wider Newcastle city area. For the purposes of this SIA, the study area has therefore been defined to include both the area of the Rezoning Concept Plan and the wider Newcastle city area.

A community profile is typically based on data from the Australian Bureau of Statistics (ABS) Census of Population and Housing. The demographic profile prepared for the NURS relied on data from the 2001 and 2006 censuses for the Newcastle LGA and is now outdated. In addition, a community profile appears to have been prepared for Newcastle by the firm *Profile.id*, although it is no longer available on Council's website.

The following community profile is based on data from the ABS 2011 Census of Population and Housing. The communities that live within the boundaries of the Urban Renewal Concept Plan (HASSELL Architects, 2016) and those residents and community facilities (eg schools) most likely to be impacted directly by the rezoning are best approximated by the Newcastle – Cooks Hill SA2 ('small area 2') census geography, as shown in Figure 4 below. This area lies within Newcastle LGA.

The following sections describe the key demographic features of this locality, and compare it with the population of the wider LGA and New South Wales (NSW) as a whole.

Figure 4 SA2 Newcastle – Cooks Hill area as defined by ABS



Source:
www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/111031229?opendocument&navpos=220

4.2 Socio-economic profile

The SA2 Newcastle – Cooks Hill locality shown in Figure 4 contained around 10,135 residents at the time of the 2011 Census. Key features of this area and comparison areas are summarised in Table 1. This shows the locality has a distinctly different demographic character to that of comparison areas of Newcastle LGA and NSW as a whole. In particular, the locality has:

» A relatively young population, as evidenced by the relatively low median age of 33 years. This is despite very small proportions of babies and school aged children. The area is instead characterised by large proportions of adults of working age (18-54 years) and relatively small proportions of people aged over 65 years, compared with the LGA and NSW.

» A low proportion of family households and correspondingly, higher proportions of lone person and group households. Of the family households living in the area, more than half have no children and there are relatively few single parent families.

» Due to the small proportions of households with children and relatively high proportion of lone person households, the average household size is relatively low, at 2 persons per household.

» Around 15% of residents were born overseas, and around 10% speak a language other than English at home. This indicates the area is relatively less culturally diverse than the NSW average but consistent with Newcastle LGA.

» High proportions of residents are university students. In addition, the proportion of residents who did not finish high school is significantly less than for the LGA and NSW.

» Resident households have relatively high median incomes, and this is supported by the high proportions of residents in full time employment, and in professional positions. Hospital, education, café and food establishments and architectural, engineering or technical services are the main industries in which residents of this part of Newcastle City work. Overall, the level of relative disadvantage in the area is lower than for the LGA. Relatively few people need assistance because of a disability.

» Consistent with the inner city location, the majority of dwellings are apartments and most residents rent rather than own their home. Nevertheless, there is a notable proportion of social housing, compared with the LGA and NSW average

» A relatively high proportion of households in the area do not own a car, although most households own one or more vehicles.

Table 1 Demographic characteristics of Newcastle – Cooks Hill SA2 and comparison areas, 2011

Indicator	Newcastle – Cooks Hill (SA2)	Newcastle LGA	NSW
Population (2011)	10,135	148,535	6,917,658
Service age groups (%)			
0-4	3.9	6.1	6.6
5-11	4.4	7.8	8.8
12-17	4.1	6.5	7.7
18-24	15.4	11.5	9.0
25-54	48.4	41.6	41.4
55-64	12.2	11.2	11.7
65 and over	11.6	15.4	14.7
Median age (yrs)	33	37	38
Household type (%)			
Family households	47.8	63.8	71.9
Lone person	38.9	29.5	24.2

Indicator	Newcastle – Cooks Hill (SA2)	Newcastle LGA	NSW
Group household member	13.2	6.6	3.8
Average household size (no. people)	2.0	2.4	2.6
Family household structure (%)			
Couples with children	29.9	40.5	45.5
Couples without children	53.5	38.8	36.6
Single parent families	13.7	18.5	16.3
Cultural diversity (%)			
Aboriginal or TSI heritage	1.9	2.6	2.5
Overseas born	14.9	12.4	31.4
Speaks language other than English at home	9.5	10.1	24.5
Educational level (%)			
Attending TAFE	2.7	2.5	2.4
Attending University	12.3	7.3	4.4
Did not finish high school	34.5	53.6	50.8
Need for assistance %	**2.9**	**5.9**	**4.9**
Labour force status persons aged 15+			
Employed full-time	62.1	57.6	60.2
Employed part-time	27.4	30.8	28.2
Unemployed	5.3	5.7	5.9
Median household income	$1,452	$1,165	$1,237
Occupation (%)			
Professionals	40.3	25.7	22.7
Clerical and administrative workers	12.0	14.1	15.1
Managers	12.6	9.9	13.3
Technicians and trade workers	9.5	13.7	13.2
Sales workers	7.8	9.8	9.3
Machinery operators and drivers	2.6	5.8	9.3
Labourers	4.4	9.0	8.7
Community and personal service workers	9.6	10.5	9.5
Top industries of employment (%)			
Hospitals	6.2%	5.2%	3.2%
Tertiary Education	5.6%	3.4%	
Cafes, restaurants, take-away food	5.3%	5.0%	3.6%
Architectural, Engineering and Technical Services	4.7%	2.9%	
School education	4.5%	4.7%	4.4%
Housing types (%)			
House	19.1	73.5	69.5
Semi-detached house	25.4	12.1	10.7
Apartment	54.6	13.9	18.8
Housing tenure (%)			
Fully owned	22.4	30.9	33.2
Being purchased	20.9	31.8	33.4
Rented – total	54.3	33.9	30.1
Rented – social housing	11.1	6.0	4.4
Vehicles (%)			
No vehicle	15.1	11.4	10.4
1 vehicle	44.2	38.6	37.8
2 or more vehicles	27.0	46.5	48.6
SEIFA - Relative Disadvantage	1040	994	996

In summary, the study area (as defined by the Newcastle – Cooks Hill SA2), shows relatively low levels of disadvantage, and is comprised of relatively high proportions of younger adult singles, couples and group households, either employed in a professional capacity or attending university. Most people live in rented apartments. These characteristics contrast with the more than 10% of dwellings in the study area rented as social housing. The study area is typical of inner city locations with a high proportion of young professionals and a low proportion of children.

When Newcastle LGA is compared with NSW as a whole, Table 1 shows:

» Relatively fewer children and a relatively higher proportion of young adults aged 18-25 years

» Slightly smaller proportions of family households and slightly higher proportions of group households

» Relatively higher proportions of single parent families and relatively smaller proportions of couple families with children

» Relatively low rates of cultural diversity

» Relatively low median household incomes, consistent with relatively lower rates of full time employment and relatively higher rates of part time employment

» One quarter of employed people are in professional occupations, however there are relatively small proportions of managers and relatively high proportions of people in community and personal service jobs

» Three quarters of dwellings are detached and tenure is relatively evenly split between home owners, purchasers and renters.

4.3 Community facilities and services

Key facilities and services that are available to local residents and those who would live in the area after rezoning and subsequent development are identified and mapped within the NURS (2012), Hassell Urban Design Report (2014) and the Wickham Transport Interchange Social Impact Assessment prepared by GHD (July 2014 – accessed at http://www.transport.nsw.gov.au/projects-wickham-transport-interchange/environment 5 February 2016). These facilities are mapped in Figure 5 (overleaf).

Key features of these facilities include:

» A predominance of commercial uses in the West precinct and along Hunter Street (light blue)

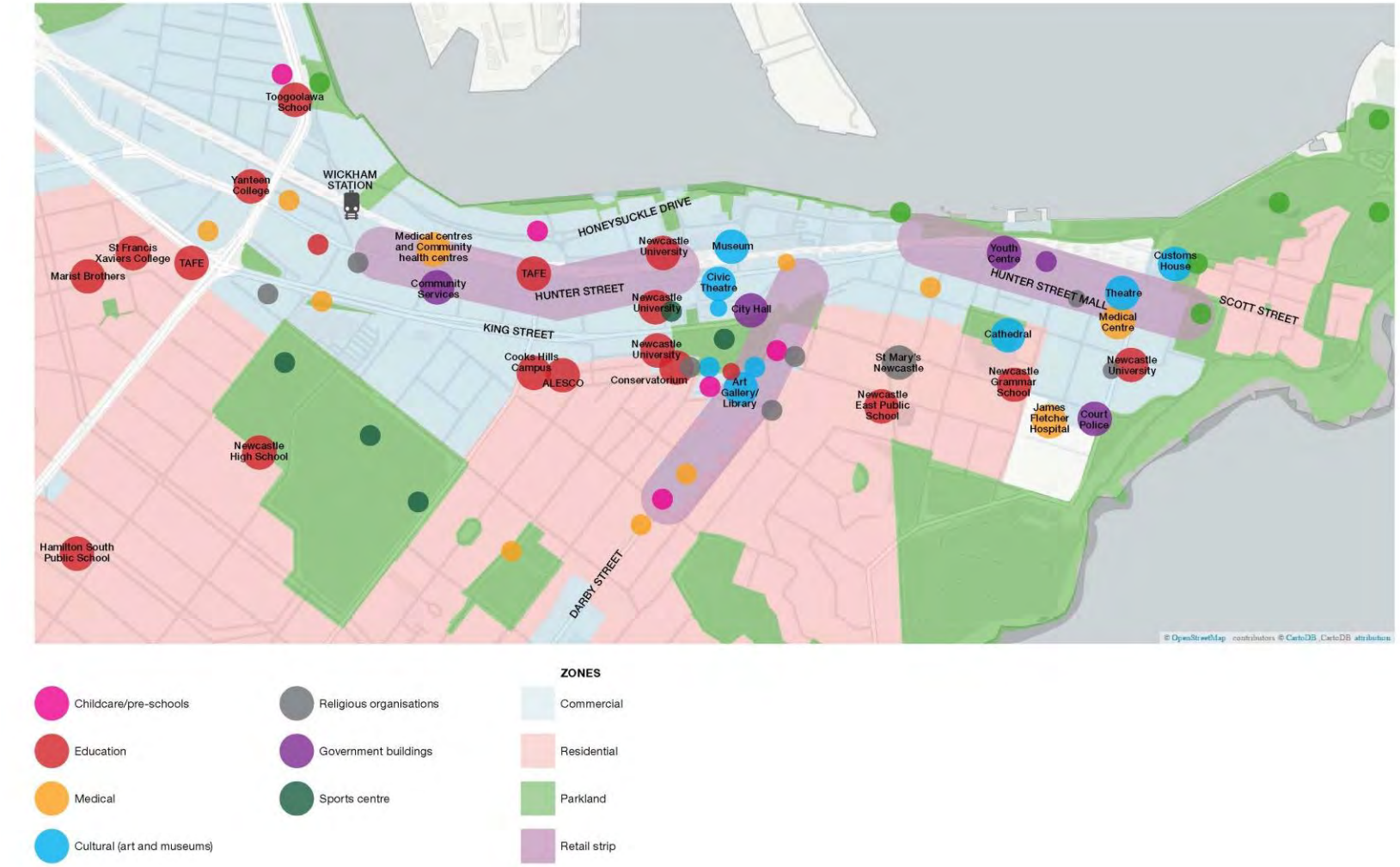
» Residential uses are clustered around the eastern end of Scott Street, and along Darby Street and Stewart Avenue (pink)

» A cluster of civic, cultural and educational buildings at Civic

» Darby and Hunter Streets are significant retail spines (purple)

» Northern part of Honeysuckle is predominantly mixed use with residential above small office and hospitality.

Figure 5 Social infrastructure near Newcastle City Centre



Source: Hassell 2014, p. 56; GHD July 2014, p. 11

4.3.1 Regional facilities

The Civic Precinct of the city centre includes several regionally significant civic and cultural facilities:

» Newcastle City Hall

» Newcastle Museum

» Newcastle Art Gallery

» Newcastle Regional Library

» Civic Theatre

» Law Courts

» Customs House (now a bar, restaurant and conference facility with heritage value).

In addition, the following regional facilities have been identified:

Tertiary educational facilities

» Hunter Street TAFE Campus

» Hunter TAFE, Hamilton Campus

» Newcastle University facilities are located in buildings across the city centre, including:

  > Conservatorium of Music, Civic Centre

  > Newcastle Legal Centre and Newcastle Graduate School of Business, in University House, Corner Auckland and King Streets, opposite Civic Park

  > Northumberland House

  > 468 Hunter Street

  > David Maddison Building

  > NeW Space (under construction).

Medical and community health facilities

» James Fletcher Hospital

» Newcastle Community Health Centre

» Family Planning NSW.

The area also includes a number of specialist allied health and medical practices.

The city centre is home to several other **community service and disability service providers**, such as The Salvation Army, Disability Infoline advocacy, the Deaf Society, Newcastle West Lake Social Club and Castle Personnel.

Places of worship

The area also includes many places of worship such as St Andrew's and St Mary's churches, Newcastle Baptist Tabernacle and Christ Church Anglican Cathedral.

Emergency services

Emergency services such as Police and Fire and Rescue are located on the city fringe.

Transport connections

The City of Newcastle is serviced by a range of public transport options, including bus, the Stockton Ferry and train:

» 30 bus routes pass through the city centre and terminate at Newcastle bus interchange at Newcastle station

» Passenger rail stations provide regular access to and from the Hunter Valley and Sydney

» The Newcastle – Stockton ferry services, run regularly between the two centres during peak periods.

Pedestrians are well catered for in and around the study area, with footpaths provided adjacent to most roadways and new connections made across the corridor since the termination of the former heavy rail line at Wickham Station. On-road bike lanes are provided on several streets in the study area, including parts of Honeysuckle Drive, King Street, and Auckland Street. Shared paths are also provided along the harbour through Honeysuckle and parallel to Wharf Road towards Nobbys Head (GHD 2015).

The Urban Renewal Concept Plan for the rail corridor and plans for the redevelopment of the Hunter Street Mall (Section 3.2) will introduce new connections and improvements to the public domain through the CBD.

Recreational and leisure activities

The Newcastle city centre is well-endowed with parks, which provide many opportunities for active or passive recreation. The main parks in the city centre are Civic Park, Cathedral Park, Pacific Park and Birdwood Park, as well as the extensive waterfront areas along the city's northern boundary, including the Queens Wharf Promenade and Foreshore Park.

In addition, National Park to the west contains the Newcastle Athletics Field and Newcastle Number 1 Sportsground which represent important sporting facilities near the city centre. Both National Park and Foreshore Park to the east provide large areas of parkland adjacent to the city centre (NURS, p. 43). The waterfront area is also home to Newcastle Ocean Baths.

As noted above, a number of regional scale cultural facilities are located in the city centre, including the Conservatorium of Music, Museum, Art Gallery, Library and Civic Theatre.

Typical of a city of Newcastle's size, the centre also offers a wide range of commercial recreational activities such as cinemas, restaurants, cafes and shops.

4.3.2 District and local facilities

Schools identified in, or in close proximity to, the city centre include:

Government schools:

» Newcastle East Public School

» Hamilton South Public School

» Newcastle High School

» ALESCO special school (9-12)

» Hamilton Public School.

Independent schools:

» St Joseph's Primary School (K-6)

» St Francis Xavier's Marist Brothers College (7-12)

» Newcastle Grammar School (K-12).

Schools nearest the city centre are shown on Figure 5.

Childcare facilities – Newcastle City Council supports 480 childcare places across the City. It leases 10 buildings to childcare providers. Within the city centre, Council directly provides services for pre-schoolers with special needs at the Beresford Childcare Centre.

The Little Unicorn, Honeysuckle is a privately operated childcare centre located within the study area.

Other childcare facilities near the study area include:

» St Andrews Church Community Pre-school

» Cooks Hill Pre-school

» Samaritans Early Learning Centre

» Brinco Childcare

» Amana Family Day Care

» Awabakal Newcastle Aboriginal Cooperative Childcare Centre

Other community facilities serving residents of the district include:

» Newcastle Senior Citizens' Centre (operated by Mercy Care).

Local **level medical and allied health services** are offered by private practitioners and include GPs and medical centres, dental, physiotherapy, skin care, cancer specialists and imaging facilities.

4.3.3 Utilisation and capacity in existing facilities

Newcastle City Council has not collected information on the overall utilisation or the level of spare capacity within its existing community facilities. Discussions with Council staff confirmed that, in addition to its flagship facilities within Civic Place, Council owns a range of smaller facilities such as community halls and other buildings. The majority of these were built in the 1960s-1970s and are not purpose built for contemporary uses. Some of the older or smaller facilities are being closed, while Council also aims to balance community needs with available facilities by providing information to groups about facilities owned by other agencies (eg such as church halls, surf clubs, school halls).

In terms of schools, the NSW Department of Education is responsible for monitoring enrolments and ensuring school places are available to match demand. While there was some anecdotal evidence about pressures in some schools (such as Newcastle East Public School) at present, the Department has advised that the current facilities are adequate to meet demands into the future.

4.3.4 Plans for future facilities

Newcastle City Council's Section 94 and 94A Development Contributions Plans enable funds to be levied to contribute towards these facilities or upgrades to meet the needs of future populations. The Section 94A plans include provision for the following facilities or upgrades to provide for future population and employment growth:

» Upgrade of the Civic Theatre, City Hall and Civic Park - $34m scheduled for 2018-24

» Construction of a district multi-purpose community centre - $5m scheduled for 2017-18.

Funds for a new community centre have been allocated within Council's S94 Contributions Plan for many years. However, a new multi-purpose facility has not been a high priority, with the many smaller facilities available and the large, regional facilities within the Civic precinct.

In addition to these community facilities in the city centre, the City has made provision within its S94 Contributions Plan for open space and recreation embellishments and acquisitions in the city centre and waterfront precinct, public domain works throughout the city centre and cycling works on King and Hunter Streets.

These plans have been based on assumptions and forecasts adopted by the *Newcastle City Centre Plan – Vision* and Council's *Draft Section 94A Contributions Plan* (updated May 2015), which forecast an additional 6,500 residents and 10,000 jobs over current levels, by 2031.

The proposed rezoning of the rail corridor and associated sites would, theoretically, add to the total population and employment forecast for the city centre, and would therefore be expected to create demands over and above those previously considered.

The impact of this additional demand is considered in Section 5 of this report.

4.4 Crime and safety

The SIA for the Wickham interchange proposal notes that "crime and safety is a significant issue in Newcastle" (GHD, 2014, p. 9). In 2015, Newcastle LGA ranked in the top twenty NSW LGAs for five of the 17 major offences:

» Non-domestic assault – ranked 16th

» Steal from person – ranked 8th

» Steal from motor vehicle – ranked 7th

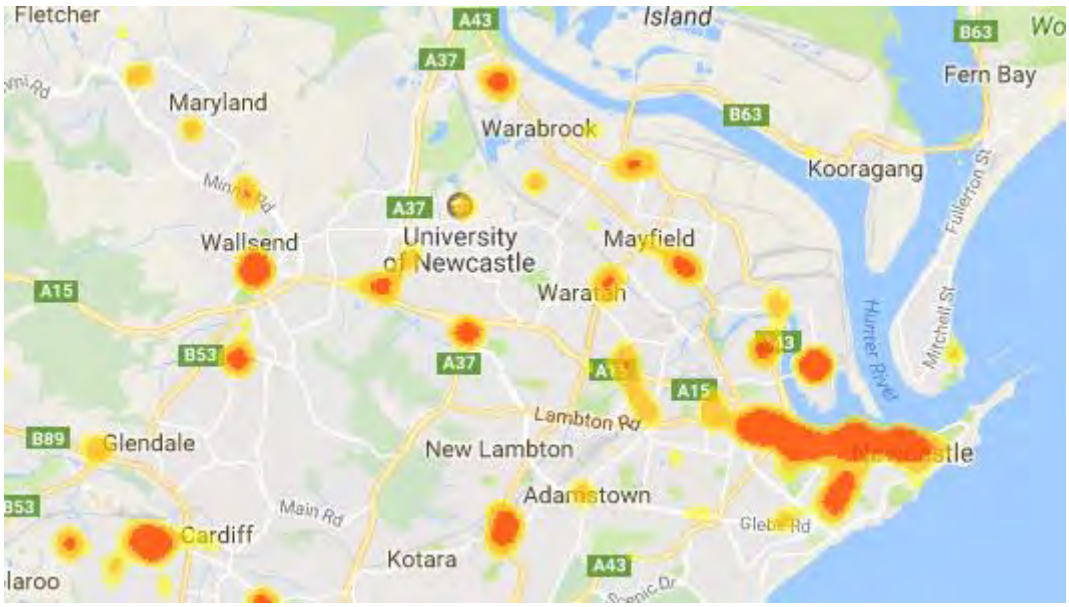
» Robbery – ranked 10th

» Steal from retail store – ranked 18th.

Five year LGA trends show significant reductions in crimes such as break and enter non-dwelling, malicious damage to property and motor vehicle theft, but increases in indecent assault, drugs and weapons offences and transport regulatory offences.

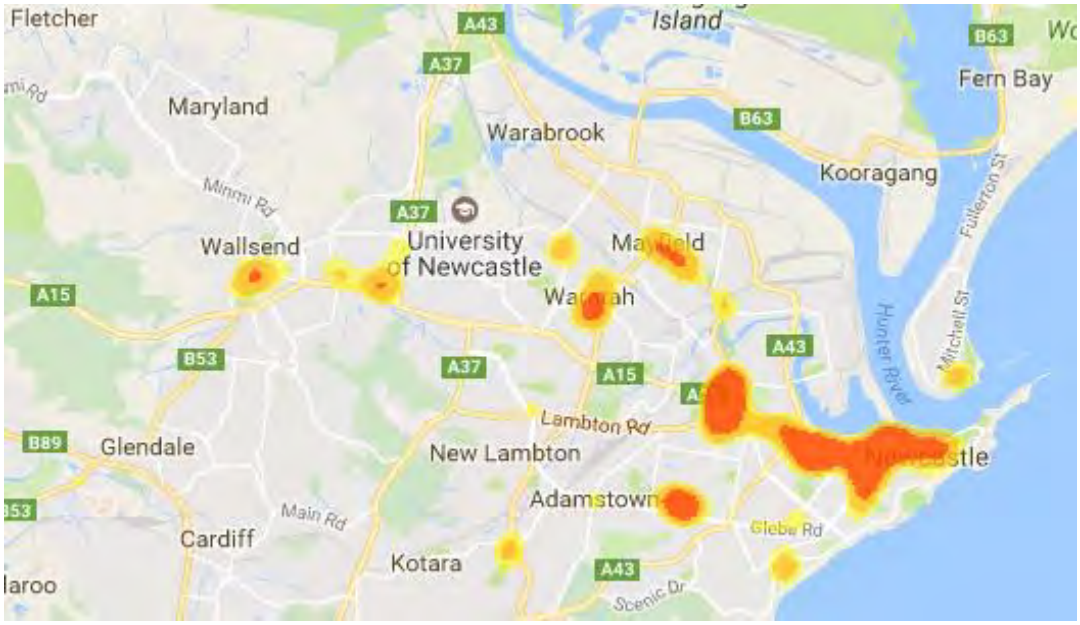
The rezoning study area is a hotspot for crimes such as domestic and non-domestic assault, break and enter (dwelling and non-dwelling), motor vehicle theft, robbery and steal from person, as shown in Figures 6 and 7.

Figure 6 Break and enter dwelling, incidence of theft (Oct 2015 to Sep 2016)



Source: BOCSAR http://crimetool.bocsar.nsw.gov.au/bocsar/

Figure 7 Assault (non-domestic), incidence (July 2013 to June 2014)



Source: BOCSAR http://crimetool.bocsar.nsw.gov.au/bocsar/

4.5 Summary of issues, service shortfalls and community needs

The review of available information indicates that the following issues are likely to be of particular importance to stakeholders within the Newcastle city community, and therefore need to be considered in the assessment of social impacts that may arise from the proposed rezoning:

- Impact of additional population and employment levels on local and regional social infrastructure such as community facilities, open space and schools
- Transport availability, accessibility to the foreshore and congestion
- Changes to local mobility and access brought about by other aspects of the Newcastle Urban Transformation and Transport Program, including introduction of light rail to the city centre and associated improvements to the public domain
- Relatively high rates of particular crimes, including personal and property crimes, such as assault
- Adoption of contemporary planning principles to ensure that community facilities and open spaces are equitably distributed, can accommodate a range of uses, are functional, safe, innovative, and promote community connections, health and well being
- Expectations that there will be community involvement at all stages of planning and implementation.

5 Community engagement process and outcomes

A key component of best practice SIA generally includes some form of community engagement to identify community values, perceptions of how the proposal might impact on the affected community and stakeholders and the opportunities to respond to local issues.

This section reviews social issues and impacts relevant to the proposed rezoning that have been identified during community consultation processes in recent years.

It is noted that there will be further opportunities for community feedback related to the rezoning during the public exhibition period, in accordance with the *Environmental Planning & Assessment Act 1979*.

NURS - 2012

Process

The NURS was prepared in 2012 by the NSW Department of Planning & Environment, in partnership with the City of Newcastle Council and Hunter Development Corporation. Other key agencies who collaborated in preparation of the Strategy included Transport for NSW, Newcastle Buses, Roads and Maritime Safety, Office of Environment and Heritage and the Mine Subsidence Board.

Outcomes and findings

Public exhibition of the NURS revealed community concerns over the truncation of the heavy rail line. Other key issues included the need for regional connectivity, potential adverse effects of increased commuter time associated with truncation of the rail line and the potential for increased traffic.

Design Newcastle engagement - 2014

Process

In June 2014, UrbanGrowth NSW initiated a two month community engagement program, which included consultations in relation to the CBD revitalisation, future uses of the vacant rail corridor land, heritage station buildings, light rail stops and open space (UrbanGrowth NSW, August 2014). These consultations built on previous engagement undertaken since 2013 to assess potential light rail routes.

As part of a Design Newcastle community consultation process, community groups and 100 randomly selected residents were invited to participate in a two-day summit to respond to State Government plans for the vacant rail corridor, heritage station buildings and activities to revitalise the CBD. The aim of the July 2014 summit was "to generate community ideas and insight that could be used to inform plans for the revitalisation of Newcastle" (Source: www.revitalisingnewcastle.com.au). A large number of ideas were generated to encourage employment, create improvements in the public domain, activate public spaces, promote sustainability and meet social infrastructure needs.

Outcomes and findings

Key issues identified by UrbanGrowth NSW through this process were:

» Support for urban renewal in the Newcastle city centre

» Support for the concept of three specialised city precincts: city east, city west and civic

» Support for "big ideas" to revitalise the city centre

» Supports a mix of housing types in the city centre

» Strong support for the introduction of new educational facilities in the city centre

» Support for the reuse of public buildings such as Newcastle Railway Station

» Support for development within the rail corridor, where that development brings people into the city centre and aids in the creation of jobs

» Support for temporary or permanent structures in the rail corridor to activate the space and create connectivity between the city and the waterfront

» Interest in ongoing consultation regarding urban renewal and development within the city centre and corridor

» Support for the introduction of light rail and the truncation of heavy rail.

These ideas and responses have been taken into consideration in preparation of the Urban Renewal Concept Plan.

Revitalising Newcastle engagement - 2015

Process

In August 2015, UrbanGrowth NSW initiated another community engagement program in partnership with Newcastle City Council (NCC) over a six week period. The engagement program was part of the NSW Government's wider Newcastle Urban Transformation and Transport Program which also includes Transport for NSW (TfNSW), the Hunter Development Corporation (HDC) and NCC.

The community engagement process attracted high levels of participation from across Newcastle and the Lower Hunter region, including:

» More than 1,400 participants from more than 40 Hunter postcodes participated in 13 face-to-face community events, including community forums, pop-up engagement stalls and door knocking city centre businesses

» More than 2,500 people participated in phone and online surveys

» More than 17,500 people engaging with online forums including the Revitalising Newcastle website, Facebook and Twitter channels

» Receipt of 285 submissions through the website, email and post.

Outcomes and findings

The engagement process resulted in clear findings and direction in relation to Program Objectives and opportunities and outcomes of the Urban Transformation:

» **"There was broad support for the Program objectives**:

  > There was strong support for bringing people back to the city, growing new jobs and connecting the city to its waterfront.

  > There were a range of suggestions for place making, public domain and community assets.

  > People wanted the heritage and character of the city centre to be respected in the revitalisation. There was some feedback on making direct reference to heritage in the Program objectives.

» **There was broad support for maintaining and enhancing the character of the city centre's three precincts by concentrating growth** as follows:

  > West End: the commercial hub for the Hunter region, with relatively higher density commercial and residential development.

  > Civic: the city's art, education and cultural heart, supported by some commercial and residential development.

  > East End: a thriving urban community with tourism, entertainment, and some, sensitive residential development that respects the heritage nature of the precinct" (UGNSW December 2015).

» People favoured the 'Harbour Play City' and 'Harbour Entertainment City' opportunities (Opportunities 3 and 4). Both combine mixed use development with open space and new community assets. People also suggested ways these opportunities could be enhanced and integrated with broader renewal of the city centre.

» People supported other outcomes of the Revitalising, including the Civic Link, Revitalisation of Hunter Street and Entertainment Precinct. There was less support for the Regional Playspace and the inclusion of a fresh produce hub or market at Newcastle Station.

All feedback from the Revitalising Newcastle engagement is being incorporated into UrbanGrowth NSW's plans for by:

» Adding a new Program objective that demonstrates commitment to preserving and enhancing the unique heritage and culture of Newcastle city centre

» Beginning work in partnership with NCC to create great places for the public and improve connections between the city and the waterfront. This work will include:

  > Opening up the area between Perkins and Newcomen Streets, remediating the land and delivering new open space and a pathway which will connect walkers and cyclists to the water, recreating the original Dangar Grid. This will include investigations in to the removal of the Market Street pedestrian bridge.

  > Examining options to refurbish and adaptively reuse the railway signal box and introduce temporary activities, such as art and performance, for the public to enjoy.

  > Refining ideas for Newcastle Station and the forecourt to create a drawcard destination for the community that respects the station's heritage values and investigating temporary uses while preparing a final proposal for community feedback

  > Continuing to inform and engage with members of the public (UGNSW December 2015).

Although the focus of consultations was on proposals for Revitalising Newcastle, the *Engagement Outcomes Report* (UGNSW December 2015) noted some participants had expressed strongly held views in relation to previous Government decisions about truncation of heavy rail and introduction of light rail in the city centre. While these were outside the scope of the engagement program (and were forwarded to Transport for NSW for their review and response, where appropriate), a summary of this feedback on transport issues was included in the Report. Key areas of concern included:

» a desire for accessible services

» placing a high priority on public transport services connecting the Newcastle city centre, suburbs and the wider region

» an emphasis on active transport (walking and cycling) and associate facilities to encourage use

» opportunities and issues relating to light rail in the city centre

» concerns about inadequate parking and the potential for increased traffic congestion.

Implications for this SIA

Community feedback to date, from the inputs to the Newcastle Strategic Plan to the most recent Revitalising Newcastle engagement program, has been critical in identifying community values and preferences for the city's future. Feedback demonstrates there is a high level of interest within the community about the future shape of Newcastle's city centre and desire for renewal. Community priorities expressed the importance of preserving key aspects of the city's heritage and providing jobs, high quality public spaces, appropriate housing, educational facilities, transport and new social infrastructure. There is also a desire for, and expectations of, ongoing consultation through the renewal period.

This community feedback has helped UGNSW to refine the objectives and plans for the surplus rail corridor lands, to identify community concerns and support community benefits arising from the Urban Renewal Concept Plan. These issues are explored in the following section.

6 Assessment of social issues and impacts

6.1 Introduction

This assessment of social benefits and impacts has been undertaken in accordance with the *Social Impact Assessment Policy for Development Applications* (City of Newcastle, November 1999), addressing the relevant social and economic impacts outlined in the Social and Economic Effects Matrix (p. 14).

The assessment considers positive and negative effects, and provides a descriptive summary in sufficient detail as to facilitate effective impact management.

As noted in Section 1, the assessment focuses particularly on the potential impacts and benefits to stakeholders with regard to:

» The needs the rezoning and the proposed Urban Renewal Concept Plan are intended to address

» Their suitability in relation to identified needs and land uses

» Their contributions towards the activation of spaces, accessibility and connectivity, safety considerations and contributions to the urban domain and city centre.

Impacts have been categorised in the impact display matrices according to the categories identified in Newcastle City Council's SIA Guidelines. Not all categories will be relevant.

6.2 Overview of stakeholder groups

A range of stakeholder groups would have a direct or indirect interest in the Concept Plan rezoning proposal being considered in this SIA. These would include:

» City of Newcastle Council, both councillors and staff

» The local business community, including retailers, commercial building owners and tenants and developers

» The University of Newcastle

» University and school students

» Existing residents of the City of Newcastle and new residents who would be attracted to live in the area

» Owners and occupiers of properties adjacent to the Urban Renewal Concept Plan boundaries

» Employees and commuters to the central city and public transport users

» Visitors to Newcastle City Centre and Harbour areas.

The following analysis considers the potential for impacts and benefits according to these specific groups of stakeholders.

6.3 Potential project benefits

From a social impact perspective, the proposed rezoning and the Urban Renewal Concept Plan have the potential to offer a considerable number of benefits for improved spatial planning within Newcastle City.

At a general level, from a social impact perspective the proposed rezoning has the potential to offer benefits such as an increase in the stock of dwellings in areas accessible to transport, improved housing affordability through increased supply, greater diversity in dwelling types and improved design. Other benefits include improvements to the quality and accessibility of the public domain and community uses, public safety, the preservation of valued community heritage, provision of new transport services, and (if community engagement is encouraged) improved levels of social cohesion. Induced development will support new business and employment centres, thus improving access of existing residents to employment opportunities. Improved transport links will provide improved access for existing residents to jobs in existing centres (locally and in more distant locations).

These benefits would accrue to many of the stakeholder groups listed above. A brief description of the key issues is provided in the following sections.

6.3.1 Accommodation and housing

Additional housing is an important component of the Urban Renewal Concept Plan, as it will support a larger population living and working in the city centre, which in turn support the viability of shops and services and create activated areas throughout the week (day, evening, nights and weekends), with improved safety.

Accommodation and housing provided for within this rezoning proposal would be in addition to the forecasts within Newcastle City Council's S94 Contributions Plan for 6,500 residents and 10,000 jobs to 2031. The dwelling numbers are also additional to targets included in the Newcastle Urban Renewal Strategy (NURS) of 6,000 new dwellings by 2036.

Dwelling yields that could be possible within the rezoned lands of the rail corridor and adjacent catalyst sites indicate potential for an additional 400-500 units across a range of studio, one, two and three bedroom formats. The indicative breakdown is shown below:

Table 2 Indicative development yields for residential accommodation within the proposed rezoning

Dwelling types	Indicative number	Indicative percent
Studio apartments	88	20%
One bedroom apartments	154	35%
Two bedroom apartments	154	35%
Three bedroom apartments	44	10%
Total	**440**	**100%**

Source: UrbanGrowth NSW

Applying the average household occupancy rate for apartments within the City of Newcastle of 1.6, an increase of between 400-500 dwellings would provide housing for approximately 640-800 new residents.

In some locations, apartments would be built on sites where rail corridor land can be amalgamated with adjacent government owned land. Most of the apartments would be incorporated into mixed use developments along the former rail corridor. Most of the units would be one or two bedroom apartments and another 20% would be studio apartments, which accords with the housing and demographic trends showing a predominance of single person and couple households in the locality discussed in Section 3.2 of this report.

Mixed use development, with commercial (retail, office or business uses) at ground level and residential uses above, is proposed for majority of the rezoning sites and this would be linked with associated improvements including the light rail and the redevelopment of Hunter Street mall.

An increase in the supply of housing, and particularly of smaller dwellings such as apartments, would also be expected to ease pressure on dwellings prices in the vicinity, and hence have benefits for affordability. SGS (2016) notes that the high representation of low income households in the Newcastle LGA suggests that the demand for affordable housing is expected to be strong (p. 24). This supports the inclusion of a range of smaller dwelling types, such as studio, 1 and 2 bedroom apartments.

The supply of an estimated 400-500 new apartments will also help address some shortages of supply for smaller household types and may place downward pressure on house prices in the area (assuming demand remains the same) (SGS 2016, p. 25). UGNSW is committed to providing a diversity of housing types, including 5% affordable housing, to attract a broad range of households to the area. The mechanism to provide this has been included within a Voluntary Planning Agreement with Council, and associated with this rezoning.

While the rezoning would permit revitalisation of the city centre, implementation of the Urban Renewal Concept Plan would create temporary construction impacts. Given the size of the study area, these impacts would be expected to be felt across a large area and over a long time period. They would be experienced by people already living or working in the city and others traveling through or visiting. Measures to alleviate these impacts are discussed in Section 7.

In total, approximately 37% of land within the rail corridor is planned for development as housing or mixed uses.

6.3.2 Access and mobility

The existing heavy rail corridor creates a major barrier to pedestrian, cycle and vehicular movements in a north-south direction and blocks movements and views between Newcastle City centre and the Harbour. In 2014, there were only three wheelchair accessible crossings of the rail corridor. Crossing the rail line required access by bridge and stair structures.

Improvements to access and mobility are integral to, and a significant driver underpinning, the Urban Renewal Concept Plan. These improvements to access and mobility are incorporated into the objectives for the Newcastle Urban Transformation and Transport Program. Several new at-grade crossings have already been opened as a result of the truncation of the heavy rail line at Wickham Station and on completion there will be seven crossings of this former rail corridor.

In total, approximately 35% of the land within the Urban Renewal Concept Plan is planned as some form of public open space or public domain, including new pedestrian and cycle connections. The specific details of the design and inclusions within the new public domain areas, and hence the benefits to the community, will be developed as part of Development Control Plans (DCPs) and Development Applications (DAs), following rezoning.

Specific transport, access and connectivity improvements associated with the Urban Renewal Concept Plan include:

» Removal of existing heavy rail line will increase on-grade connectivity between the city and the harbour for pedestrians and cyclists

» Introduction of light rail from Wickham to the east will link key city precincts, and provide a more active and vibrant streetscape

» Improvements to the network of safe, cycle-friendly routes.

In addition, the proposed rezoning will support place based initiatives for public domain improvements to create new public spaces which will result in greater walkability and access for people in wheelchairs, with prams or with limited mobility, whether residents, employees or visitors to the city centre. These places and spaces will be designed in accordance with Crime Prevention Through Environmental Design (CPTED) and Safer by Design principles, to encourage public safety and security. Inclusion of a diversity of housing sizes and prices, including affordable housing, will enable households from a wide range of socio-economic backgrounds to access these spaces.

In the East End precinct, the design principles include extending the street grid, connections and views towards the Harbour, including greatly increased pedestrian access between Hunter Street and the harbour and links to the light rail. Public domain improvements where new access opportunities will be created are summarised in the Urban Renewal Concept Plan include:

» Darby Plaza - a new community focused public space with play facilities and walking and cycling links connecting Hunter Street and Darby Street to the water

» Civic Link - which will allow a new public space to be created linking Hunter Street to the Newcastle Museum and providing direct visual and physical connections between Wheeler Place, the waterfront and the light rail system

» Hunter Street revitalisation – a mixed use and heritage precinct activated by connections to new pedestrian and cycling links to the waterfront

» Entertainment Precinct – a new public space between Scott Street and the waterfront, incorporating a new connections from Market Street to Queens Wharf and a variety of opportunities to experience the area's heritage character

» Newcastle Station – re-purposing of this important heritage focal point as a destination accommodating a range of activities.

Improvements for cyclists will include cycle paths and shared zones across the study area and linking to existing routes.

6.3.3 Recreation and leisure facilities

The Program will provide significant opportunities to improve the quality of open space and north-south connections within the rail corridor.

The proposed rezoning would enable land amalgamations and creation of new north-south linkages within the study area connecting to other east-west routes into surrounding streets and communities, thus facilitating access to existing recreation and leisure facilities (e.g. areas of open space, playgrounds and parks).

The Urban Renewal Concept Plan includes a range of new pedestrian and shared path links that would encourage active transport for recreational and leisure purposes, as well as new parks (e.g. Civic Green) and upgraded leisure areas (e.g. Entertainment Precinct). In addition, the proposed Entertainment Precinct would provide a significant new area of open space for the public adjacent to the waterfront and adjoining existing parkland in the vicinity of Newcastle Station. These facilities would appeal to existing and new residents and workers and would attract visitors to enjoy new facilities here and across Newcastle city centre.

Recreation and leisure activities would also take place within the many public plazas, cafes and streetscapes that would be created through this rezoning and revitalisation project. There will also be many opportunities for private developers to provide commercial leisure facilities suited to local needs for daytime, evening, night-time and weekend activities.

Apartments and mixed use developments would also contain areas of private open space for residents and the guests.

In addition, the Program will have cumulative benefits as Newcastle City Council has advised that the proposed recreational facilities will complement Council's planned improvements to the public domain to the east of the rail corridor.

6.3.4 Employment and economic benefits

The proposed rezoning would create employment opportunities for Newcastle residents through provision for of around 5,000m^2 of commercial (retail, office and business) space within the disused rail corridor.

In addition, SGS has estimated that the proposal would create 600 full-time equivalent jobs in the construction and development industries over the next twenty years and up to another 934 ongoing jobs in local businesses, once complete.

As well as the employment benefits outlined above, the revitalisation of the Newcastle city centre will have direct and indirect economic benefits for existing businesses within the Urban Renewal Concept Plan and adjacent areas as the local population grows, the urban public domain is transformed and rejuvenated and new activities are attracted to the older areas. This renewal will create income and employment benefits, and attraction of new businesses to support the incoming population will create cumulative benefits over time.

The contribution of new, high quality retail spaces, offices, dwellings and public places will also raise average land values.

Refer to the Economic Impact Assessment prepared by SGS (2017) for further information.

6.3.5 Public health benefits

Renewal of Newcastle's city centre and development of the light rail system would, overall, be expected to create opportunities for health benefits for residents, the city workforce, visitors and the wider Newcastle community.

Research and case study analysis undertaken by Elton Consulting for Parramatta City Council's Western Sydney Light Rail project (2013) identified a wide range of benefits that are directly attributable to either light rail projects themselves or the urban renewal associated with their development. While case study projects varied considerably in terms of their size and extent of associated urban renewal, the evidence showed that light rail and urban regeneration projects more generally, encourage active travel (ie walking, cycling and public transport), which has measurable public health benefits. For example:

» *"Greater land use mixes, population and employment density, street connectivity and continuity of the bike and pedestrian network are all believed to increase physical activity and contribute to positive health outcomes, as are the presence of recreational facilities and parks (The Atlanta Beltline Health Impact Assessment"* (Ross 2007 p 14)

» Walking, particularly in pleasant urban environments that are perceived as being walkable, has been identified as contributing to social cohesion (social inclusion and community relationships) and personal wellbeing (Commonwealth of Australia 2012 p 56; Newman and Matan 2012)

» A strong body of evidence has confirmed a relationship between higher housing densities and increased active transport for people in all age groups (particularly adult populations), as "highlighted in an evidence review of the health impacts of increasing density in Australia (Giles-Corti et al 2012). Living closer to shops and services is a consistent predictor of walking for both transport and recreational purposes for all age groups…While only limited causal links have been established, several major international health and transport agencies agree there is sufficient evidence to warrant actions aimed at improving the built environment to promote physical activity, particularly active transport (Giles-Corti et al 2012, p7). The evidence suggests that it is optimal to locate higher density housing away from roads with heavy traffic, but within easy access of public transport, shops, services and public open space (p17). High quality urban environments that integrate transport infrastructure offer a wide range of liveability benefits. These include direct health benefits, increased access, enhanced user experiences, greater affordability, increased community interaction, and benefits for the local economy and environment (Australian Government 2011)" (Elton Consulting, 2013, p. 11).

» An open space network and quality public domain will encourage active travel and extend the spatial area across which residents experiences the benefits from a light rail network. Improvements to public areas and existing parks and greenspace provided as part of an urban regeneration area will support positive health outcomes by encouraging physical activity, active travel and enhancing amenity and liveability.

» *"Public domain improvements (including safe and well-designed walkways and cycleways, landscaping, street furniture and way finding) will not only help to support a successful light rail system, but will support greater use of the public domain more generally – with multiple related benefits, from increased activation and passive surveillance, to stimulation of the local economy. The public domain and light rail services should be accessible to all people, including those with limited mobility"* (Elton Consulting, 2013, p. 77).

These findings are further substantiated in another recent report (Giles-Corti et al, 2014 for The Heart Foundation) about the public health benefits of high density neighbourhoods, including:

» *"Consistent cross-sectional evidence that those living in higher density neighbourhoods undertake more walking and physical activity than those living in low density neighbourhoods.."*

» *"Relatively consistent cross sectional evidence that higher residential densities [are] positively associated with active transport modes"* (p. 6).

The Heart Foundation report explains that these findings arise because density, together with other built environment attributes, such as proximity to transit, accessibility to desired destinations and good design, promote walking, which creates benefits for cardio-vascular health. "It is the cumulative and combined effects of these attributes that create the pedestrian-friendly areas required to increase levels of physical activity and in turn, reduce the risk of cardio-vascular disease" (Giles-Corti et al, 2014 p. 7).

Development of active travel infrastructure such as pedestrian walkways and cycleways through Newcastle's city centre (alone or in association with the proposed light rail) would also be consistent with the objectives of the Department of Infrastructure and Transport's Draft Report, *Walking, Riding and Access to Public Transport* (Commonwealth of Australia, 2012). The report calls for Australian governments to work with businesses and the community in planning for land use and transport changes, building appropriate infrastructure for walking and bicycling needs and encouraging greater participation in walking, riding and public transport.

6.3.6 Heritage benefits

The Revitalising Newcastle community engagement process, outlined in Section 5, sought feedback on the Vision, Objectives, Opportunities and Outcomes for Newcastle City Centre. The

consultations demonstrated the strong community support for the city's heritage and character to be respected in the revitalisation. This included calls to balance heritage preservation and new development, and exploring opportunities to celebrate and conserve Newcastle Station's architectural and cultural heritage.

As a result, the Program's objectives have been expanded to include a specific aims to preserve and enhance the unique heritage of the city centre. Acknowledgement of the important community values and incorporation into the Concept Plan and future development will create future benefits for the Newcastle community.

6.3.7 Community uses

Closely aligned with the identified heritage values, the Urban Renewal Concept Plan will focus on ensuring that a range of new community uses and assets are created within the surplus rail corridor lands, particularly around Newcastle station.

There was clear community support through the Revitalising Newcastle engagement process for the provision of open space and community assets as part of the Program. UGNSW will continue to work with Newcastle City Council and the community to develop plans for community uses. In the Newcastle station area community uses could include creation of a tourist destination and leisure activities such as creative spaces, restaurants, a museum, arts centre or entertainment venues.

Ongoing liaison with Council and the community to develop these concepts into specific activities and community assets will provide tangible community benefits for existing and future residents, and people working in or visiting the city.

6.4 Potential social impacts

While the proposed rezoning would be expected to create significant and highly visible benefits for the general public and for people wishing to live in, or visit, the Newcastle city centre, changes in a busy and populous area may have the potential for some adverse impacts for certain groups. These impacts are considered below.

6.4.1 Population change

The proposed new population that could be attracted to the Newcastle city centre as a result of development facilitated through the rezoning would result in an additional 640-800 residents, when the average occupancy rate for apartments of 1.6 persons per household is applied to the potential 400-500 units.

The community profile outlined in Section 4 notes that the Newcastle – Cooks Hill SA2 locality presently contains high proportions of relatively young adult singles, couples and groups, many of whom are either employed in a professional capacity or attending university and living in rented apartments. There is a lower representation of families, particularly those with young children, and people aged over 65 years.

NURS (2012) notes that an ageing population and smaller households will drive residential development in this central area, together with the increasing desirability of inner city areas as preferred residential locations – for instance for students, first home buyers and downsizers / retirees.

> *"Factors which will influence housing demand and growth into the future, and particularly in the city centre… could include strong demand by students associated with the potential relocation of portions of the University of Newcastle's campus to within the CBD, demand by professionals for inner city housing, as well as first home buyers who are attracted to the*

affordability of units along with the amenities of the city centre, investors and increasing market demand for smaller more affordable units" (NURS, p. 41).

The area also contains a relatively high proportion of university students and attraction of new educational uses and housing as envisaged by the Urban Renewal Concept Plan would create an incentive for student numbers to increase further over current levels. Their attraction would depend on the availability and affordability of the new apartments.

In this way, the rezoning would allow significant numbers of new dwellings within mixed use buildings. These would be attractive to young, middle aged or established professionals, city employees and students, as well as to investors and others wanting an inner city lifestyle.

6.4.2 Community structure (severance, cohesion, identity)

The expected characteristics of the future population, outlined above, indicate that new residents would be expected to share many similarities with existing residents, including the predominance of young urban professionals and single person households. While the city is becoming increasingly attractive to residents from range of cultural backgrounds, the mix of new residents would reflect Newcastle's diversity across age groups, socio-economic background and cultures. This would be expected to contribute towards relatively high levels of social cohesion and identity as new residents have similar characteristics to those already living in or near this area.

The area also contains a relatively high proportion of university students and some small apartments as part of the Urban Renewal Concept Plan could attract increased numbers of students to the city centre. Their attraction would depend on the availability and affordability of the new student apartments. However, given their prevalence at present, an increase alongside other population groups would not be expected to create tensions within the new community, and would instead be expected to reinforce the identity of this area as a student and education hub.

Preservation, restoration and adaptive re-use of important heritage features will reinforce the identity with Newcastle's heritage and values, while a focus on place-making and strengthening the character of individual city precincts in planning for the new catalyst sites will further build community identity.

Nevertheless, case studies of other urban renewal projects show that increased connectivity as part of urban renewal can lead to higher land values, increased investment in communities and urban revitalisation in key centres.

6.4.3 Impacts on community services and facilities

An additional residential population of around 640-800 residents by 2036 will generate a need for some new or expanded social infrastructure. With the majority of new dwellings proposed being 1 and 2 bedroom apartments, it would be expected that the new population would include relatively high proportions of small households, including single person, small group and couple families. The population may also include a relatively small proportion of couple families with small children. Most residents would be expected to be aged between 25 and 65 years, covering many stages of household formation, from singles, couples, young families through to older couples, older share households and older singles. The presence of the University could also attract a relatively high proportion of young adults, aged 18-25 years, to the area. Incorporation of a 5% component of affordable housing will also encourage diversity through attraction of households from lower income households. While there may be some babies and small children, families with older children tend to seek other forms of housing once children reach school age. Assuming the population profile of new residents is similar to that already living within the study area, the proportion of babies and young children would comprise around 5% of the incoming population, and an additional 10% would be of school age.

An increase in population of this size would have a moderate impact on demands for social infrastructure and open space. However, most of these demands will be able to be met through the many existing facilities within the Newcastle city centre or nearby areas, particularly given the many regional level facilities and planned upgrades described in Section 4.3.

Schools demand

In relation to schools, for masterplanning in urban infill areas, Department of Education has advised that no new schools would be required in this area and all school aged children who would live in this area following rezoning could be accommodated within the facilities identified in Section 4.3. This recognises that numbers of school aged children within the population associated with the proposed new residential development are likely to be relatively small, consistent with the community profile outlined in Section 4.2

Childcare places

A modest need is likely to be generated by the new residents for childcare places, which are currently relatively limited. While future numbers of pre-school children are expected to be relatively low, there will nonetheless be some couples in the early stages of household formation and a portion of these may seek access to local childcare. A high level estimate of demand based on the assumptions above would indicate a need for around 15-25 daycare places from residents. However, there will also be demand for childcare generated by the additional workforce. As a result, the rezoning should allow opportunities for new private childcare providers to establish centre/s within this area. With the rezoning seeking to introduce new Mixed Use zones into the city centre, where childcare is a permitted use, the rezoning will therefore enable the delivery of these 'in demand' uses.

Meeting and activity spaces

A growing population with the characteristics outlined above will also generate a need for places for meeting and gathering that facilitate social interaction and the development of community networks. In addition to the community facilities already provided (or proposed for upgrade) by Newcastle City Council, these needs will be met by the provision of a range of spaces for informal interaction, such as new plazas, cafes, opening up of linkages to the waterfront and the public domain more generally.

Open space and recreational facilities

The additional population arising from the proposed rezoning will also create a need for public open space and recreation facilities for active recreation, places for quiet recreation and leisure activities, together with active transport routes along the waterfront promenade and across the city through Civic Precinct.

Decisions about the desired quantity of open space are generally contained in Council-prepared S94 Developer Contributions Plans, or Recreation and Open Space Strategies. A common rule of thumb is to provide 2.83ha per 1,000 residents, although this is more difficult to provide within established urban areas than in greenfield developments, and is heavily dependent on the quantity and quality of facilities available within the existing local area and wider district. With an expected population of around 640-800 residents, this benchmark, if it were a greenfield area, would suggest a need for around 2ha of new open space.

As noted in Sections 6.3.2 and 6.3.3, the rezoning and Urban Renewal Concept Plan provides for many new areas of public open space and public domain improvements, including new pedestrian and cycle connections to places of regional significance along the waterfront at the East End and through the Civic precinct. The new Civic Green linking the University, Wheeler Place and the waterfront represents such regional facilities and active open space. Additional areas of open space and gardens are shown along the length of the corridor and all spaces link to established areas of

local and regional open space such as Civic Park, the waterfront Promenade, Foreshore Park, Enterprise Park and Pacific Park, to name a few. In total, the Urban Renewal Concept Plan provides for approximately 1.4ha (or 35%) of high quality, new open space and greatly improved linkages between existing facilities and the Newcastle waterfront. This adds to the substantial foreshore open space area. These parks and linkages will provide recreation destinations for the wider Newcastle and regional populations, as well as meeting the open space needs of the local city centre population.

Given the site's location within inner Newcastle and its proximity to a range of regional recreational areas and open space, the open space to be provided is considered adequate and will provide benefits for Newcastle's new and existing residents through a focus on the provision of quality open spaces and embellishments. This strategy will also complement Newcastle City Council's S94 A Plan (updated 2015) which includes plans to acquire and embellish open space and public domain areas within the Honeysuckle Waterfront Precinct, as well as other public domain improvements associated with the East End Public Domain Plan and other streetscape and pedestrian / cycleway upgrades.

6.4.4 Community and public safety

The attraction of new residents and an increased workforce to this area, combined with public domain improvements arising from the rezoning and subsequent design, would be expected to activate and revive Newcastle's central city area and so contribute towards public safety.

Parts of the city centre are currently known to be hotspots for crime, and may thus present challenges for attracting new residents and enlivening older areas, particularly in the early stages of revitalisation. However, reducing currently high crime rates and overcoming perceptions of crime risk will be essential if some of the areas proposed for rezoning are to be successfully transformed into socially sustainable communities.

Incorporation of public domain improvements to support social and entertainment activities along Darby Street, together with the revitalisation of Hunter Street Mall, will attract people to the city, and create an active and lively urban boulevard along Hunter Street associated with the public transport and new mixed use development throughout the day, during evenings, nights and on weekends. The Urban Renewal Concept Plan will support public safety through improved access, increased activity, passive surveillance and lighting of the public domain – transforming the former under-utilised and poorly lit rail corridor.

Community safety will need to be directly addressed through incorporation of an explicit set of Crime Prevention Through Environmental Design (CPTED) principles and Safer by Design best practice models. These principles and models address specific architectural and design elements that are most appropriately addressed at the DCP or DA stages to ensure consistency with Council's Community Safety plans. It is envisaged that all future public domain, building and built form applications would need to ensure they address these principles. A component of CPTED involves liaison with NSW Police and opportunities for their review of plans prior to approval.

6.4.5 Cultural and community values

Community consultation undertaken for Newcastle City Council's Strategic Plan, for the NURS and as part of the Revitalising Newcastle project, has highlighted a range of community and cultural values important to the existing Newcastle residential and business communities summarised in Section 5.

These issues have been largely incorporated into UGNSW's Urban Transformation and Transport Program, through the rezoning plans and are therefore consistent with the overall community values raised. The most recent round of community engagement identified a strong community

preference for the preservation and enhancement of the city's heritage values and development of community assets in areas such as Newcastle station.

It will be important to ensure that community consultation continues and reaches individuals and stakeholder groups that may otherwise feel marginalised or excluded from the benefits of the rezoning. In addition, it is important that the community feedback is incorporated into planning for the future redevelopment and revitalisation of the city centre.

While the community profile in Section 4 notes that this area is presently characterised by a relatively low level of cultural diversity compared with Newcastle LGA and NSW as a whole, discussions with the City of Newcastle noted that there appears to be an increasing cultural diversity within the city centre in recent years. The attraction of new businesses and residents to the apartments made possible through the rezoning, and ongoing development of the university precinct, would be expected to further add to levels of cultural diversity, depending on the cultural backgrounds of the students and the subjects on offer.

6.4.6 Interaction between development and existing community

As noted in the discussion of the characteristics of the existing and incoming populations above, the rezoning would be expected to enable development that would attract similar types of residents as those already living in the city centre, as well as new higher income households and students.

Growth in the resident population that will be made possible through this rezoning needs to be considered in the context of the growth that will already be possible through the 2012 rezoning of Newcastle. The 2012 rezoning will itself contribute towards significant additional residential and commercial development within the city centre. This will lead to progressive change over time, thus blurring the boundaries between the existing city residents and those attracted to the rezoned rail corridor lands.

Moreover, the focus within the Urban Renewal Concept Plan is on creating connections through urban design and transport routes to ensure the precinct is permeable and encourages movement between different parts of the city.

Although there may be differences in socio-economic or cultural backgrounds between some existing and newer residents, there is no expectation that the rezoning would create tensions between these groups. It is possible that some incoming residents could rightly or wrongly have concerns about the changes associated with new activities, such as on local crime or noise levels, particularly if newcomers are easily identified or seen as wealthy targets. At the same time, existing residents may experience resentment that new people are moving into areas which have traditionally been seen as their local community, which is now undergoing change.

Design of residential buildings and the public domain and incorporation of CPTED design elements – which limit noise, activate public spaces, encourage safety and security and ease of access to and within the city centre – should help address some of these concerns. In addition, the physical design should ideally be supplemented by activities to encourage interaction and linkages between residential communities within the city centre. A process of community engagement and liaison between UrbanGrowth NSW, Newcastle City Council, the business community and other key stakeholder groups could assist in identifying strategies to maximise the potential for social cohesion across different interests and communities and identify potential issues before they become a problem.

6.4.7 Needs of social groups

The Newcastle city centre location contains a range of significant social infrastructure, open space and recreational facilities used by a wide range of population groups, including children, young people, older people, families, people with a disability, indigenous persons and people from culturally and linguistically diverse communities.

The rezoning, and subsequent implementation of the Urban Renewal Concept Plan, aims to attract additional residents and revitalise the business environment, which will support a wider range of services and facilities and activate the area throughout the day and night.

As noted earlier, the public domain will be designed to be accessible and attractive for people with limited mobility and will enable development of attractions such as open spaces, play areas and linkages suitable for people from a wide range of age, socio-economic and culturally diverse groups. A variety of open space designs and inclusions are proposed to appeal to different age groups and abilities.

6.4.8 Risk perception in the community

The rezoning would enable development according to the Urban Renewal Concept Plan that meets the objectives of Council and State government strategic plans and incorporates many expressed community values.

While community feedback shows that some stakeholders may not support the proposed changes, many others are supportive of the potential for renewal that would be achievable with the rezoning. Nevertheless, risks brought about by this rezoning could relate to factors such as:

» Displacement and social exclusion

» Gentrification and changes to community character

» Increases in property prices and reduced housing affordability

» Potential for increases in crime and feelings of insecurity.

As noted above, some of these features are specifically addressed in the Urban Renewal Concept Plan or CPTED requirements at detailed design stage (i.e. at Development Application stage). It is difficult to determine whether or not the local area will experience some property value increases. However, provision for a range of dwellings sizes, styles and locations will ensure that some dwellings will continue to be available to those on lower incomes.

An open and inclusive engagement program should assist in communicating key messages to stakeholder groups and ensuring concerns about potential risks can be addressed. This is discussed further in Section 7.

6.4.9 Social equity

Social equity considerations relate to the relative incidence and nature of benefits and impacts that will arise from a project, such as the rezoning and implementation of development in accordance with the Urban Renewal Concept Plan.

As noted earlier, the project will make possible a large number of benefits for individuals and groups across a range of community interests. The revitalisation of the city centre aims to improve the city centre environment for everyone wishing to access it and use its facilities. The mixture of dwelling sizes and styles, including a 5% component of affordable housing for low to moderate income households, will encourage a diversity amongst new residents, and revitalisation of the city centre and public domain will support business activities, thus attracting new uses across the day and night and creating employment opportunities.

Nevertheless, large scale development projects would be expected to create some disadvantages for some people. The types of individuals or groups that may be adversely impacted could include:

» Residents or businesses occupying existing buildings that would be subject to redevelopment, who would be displaced by the redevelopment

» People living or working in the city who could experience prolonged disruption due to noise, dust, vibration or traffic impacts associated with major redevelopment

» Low income people or people on pensions or with disabilities, living in specialised accommodation in this central area near services, who may be displaced as a result of the rezoning

» People on very low or low incomes who may experience displacement as a result of progressive gentrification or loss of affordable housing options.

Proposals within the Urban Renewal Concept Plan for affordable housing, new physical connections, mobility and public domain improvements and new residential and education communities to activate the locality and draw new employment into this area, will all help to attract a diverse community to this area and hence encourage social integration and foster equity of access and opportunity.

However, there will be a need for a proactive approach to identify potential for individuals or groups to become marginalised as redevelopment proceeds. Strategies to ensure social benefits can be captured and the incidence of impacts does not fall on vulnerable or marginalised groups are outlined below in Section 7.

6.4.10 Property values

Rezoning, regeneration and revitalisation of the city centre will create opportunities for new development, housing and employment. However, revitalisation will also create the potential for housing demand from new, higher income residents to gradually displace those on low or very low incomes from the city centre. There is a risk that an increase in property values associated with new uses, desirable public domain improvements and gentrification could adversely impact on some individuals or social groups.

Housing affordability will be addressed by providing a range of smaller dwelling formats, such as studio, 1 and 2 bedroom apartments. This will increase the supply of lower or moderately priced accommodation within the Newcastle city centre and meet identified needs for apartments for people on moderate incomes. The Plan also includes the provision of 5% affordable housing which will help to mitigate these issues.

6.4.11 Construction impacts

The rezoning and implementation of the Urban Renewal Concept Plan would create periods of construction across the city of Newcastle. Construction can create many adverse impacts in the short to medium term for people living or working near construction sites or affected by traffic and transport changes.

Measures to mitigate the impacts of construction are discussed in Section 7.

6.5 Summary of social impacts and benefits

In summary, the potential benefits and impacts of the rezoning and Urban Renewal Concept Plan approval are shown the table below.

Table 3 Summary of impacts and benefits

Potential impact	Rating and effects	Impacted stakeholders
Social benefits		
Accommodation and housing	**Significantly positive** Rezoning will support mixed use development, providing dwellings in a range of sizes and price ranges. The Concept Plan provides for 400-500 new studio, 1, 2 and 3 bedroom dwellings. UGNSW will aim to provide 5% of dwellings as affordable housing The new residential population will help to revitalise and activate the city centre Significant increase in dwelling numbers and the affordable housing component will help to maintain affordability	**New residents and investors** **Developers**
Access and mobility improvements	**Significantly positive** Access and mobility improvements are integral to the Concept Plan, including removal of the barrier created by the heavy rail corridor, proposals for north-south connections and new areas of public open space that will be accessible, including to people with limited mobility and from lower socio-economic and diverse cultural backgrounds. Cycle friendly and shared pedestrian zones through the corridor, surrounding neighbourhoods and new public spaces provide improved access to the Harbour, to new parks and public areas, to places of work, university and mixed use. Rezoning would also enable introduction of the light rail route Design according to CPTED principles will address community safety	**All residents, employees and visitors to the city centre** **City of Newcastle** **Light rail operator**
Recreation and leisure facilities	**Significantly positive** Rezoning will improve access to existing facilities and create 2.21ha of new public spaces and places for recreation and leisure Site amalgamations and rezoning will help create new areas for recreation and leisure, including in Civic centre and will improve pedestrian and cycleway connections to other small and large parklands, waterfront areas and facilities	**New and existing residents, employees, visitors to the Newcastle city centre**

Potential impact	Rating and effects	Impacted stakeholders
	adjacent to the railway corridor lands. Design of apartments to provide areas of private open space	
Employment opportunities	**Significantly positive** Rezoning for new retail and office space will encourage businesses to locate in city centre and create around 934 jobs Construction workforce of around 600 jobs	**Businesses, employees, local residents** **Developers**
Local economic effects	**Significantly positive** Revitalisation of Newcastle's city centre will activate new areas and attract and support local economic activity, resulting in flow on benefits from new housing and office development	**Businesses** **City of Newcastle**
Public health benefits	**Significantly positive** New connections and public domain improvements will encourage active travel with public health benefits There is evidence that urban renewal and public transport improvements act as triggers to activate public spaces and encourage active transport and its associated public health benefits	**Residents, employees and visitors to city centre using new public spaces and light rail** **Wider Newcastle population**
Community and cultural values	**Significantly positive** Community values identified through engagement during planning processes are being incorporated into the rezoning and Concept Plan design Restoration of heritage features and values Potential for community uses incorporated into Concept Plan	**Residents, businesses and visitors within wider Newcastle area** **City of Newcastle**
Social impacts		
Population change	**Neutral** The dwelling mix and yield made possible by the rezoning and proposed in the Concept Plan would attract another 640-800 residents to the city centre The population is expected to progressively increase over the next 6-8 years. Characteristics of new residents are expected to be broadly similar to the existing community and would include	**New residents** **Local businesses** **Developers**

Potential impact	Rating and effects	Impacted stakeholders
	mostly young or middle aged professionals and students, as well as some lower income households. The precise makeup would be influenced by the affordability and price range New population in the city will help to revitalise and activate rundown parts of the centre and support local businesses.	
Impacts on community services and facilities	**Neutral** to **Moderately positive** The projected population will be able to access the many regional level community and open space facilities within the city centre at present, including new public spaces and connections created by this proposal and new activities generated to meet demands from residents and visitors Schools and childcare may experience a small increase in demand, although the area is not expected to attract large numbers of children. No new schools are likely to be required. Opportunities for new childcare facilities to be developed by the private sector Rezoning would provide opportunities to create places where students, residents, workers and visitors can meet and recreate	**New residents** **Private childcare providers** **City of Newcastle** **Department of Education** **Transport operators**
Community structure including severance, cohesion and identity	**Slightly negative** to **Slightly positive** New residents are expected to share many similarities with existing residents, including a focus on young and established professionals and students, as well as people from a range of socio-economic backgrounds and cultures Restoration and incorporation of heritage features and values would maintain community identity and sense of history and place The potential for increases in property prices, loss of affordability and gentrification could result in displacement of lower income residents	**New and existing residents** **Lower income earners** **Wider community**
Community safety	**Moderately positive** Revitalisation of the city centre and CPTED design principles will help activate public spaces where crime levels are relatively high Concerns about personal and property	**New and existing residents, local businesses** **City of Newcastle** **NSW Police**

Potential impact	Rating and effects	Impacted stakeholders
	safety can be addressed through appropriate design and policing	
Community interaction	**Neutral** to **Slightly positive** Growth and change is already underway within the city centre as a result of the 2012 LEP. This proposal would continue this process Access and mobility plans and quality urban design would encourage activation of city and interaction between groups	**Residents, businesses and visitors to city centre**
Meeting needs of different social groups	**Neutral** to **Slightly positive** Rezoning and implementation of the Concept Plan would meet the needs of most social groups Community and stakeholder engagement through the planning and development process would identify specific needs and ways to minimise adverse impacts	**Residents, businesses and visitors to city centre, including children, young people, older people, families, persons with a disability, ethnic and indigenous persons and those on lower incomes**
Community perception of risks associated with development and change	**Slightly negative** to **Moderately negative** Many community values have been addressed in the planning process. However, some risks remain, including: » Gentrification and changes to community character » Increases in property prices and reduced housing affordability » Potential for displacement and social exclusion » Perceptions of crime risk. Measures to address these risks are proposed in Section 7	**Existing and new residents** **Students** **Other at risk groups including young people and those on very low incomes** **Wider Newcastle community**
Potential for property value increase	**Slightly negative** to **Slightly positive** A potential increase in property values may benefit those already owning property, but for those trying to buy into the market, it could impact on the level of affordability Housing affordability will be addressed by providing a range of smaller dwelling types and a 5% component as affordable housing	**New and existing residents**
Social equity	**Moderately negative** Potential benefits for City of Newcastle and residents, businesses and visitors to	**Residents or businesses who may be displaced during construction,**

Potential impact	Rating and effects	Impacted stakeholders
	city centre Some lower income, vulnerable or at risk groups could be adversely impacted through gentrification and property price increases	**through gentrification or loss of affordable housing options** **People living or working in the city who may experience prolonged disruption** **Low income earners, people on pensions or with disabilities, those living in social housing**
Construction	**Moderately** to **significantly negative** Changes to the amenity of the city centre would occur during construction, and the changes would differ depending on the exact location and nature of development.	**Existing and new residents, employees and visitors** **City of Newcastle**

7 Mitigation and management of social impacts

Section 6 of this report highlighted the following issues as having potential to create some adverse social impacts:

» Impacts on community services and facilities

» Impacts on community structure for community interaction and connections

» Community perception of risk

» Potential for displacement as a result of property value increases

» Social equity impacts

» Construction impacts.

This section provides recommendations to manage or avoid these potential social impacts.

Planning for new community services and facilities

An increase of around 1,200 residents over and above those planned for in the *Newcastle 2030* Strategic Plan and Council's *Section 94A Development Contributions Plan 2009* (updated 2015), would contribute to demand for some community facilities, such as school and childcare places, as well as open space and recreational facilities. There may also be impacts on higher order district and regional facilities if these are, or will be, under-provided for at present.

Under Section 94A obligations, developers are obliged to provide contributions to community infrastructure needs on site or in the local area. *Council's S94A Development Contributions Plan* (2009 updated 2015) requires the proponent to pay a levy of 1% on developments costing in excess of $200,000. The Plan also sets out expectations for the types of community facilities and the ways in which they should be provided (pp. 12-13).

Planning for these needs is best undertaken in consultation with service providers, particularly the City of Newcastle Council, Department of Education and NSW Health Hunter New England Local Health District, and requires a detailed understanding of current capacity issues, plans for future growth and the ways in which services and facilities can best accommodate the needs of a growing population and workforce.

It is recommended that UGNSW work with the City of Newcastle to identify the preferred means of ensuring the needs of new residents and workers for community facilities and services are met by planning for embellishments or upgrades to the quality of open spaces within or near the city centre. It is further recommended that discussions with other service providers continue to monitor changes over time, identify the potential for constraints to supply and the ways in which social infrastructure can best be provided or augmented to meet these needs.

UrbanGrowth NSW are entering into a Voluntary Planning Agreement in relation to dedication of the open space and embellishment to improve and increase public benefit in the city centre.

Fostering interaction and connections

While it is expected that the majority of new residents will have similar characteristics to those already living in this city area, it will be important to ensure the rezoning and implementation of

the Urban Renewal Concept Plan does not displace vulnerable or lower income residents as gentrification occurs over time. Incorporation of a range of smaller dwelling types and a 5% component of affordable housing will help attract or retain some residents on lower and moderate incomes. It will also be important to ensure that the different groups attracted to the city can interact in their daily lives and recreational activities.

The Urban Renewal Concept Plan underpinning the rezoning contains a number of specific design elements for connections and access that will encourage mobility.

Further interaction could be encouraged through liaison with Newcastle City Council to implement strategies such as:

» Exploring and encouraging opportunities for programs or activities which would foster interaction, such as exercise classes, further education, heritage and environmental groups or educational talks, which would be open to all local residents and employees to ensure clear signage to help people navigate through the city, including signage for major community destinations and heritage areas and around pedestrian, cyclist and public transport networks

» Mixing of residents will also occur in schools and the use of common facilities in the wider area.

On-going liaison between UrbanGrowth NSW, the City of Newcastle Council and other key stakeholders within the study area would be useful to identify strategies to encourage interaction.

Addressing community perceptions of risk

An analysis of community values and feedback expressed through community consultations suggests that the following risks have the potential to create community concern:

» The potential for displacement and social exclusion as a result of gentrification and changes to community character over time

» Increases in property prices and reduced housing affordability

» Potential for increases in crime and safety risks.

Risks of displacement may be difficult to overcome entirely, but could be minimised through adoption of a range of dwelling types, sizes and price points across the city area. In particular, the provision of a high proportion of smaller 1 to 2 bedroom dwellings would help to satisfy housing demand and better match housing supply with demand.

Public safety and crime risk have been addressed in the Urban Renewal Concept Plan and in the future DCP through quality design. The adoption of CPTED principles in the Concept Plan such as strengthening of the grid system, clear access routes, a legible public realm and activation of public spaces (in part, through proposed development that would contain activity generating uses at the ground floor) will further improve safety within the public realm, as will detailed design and liaison with NSW Police prior to lodgement of a DCP or DA. The requirement for quality finishes and the like, would also be dealt with at the detailed design stage. It is recommended that NSW Police are offered the opportunity to review future plans for this area at the DA stage, in accordance with CPTED principles.

Other factors that would contribute to community safety and security during implementation of the Urban Renewal Concept Plan include:

» Good signage to help people to navigate through the city areas and facilitate pedestrian, cyclist and public transport movements

» Streets and public open spaces that allow natural surveillance from window, balconies, passing vehicles and pedestrian and cyclist traffic.

Social equity impacts

Strategies to retain or encourage the development of lower priced housing, encourage interaction and engage with stakeholder groups within the community will help to minimise the potential for lower income and or other at risk groups to be adversely impacted by the changes that could occur as a result of the rezoning. UrbanGrowth NSW will aim to achieve a target of 5% affordable housing within the area and will work with the City of Newcastle Council and other interest groups to investigate opportunities to provide these housing options

It is recommended that UrbanGrowth NSW work with the City of Newcastle Council and other interest groups to ensure at risk or vulnerable groups or individuals are identified and targeted as part of the stakeholder engagement strategy, so that any unintended consequences of the renewal plans can be addressed.

Construction impacts

Construction over the next six to eight years would be expected to cause temporary, but substantial, disturbance for some local residents, businesses and other activities.

Before construction begins, construction contractors for each site should be required to prepare a construction management plan (CMP) that specifies mitigation measures for specific amenity, character and environmental impacts during construction. This would include restrictions on the times during which construction can take place. Construction management practices and consultation with Newcastle City Council and neighbours, about the timing and extent of inconvenience and timing of out-of-hours works, are standard conditions to help mitigate construction impacts at Development Application. Contractors would also need to work closely with residents to develop measures to ensure access to individual properties can continue.

Community consultation and communications

In planning the implementation of the rezoning through the Urban Renewal Concept Plan, there will be a need for UrbanGrowth NSW to continue to liaise closely with Newcastle City Council, residents, businesses and other stakeholders, and expectations within the community that consultation will occur.

Providing opportunities to involve and inform stakeholders and development partners throughout the planning process would keep the local and wider Newcastle community informed about the future of the rail corridor and catalyst sites, timing of the rezoning and subsequent construction, the nature of expected impacts (noise, vibrations, disruptions to local access etc) and will result in improved outcomes for the local community.

This process is particularly important for the acceptance of the proposal within the wider community and its integration with the surrounding area.

It is recommended that UrbanGrowth NSW continues to implement its communications and community engagement strategy as implementation occurs.

8 Conclusions and recommendations

The analysis undertaken to identify social impacts and social infrastructure needs arising from the proposed rail corridor rezoning has identified and examined ways in which social benefits and potential social impacts may arise.

The size and composition of incoming residents are not expected to differ significantly from the present population in the Newcastle city centre, given the relatively young and affluent population in the area at present.

Key social issues that may occur as a result of the rezoning and subsequent implementation of the Urban Renewal Concept Plan include:

» The impact of the forecast additional population and employment levels on local and regional social infrastructure

» Demand for public transport services and pedestrian / cyclist access routes through the city centre

» Perceptions that certain areas have relatively high crime rates.

Benefits of the rezoning for the local community, wider Newcastle community, business and visitors are expected to be:

» Provision of a range of dwelling styles, mixed uses (retail, office and business) and open spaces to revitalise this important city area

» A diversity in dwelling prices, including affordable housing, that will appeal to a broad cross-section of households

» Improvements to the public domain, including access to the Harbour area from the city and surrounding streets, new areas of open space and new pedestrian and cycling linkages, with the potential for community health benefits

» Stimulation and revitalisation of local economic activity, during the day, evening, night-time and weekends Preservation and enhancement of unique and valued heritage

» New community uses and activities around the Newcastle Station precinct.

Nevertheless, the analysis has highlighted the following issues that may have the potential to create some social adverse impacts:

» Impacts of the forecast additional population and employment levels on community services and facilities and demands for quality open space

» Impacts on community structure

» Community perceptions of risk

» Potential for displacement as a result of property value increases

» Social equity impacts

» Construction impacts.

Recommendations for additional measures over and above those incorporated into the rezoning and Urban Renewal Concept Plans that would minimise or manage these potential impacts include:

» Continuing discussions and liaison with social infrastructure providers (particularly the City of Newcastle Council, Department of Education and NSW Health) to ensure capacity issues, plans for future growth and service delivery can best accommodate the needs of this additional population and workforce

» Ensure clear signage to help people navigate through the city, including signage for major community destinations and heritage areas and around pedestrian, cyclist and public transport networks

» Liaison between UrbanGrowth NSW, the City of Newcastle Council and other key stakeholders to explore opportunities for programs or activities to foster community integration and interaction, such as activities and classes, further education, heritage and environmental groups or educational talks, which would be open to all local residents and employees

» Liaison with NSW Police and the City of Newcastle in relation to public safety and adherence to Crime Prevention Through Environmental Design (CPTED) principles in design

» UrbanGrowth NSW to work with the City of Newcastle Council and other interest groups to ensure at risk or vulnerable groups or individuals are identified and targeted as part of the stakeholder engagement strategy, so that any unintended consequences of the renewal can be addressed

» UrbanGrowth NSW continues to implement its communications and community engagement strategy as further planning for the Urban Renewal Concept Plan and implementation occurs.

9 References

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A Proposed rezoning sites & yields

Table A1 Sites for Rezoning – Proposed development summary

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 01 B4 Mixed Use 3,370m^2	Parcel 01	3,370m2	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 02 B4 Mixed Use 408m^2	Parcel 02	408m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 03 B4 Mixed Use 3,146m^2	Parcel 03	1,869m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
	Parcel 04	900m^2	B4 Mixed Use	FSR – 3:1	Height - 24m
Parcel 04 RE1 Public Recreation 2,464m^2	Now parcel 05 (and small corner of old 03 where western boundary of park realigned)	2,839m^2	RE1 Public Recreation	N/A	N/A
Parcel 05 B4 Mixed Use 1,603m^2	Now parcel 06	1,604m^2	B4 Mixed Use	FSR – 3:1	Height – 18m
Parcel 06 B4 Mixed Use 295m^2	Now parcel 07	295m^2	B4 Mixed Use (road)	FSR – 2.5:1	Height – 30m
Parcel 07 B4 Mixed Use 2,040m^2	Now parcel 08	2,040m^2	B4 Mixed Use	FSR – 2.5:1	Height – 30m

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 08 B4 Mixed Use 988m^2	Now parcel 09	988m^2	B4 Mixed Use	FSR – 4:1	Height – 24m
Parcel 09 B4 Mixed Use 467m^2	Now parcel 10	467m^2	RE1 Public Recreation	N/A	N/A
Parcel 10 SP2 Infrastructure 386m^2	Now parcel 11	386m^2	SP2 Infrastructure	N/A	N/A
Parcel 11 B4 Mixed Use 4,542m^2	Now parcel 12	4,542m^2	B4 Mixed Use	FSR – 1.5:1	Height – 14m
Parcel 12 B4 Mixed Use 1,544m^2	Now parcel 13 (and has been reduced in size)	659m2	SP2 Infrastructure	N/A	N/A
Parcel 13 RE1 Public Recreation 303m^2	Now parcel 14 (new parcel 14 encompasses part of old parcel 12, and the whole of old parcel 13, 14 and 15)	11,151m^2	RE1 Public Recreation	N/A	N/A
Parcel 14 B4 Mixed Use 2,251m^2					
Parcel 15 RE1 Public Recreation 7,713m^2					
Parcel 16 SP3 Tourist 10,698m^2	Now parcel 15	10,698m^2	SP3 Tourist	FSR – 1.5:1	Height – 10-15m

Table A2 provides an estimate of possible gross floor area and Table A3 provides possible dwelling yield for the rezoning sites.

Table A2 Anticipated gross floor area

Parcel	Gross Floor Area	
	Non-resi (m^2)	Resi (m^2)
01	1,100	9,100
02		
03	600	5,050
04	270	2,400
05		
06	480	4,300
07		
08	500	4,600
09	400	3,500
10		
11		
12	690	6,100
13		
14		
15		
TOTAL	**4,040**	**35,494**

* Assumed that all sites can achieve full GFA entitlement
** Assumed GFA split =10% non-residential + 90% residential
Source: Hassell

Table A3 Anticipated dwelling yields

Parcel	Number of dwellings				
	Total	**Studio**	**1 bed**	**2 bed**	**3 bed**
		20%	**35%**	**35%**	**10%**
01	**114**	23	40	40	11
02					
03	**63**	13	22	22	6
04	**30**	6	11	11	3
05					
06	**54**	11	19	19	5
07					
08	**57**	11	20	20	6
09	**44**	9	16	16	4
10					
11					
12	**77**	15	27	27	8
13					
14					
15					
16					
TOTAL	**440**	**88**	**154**	**154**	**44**

* Assumed GFA per apartment = 80m^2 average
Source: Hassell



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Attachment K - Economic Assessment

By SGS Economics & Planning, dated May 2017

Rezoning of surplus rail corridor lands – economic assessment

Draft final report

SGS Economics & Planning

UGNSW
May 2017

Independent insight.

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SGS Economics & Planning | Independent insight.

This report has been prepared for UGNSW. SGS Economics and Planning has taken all due care in the preparation of this report.However, SGS and its associated consultants are not liable to any person or entity for any damage or loss that has occurred, or may occur, in relation to that person or entity taking or not taking action in respect of any representation, statement, opinion or advice referred to herein.

SGS Economics and Planning Pty Ltd
ACN 007 437 729
www.sgsep.com.au
Offices in Canberra, Hobart, Melbourne and Sydney

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1 INTRODUCTION

Overview

This section provides a background and context for the economic assessment. It outlines the sites proposed for rezoning Proposal as well as the intended outcomes of the rezoning.

1.1 General

This report has been prepared to support the amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor land ('rail corridor land') between Worth Place and Watt Street in Newcastle city centre (Figure 1).

FIGURE 1. REZONING STUDY AREA



Source: Elton Consulting.

The Newcastle Urban Transformation and Transport Program ('Program') has been established to deliver on NSW Government's more than $500m commitment to revitalise the city centre through: the truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange; the provision of a new light rail line from Wickham to the Beach; and the delivery of a package of urban transformation initiatives.

The transformation element of the Program aims to bring people back to the city centre by strengthening connections between the city and the waterfront, creating employment opportunities, providing more public space and amenity, and delivering better transport.

The proposed rezoning of the rail corridor land forms a part of the delivery of urban transformation initiatives, comprising a package of transport, built form and public domain improvements.

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1.2 Newcastle urban transformation

The Newcastle Urban Renewal Strategy (NURS) sets out the NSW Government's long term approach and vision for the revitalisation of Newcastle city centre to the year 2036.

The NURS identifies three character precincts in Newcastle city centre (West End, Civic and East End), within which significant housing and employment opportunities, together with built form and public domain changes and improvements exist. The NURS describes these precincts as:

- East End: residential, retail, leisure and entertainment
- Civic: the government, business and cultural hub of the city
- West End: the proposed future business district including the western end of Honeysuckle (Cottage Creek)

UrbanGrowth NSW has been directed by NSW Government to deliver on NURS through the Program, in partnership with Transport for NSW (TfNSW), the Hunter Development Corporation (HDC) and the City of Newcastle Council (Council).

Proposed rezoning

UrbanGrowth NSW seeks to amend the Newcastle Local Environmental Plan 2012 (NLEP) to enable the delivery of the Program and the objectives of NURS planning outcomes.

Vision

Our vision for the Program has been informed by feedback from the community, Council, government agencies and urban renewal experts.

> *Our vision is an activated city centre and waterfront that attracts people, new enterprises and tourism. Overtime, we see great opportunities to build on the strengths of the city centre to encourage innovative and enterprising industries to survive. In the longer term, we see an opportunity to strengthen Newcastle's position on the regional, national and international stage, with a view to stronger ties with Asia Pacific.*

Program objectives

The Program is underpinned by five objectives which will drive successful urban transformation:

1. **Bring people back to the city centre**. Reimagining the city centre as an enhanced destination, supported by new employment, educational and housing opportunities and public domain that will attract people
2. **Connect the city to its waterfront**. Unite the city centre and the harbour to improve the experience of being in and moving around the city
3. **Help grow new jobs in the city centre**. Invest in initiatives that create jobs, with a focus on innovative industries, higher education initiatives to encourage a range of businesses to the city centre
4. **Create great places linked to new transport**. Integrate urban transformation with new, efficient transport to activate Hunter and Scott's Streets and return them to thriving main streets
5. **Creating economically sustainable public domain and community assets**. Leave a positive legacy for the people of Newcastle. Ensure that new public domain and community facilities can be maintained to a high standard into the future
6. **Preserve and enhance heritage and culture.** Respect, maintain and enhance the unique heritage and character of Newcastle city centre through the revitalisation activities.

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Urban transformation concept plan

Rail corridor land runs through the East End and Civic city centre precincts (established by NURS).

Based on this vision and the results of extensive stakeholder and community engagement, an overall urban transformation concept plan ('concept plan') has been prepared for rail corridor (rezoning sites), as well as surrounding areas.

The concept plan considers and integrates with the delivery of light rail. It is also coordinated with the proposed Hunter Street Mall development to create an interactive, synergised and cohesive city centre and foreshore area.

The concept plan (as shown in Figure 2) includes five key 'key moves', two that relates to the Civic precinct and three of which relate to the East End.

Entertainment precinct (East End)

1. Civic link (Civic)

This area is the civic heart of Newcastle and includes some of the regions most important civic and cultural assets, including Civic Park, City Hall, Civic Theatre and Newcastle Museum. Current investment in the area includes the law courts development and the University of Newcastle NeW Space campus – both of which are under construction.

The focus of this key 'move' is to leverage best value from new investments by creating new open space and walking and cycling connections that link Newcastle's civic buildings to the waterfront and the light rail system.

- **Civic Green.** Creating a new civic focused public space linking Hunter Street to the Newcastle Museum that will provide direct visual and physical connection from Wheeler Place to the harbour, activate light rail on Hunter Street and meet the needs of the incoming legal and student populations
- **Built form improvements.** Sensibly scaled mixed use development that forms part of the Honeysuckle development.

2. Darby Plaza

Darby Street is Newcastle's premier 'eat street', offering a mix of shops, cafes, restaurants and night life. At present Darby Street ends at the intersection with Hunter Street, and this key 'move' seeks to create a new node of activity and linkage through to the harbour that complements the delivery of light rail.

- **Darby Plaza.** A new community focused public space with play facilities, including provision of new walking and cycling facilities from Hunter Street to the harbour.
- **Built form improvements.** Zoning of rail corridor land between Merewether Street and Argyle Street to allow for future mixed use development in conjunction with surrounding lands in the longer term.

3. Hunter Street Revitalisation (East End)

Hunter Street features some of Newcastle's best heritage buildings and offers a mix of shops, cafes, restaurants and other local business. Hunter Street has experienced decline in recent years, and the opportunity exists to reinstate Hunter Street as the regions premier main street and complements light rail.

- **Built form improvements.** Sensibly scaled mixed use development consistent with the adjoining land uses to create an activated street with 'two edges', celebrate heritage and create new linkages from Hunter Street to the waterfront, provide activation around light rail stops and improve walking and cycling facilities.

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4. Entertainment Precinct (East End)

This key 'move' aims to create a place where people can come to play, relax and reconnect with the harbour in a new public space stretching from Scott Street to the waterfront incorporating a new connection from Market Street to Queens Wharf. This key 'move' assist to activate the area with a variety of activities to create an exciting place for the East End.

– **Recreational opportunities.** This precinct will incorporate the adaptive re-use of the signal box and provision of recreation opportunities for all ages and abilities. Public domain will be, designed to provide a thoughtful series of character areas and experiences as one walks the length. The area will also provide opportunities for viewing and interpretation of heritage character that respect the unique qualities of place.

5. Newcastle Station (East End)

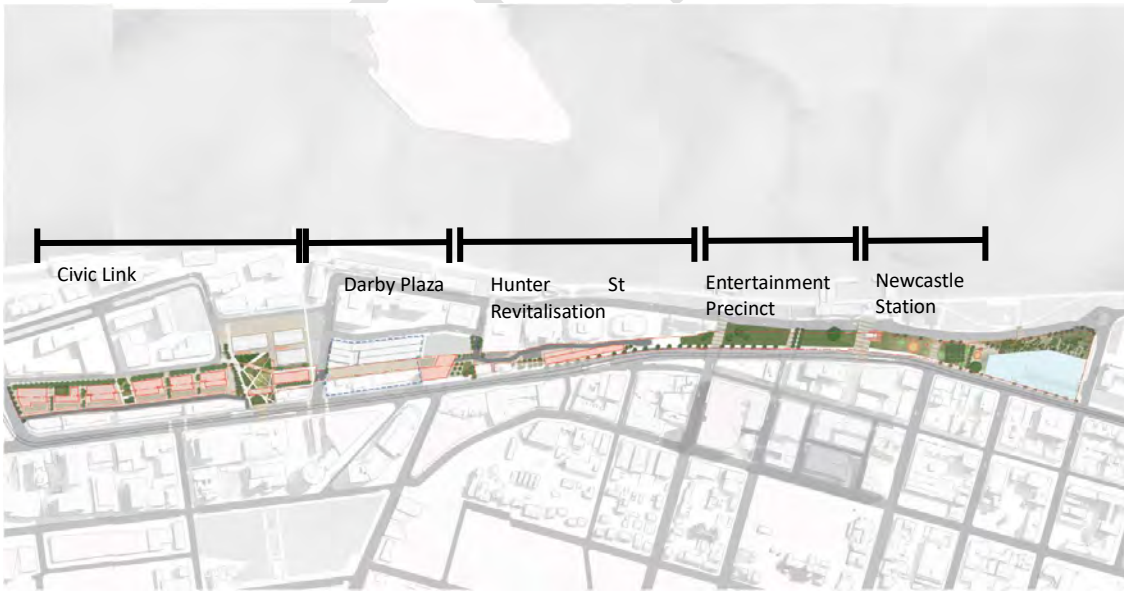
Newcastle Railway Station is proposed to be re-purposed into a hallmark destination and focal point for the new East End, accommodating enterprises and activities that attract visitors and stimulate the economy.

Refurbishment would fully respect and celebrate the heritage integrity of the Station, and could accommodate a range of different activities including community, retail, leisure and commercial uses.

Rezoning concept plan

The proposed rezoning of the rail corridor lands itself, as part of the urban transformation program concept plan, is the focus of this report. Figure 4 provides a red line to define the site rezoning area within the broader program planning outcomes.

FIGURE 2. REZONING CONCEPT PLAN



Source: Hassell

Amendments to the NLEP are required to deliver part of the concept plan. The proposed amendments are on surplus rail corridor land only.

Necessary amendments to the NLEP include:

- Amendment to the Land Use Zoning Map to introduce new B4 Mixed Use and RE1 Public Recreation zones
- Amendment to the Height of Building and Floorspace Ratio maps to facilitate development on select parcels of land
- Amendment to the Land Reservation Acquisition map and Schedule 4 of the NLEP to identify public open space as land for acquisition by Council
- Amendment to the Additional Permitted Uses map to allow specific forms of development at Newcastle Station.

The approach taken to the amendments is to support the NURS planning approach and to remain consistent with surrounding planning controls in terms of zones, floor space ratio (FSR) and height.

The concept plan will also form the basis for updates to the Newcastle City Centre Development Control Plan design controls to guide development and public domain works for rezoning sites.

Proposed Rezoning

This planning proposal seeks to rezone rail corridor land (rezoning sites) to enable the delivery of the proposed urban uses established in the concept plan.

An indication of the location of the proposed rezoning parcel is indicated in the map in Figure 3.

FIGURE 3. REZONING EXPLANATORY MAP – PARCELS



Source: Hassell, 2017

The planning proposal concept plan includes public domain, entertainment, mixed use and commercial and residential development.

In general, the proposed rezoning will provide a mix of uses enabling between 400-500 dwellings which will comprise a variety of styles and types, and around 5,000m^2 of commercial, restaurant and other entertainment uses, as described in Table 3, and excluding any education or associated uses.

Proposed maximum building height and floor space ratio controls respect existing controls that apply to surrounding land.

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TABLE 1. SITES FOR REZONING – PROPOSED DEVELOPMENT SUMMARY

	Parcel Code*	Purpose	Site area (sqm)	Proposed zoning	Proposed floorspace ratio	Proposed maximum building height (m)
Civic Link	1	B4 Mixed Use	3,370	B4 Mixed Use	FSR – 3:1	Height - 30m
	2	B4 Mixed Use	408	B4 Mixed Use	FSR – 3:1	Height - 30m
	3	B4 Mixed Use	1,869	B4 Mixed Use	FSR – 3:1	Height - 30m
	4	B4 Mixed Use	900	B4 Mixed Use	FSR – 3:1	Height - 24m
	5	RE1 Public Recreation	2,839	RE1 Public Recreation	N/A	N/A
	6	B4 Mixed Use	1,604	B4 Mixed Use	FSR – 3:1	Height – 18m
	7	B4 Mixed Use (road)	295	B4 Mixed Use	FSR – 2.5:1	Height – 30m
Darby Park	8	B4 Mixed Use	2,040	B4 Mixed Use	FSR – 2.5:1	Height – 30m
	9	B4 Mixed Use	988	B4 Mixed Use	FSR – 4:1	Height – 24m
Hunter St Rev	10	RE7 Public Recreation	467	RE7 Public Recreation	N/A	N/A
	11	SP2 Infrastructure	386	SP2 Infrastructure	N/A	N/A
	12	B4 Mixed Use	4,542	B4 Mixed Use	FSR – 1.5:1	Height – 14m
	13	SP2 Infrastructure	659	SP2 Infrastructure	N/A	N/A
Entertainment precinct	14	RE1 Public Recreation	11,151	RE1 Public Recreation	N/A	N/A
Newcastle Station	15	SP3 Tourist	10,698	SP3 Tourist	FSR – 1.5:1	Height – 10-15m

Source: Elton, 2017.

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Potential Rezoning Yields

Table 2 provide an estimate of possible gross floor area and Table 3 provides possible dwelling yield for the rezoning sites.

TABLE 2. ANTICIPATED GROSS FLOOR AREA

Parcel	Gross Floor Area	
	Non-resi (m^2)	Resi (m^2)
1	1,100	9,100
2		
3	600	5,050
4	270	2,400
5		
6	480	4,300
7		
8	500	4,600
9	400	3,500
10		
11		
12	690	6,100
13		
14		
15		
TOTAL	4,040	27,760

* Assumed that all sites can achieve full GFA entitlement
** Assumed GFA split =10% non-residential + 90% residential
Source: Hassell

TABLE 3. ANTICIPATED DWELLING YIELD

Parcel	Number of dwellings				
	Total	Studio	1 bed	2 bed	3 bed
		20%	35%	35%	10%
1	**114**	23	40	40	11
2					
3	**63**	13	22	22	6
4	**30**	6	10	10	3
5					
6	**54**	11	19	19	5
7					
8	**57**	11	20	20	6
9	**44**	9	16	16	4
10					
11					
12	**77**	15	27	27	8
13					
14					
15					
16					
TOTAL	**439**	**88**	**154**	**154**	**43**

* Assumed GFA per apartment = 80 square metres average
Source: Hassell

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1.3 Context

Newcastle is the second largest city in NSW and is the economic and social heart of the Hunter Region. Regionally significant infrastructure – including transport, government, health and education services – is located in Newcastle city centre. Key infrastructure of regional and state significance includes:

- Port of Newcastle – one of the world's largest coal export ports and a significant driver for the state economy
- Newcastle Airport – provides regular services to and from Sydney, interstate capitals and regional NSW
- University of Newcastle – one of Australia's leading Universities, and TAFE campus'
- John Hunter Hospital – the main hospital for Newcastle and much of northern NSW
- Social infrastructure such as Newcastle Regional Library, Civic Theatre, Newcastle Museum and Art Gallery and Newcastle City Hall.

Newcastle city centre is the core of this regional city and provides a range of functions including commercial, retail, entertainment, cultural, educational and transport services. It is located on a peninsula between the Pacific Ocean and the Hunter River.

The western and central parts of the city centre are largely built upon the floodplain of the Hunter River and Cottage Creek and consequently are relatively flat. By contrast, the eastern end of the city around Newcastle Station and toward the beach is located on two steep hills, providing a scenic backdrop to the city centre when viewed from the foreshore of the Hunter River.

The topography of the city centre and the gridded street network permit views from the city centre to the harbour, as well as views from the harbour back to the city where the cathedral at the crown of the hill is a recognisable landmark. It contains a rich collection of historic and significant civic buildings which give the city a distinct character.

The compact nature of the city centre, where beach and the city centre are within easy walking distance, makes Newcastle a very attractive place to live and work. The city offers the employment, educational and commercial opportunities of a big regional city with the commuting convenience and proximity of a small city.

1.4 Relationship to other projects

Light rail

The NSW Government has proposed light rail to Newcastle as part of a strategy to revitalise the Newcastle city centre. Light rail will travel from a new transport interchange at Wickham, through the Newcastle city centre to Pacific Park in the east.

The truncation of heavy rail services at Wickham and the building of a new interchange are the first steps in delivering an urban renewal and transport solution for Newcastle.

Transport for NSW has been working closely with UrbanGrowth NSW, Newcastle City Council and Roads and Maritime Services in planning for light rail. Light rail will help improve public transport and access, reunite the city centre with its waterfront and improve the attractiveness of public spaces. The light rail route will travel east from the new transport interchange at Wickham along the existing rail corridor to Worth Place, before moving south to connect with Hunter Street and Scott Street before reaching Pacific Park, near the beach.

Initial geotechnical investigations have been completed and detailed design and environmental planning is well underway.

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The Review of Environmental Factors assessment has been approved and implementation has commenced.

Hunter Street Mall

A 15,000m^2 landholding within Newcastle's Hunter Street Mall was compiled by UrbanGrowth NSW and joint venture partners GPT Group. The site has recently been sold and the developer will commence redevelopment of the Mall sites.

The project ambitions are to:

- revitalise Hunter Street Mall
- leverage the State Government's investment in light rail
- provide an urban renewal catalyst for the East End Precinct, in support of Government's broader Urban Transformation and Transport Program.
- provide for a staged development, broadly bounded by Hunter, King, Perkins and Newcomen Streets, which will include a mixed use development comprising approximately:
    - 4,900m^2 GFA retail premises
    - 2,700m^2 GFA commercial premises
    - 47,800m^2 GFA residential uses comprising residential flat buildings and shop top housing.
    - car parking with a capacity for approximately 491 vehicles to be accessed from King, Perkins, Wolfe, Thorn, Laing, Morgan and Newcomen Streets, and
    - service vehicular access from Perkins, Thorn, Laing and Morgan Streets.

1.5 Report contents

This report provides a qualitative and quantitative economic assessment, including an analysis of market dynamics and job creation potential, arising from possible development outcomes from the rezoning of surplus rail corridor lands.

This report has been based upon the proposed zoning under the Planning Proposal as submitted for Gateway determination, with the inclusion of Parcel 13. It is noted that this parcel has been removed from the current Planning Proposal in accordance with the Gateway determination as issued by the NSW Department of Planning and Environment. Nevertheless, for completeness, this report has considered the potential for some development occurring within this parcel in the future (subject to outcomes of a separate Planning Proposal). The recommendations of this report discuss whether there are any specific implications arising from this additional parcel.

The contents of this report are as follows:

- This section provides an overview of the background to the study, the proposed rezoning and report contents
- Section 2 outlines the demand for commercial and retail floorspace in the Newcastle city centre. It assesses the floorspace outlined in the Proposal for mixed use development. The demand for residential dwellings will also be assessed in this section.
- Section 3 will assess the number of jobs created from the proposed rezoning and the subsequent developments. The impact of construction will also be assessed.
- Section 4 will summarise the findings of this report.

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2 MARKET DYNAMICS

Overview

This section outlines the recent economic performance of the Newcastle city centre including analysis of market dynamics for retail and office development. The benefits of increasing employment and population within a city centre is discussed as the rezoning proposal is aiming to increase commercial floorspace and the number of dwellings within the Newcastle city centre.

Future demand (based on existing research completed by ourselves and other organisations), and how the rezoned rail corridor lands could address future needs.

2.1 Recent economic performance of the Newcastle city centre

Historically the Hunter has been a resource-based economy. Since the 1950s the Hunter has experienced two structural shifts in employment. The first was from primary to secondary industry from the 1950s to 1970s. The second was from the secondary to the tertiary sector. Manufacturing generated most (regional) export activity but tariff reductions led to the loss of steel and closure of BHP. This occurred from the 1970s through to around 1995 with the final departure of BHP in 1999. The employment share in the secondary sector in the Hunter fell from 24.6% in 1976 to only 14.1% in 1996[1].

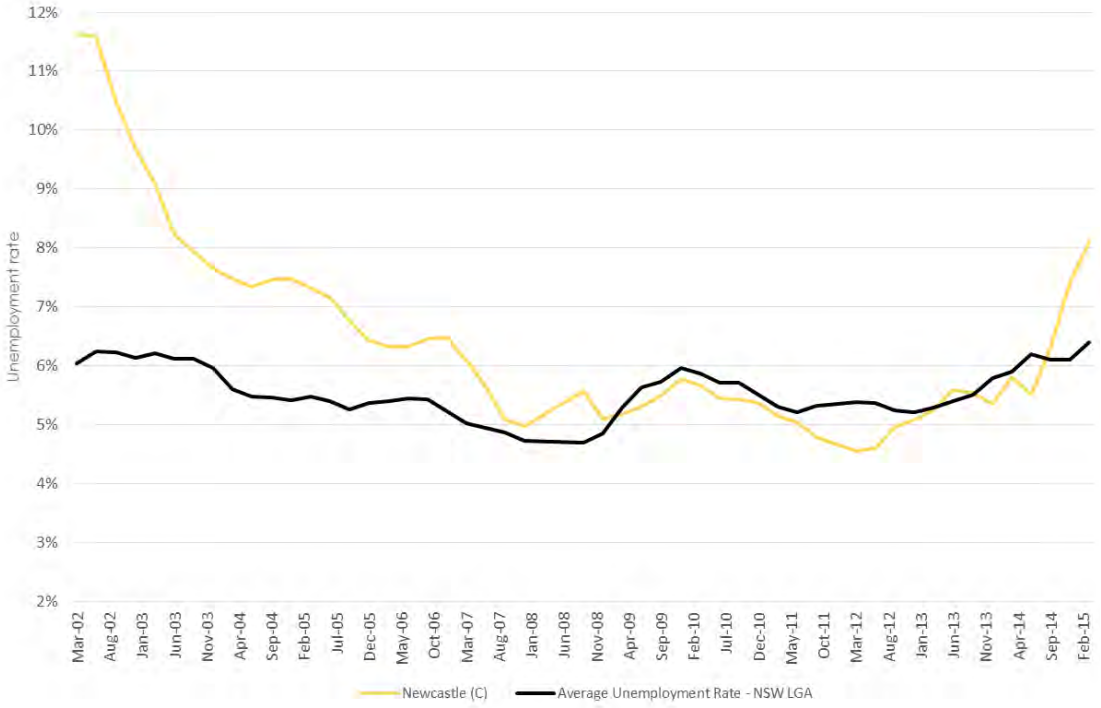
The Newcastle structural change broadly reflects Australian structural changes but the narrower economic base makes it more vulnerable to impacts on few industries.

Unemployment in Newcastle LGA has decreased significantly over the 2000s, from double the NSW average in 2002 (12%) to being below the NSW average between 2009 and 2013 (Figure 4). Recently, there has been an increase in unemployment likely related to the end of mining construction phase. This increase in unemployment reveals the continued vulnerability of the Newcastle LGA to the resources sectors and highlights the need for further diversification in its economic base.

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[1] The Hunter Valley Research Foundation, 2011. Diversification of the Hunter Economy - Post BHP.

FIGURE 4. NEWCASTLE LGA UNEMPLOYMENT RATE



Source: Commonwealth Department of Employment, 2015.

In light of the structural change in employment in the Newcastle city centre, Table 4 highlights the industry composition and growth/decline in the city centre. The industries that changed the most dramatically are highlighted. The key findings are:

- 'Heavier' industries such as Manufacturing, Construction and Wholesale Trade contracted the most in percentage terms
- Retail Trade lost the highest number of jobs in the centre (292); although retail jobs also contracted in the Newcastle LGA by 1%.
- Professional, Scientific and Technical Services decreased in the centre, but increased in the LGA
- Government and education sectors increased at a faster rate in the centre, compared to the LGA

Employment in the Newcastle LGA grew by 1.7% per annum between 2006 and 2011. Over the same period employment growth in the Hunter Region was slightly higher at 2.0%. Comparatively, employment growth in the Newcastle city centre was lower at only 1% per annum. Therefore, much of the employment in the region and in the LGA was at the expense of employment growth in the Newcastle city centre.

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TABLE 4. EMPLOYMENT GROWTH IN THE CITY CENTRE: 2006-2011

	2006	2011	AAGR 2006-2011	AAGR Newcastle LGA	AAGR Hunter Region
Agriculture, Forestry and Fishing	13	41	25.8%	-19.7%	-3.7%
Mining	28	121	34.0%	21.7%	8.5%
Manufacturing	554	275	-13.1%	0.8%	0.6%
Electricity, Gas, Water and Waste Services	491	444	-2.0%	4.4%	3.3%
Construction	585	397	-7.5%	3.0%	2.6%
Wholesale Trade	425	146	-19.2%	-0.9%	-0.3%
Retail Trade	1,819	1,527	-3.4%	-0.2%	-0.1%
Accommodation and Food Services	1,541	1,629	1.1%	2.0%	2.3%
Transport, Postal and Warehousing	661	734	2.1%	2.8%	1.9%
Information Media and Telecommunications	819	699	-3.1%	-4.2%	-2.8%
Financial and Insurance Services	1,804	2,541	7.1%	0.8%	1.2%
Rental, Hiring and Real Estate Services	420	405	-0.7%	-0.5%	0.6%
Professional, Scientific and Technical Services	2,755	2,718	-0.3%	3.7%	3.5%
Administrative and Support Services	748	645	-2.9%	2.4%	3.9%
Public Administration and Safety	2,377	3,096	5.4%	0.6%	1.7%
Education and Training	623	893	7.5%	2.5%	2.1%
Health Care and Social Assistance	1,810	2,232	4.3%	2.8%	3.7%
Arts and Recreation Services	98	146	8.3%	2.8%	2.9%
Other Services	627	459	-6.0%	1.8%	2.8%
Unclassified	345	318	-1.6%	1.2%	1.8%
Total	18,545	19,467	1.0%	1.7%	2.0%

Source: BTS, 2006, 2014.
Note: Industry growth rates were not available for 2001

The top three industries located in the Newcastle city centre are financial and insurance, professional services, and government. These industries account for nearly 40% of total jobs in the Newcastle city centre, indicating the study area still plays a 'higher order' central city role.

Financial and insurance services, public administration and education, and arts and recreation jobs grew significantly in comparison to the benchmark areas. Typically, professional and technical services, administration and support services and retail trade jobs would be expected to increase in a Regional City location but these sectors declined. At the same time, these industries grew or remained stable in benchmark areas – indicating that other centres in the region are cannibalising these jobs. This is inconsistent with Newcastle city centre's role as a Regional City for the Hunter region.

Manufacturing experienced a significant contraction compared to Newcastle LGA. While jobs for some industries have also decreased in the Newcastle LGA and Greater Newcastle, they have typically decreased at a much greater rate in the Newcastle city centre in 2006-2011.

Table 5 below shows the forecast employment for the Newcastle city centre[2]. Highlighted are the top 5 industries in terms of size within the Newcastle city centre. Retail, food and professional services are expected to be the largest industries within the Newcastle city centre. The increase of approximately 9,500 jobs within the centre highlights the potential demand for commercial floorspace.

[2] The Newcastle centre is defined by the following BTS Travel Zones: 6317, 6350, 6351, 6352.

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TABLE 5. NEWCASTLE CITY CENTRE EMPLOYMENT FORECAST

	2011	2016	2021	2026	2031	Change 2011-2031
Agriculture, Forestry and Fishing	41	66	73	77	81	40
Mining	121	84	88	90	92	-29
Manufacturing	275	269	267	266	265	-10
Electricity, Gas, Water and Waste Services	444	399	417	443	464	20
Construction	397	411	439	468	498	100
Wholesale Trade	146	140	132	124	118	-28
Retail Trade	1,527	1,945	2,489	2,699	2,785	1,258
Accommodation and Food Services	1,629	1,887	2,188	2,353	2,486	857
Transport, Postal and Warehousing	734	871	1,038	1,101	1,144	410
Information Media and Telecommunications	699	973	1,187	1,252	1,270	571
Financial and Insurance Services	2,541	2,698	2,886	3,100	3,271	730
Rental, Hiring and Real Estate Services	405	527	642	714	751	345
Professional, Scientific and Technical Services	2,718	3,242	4,018	4,623	4,877	2,159
Administrative and Support Services	645	768	922	989	1,027	381
Public Administration and Safety	3,096	3,425	3,739	3,977	4,177	1,081
Education and Training	893	1,015	1,158	1,211	1,229	336
Health Care and Social Assistance	2,232	2,482	2,622	2,701	2,710	478
Arts and Recreation Services	146	249	347	376	381	234
Other Services	459	572	688	735	757	299
Unclassified	318	352	399	424	423	105
TOTAL	19,467	22,372	25,740	27,723	28,806	9,339

Source: BTS, 2014.

Vacancy rates

Overall commercial vacancy rates have declined over the past year in Newcastle city centre. However, observing different grades of office space shows there is an increase in the vacancy rates for lower grade spaces. A recent Property Council Australia (PCA) report finds that vacancy rates for A-grade office space in the Newcastle area are at an all-time low of 2.7%. However, due to the small size of the market for this space, an uptake of one large office floorplate will have a noticeable impact on net absorption and vacancy.

TABLE 6. COMMERCIAL OFFICE VACANCY RATES: NEWCASTLE CITY CENTRE 2014-2015

Grade	Jan 14 (% of total floorspace)	Jan 15 (% of total floorspace)
A	5.0%	2.7%
B	7.0%	13.3%
C	16.5%	9.8%
D	10.2%	14.1%
Total	9.2%	8.7%

Source: Property Council Australia, 2015.

Discussions with local real estate agents[3] revealed that there is limited demand for office space in the market, with a particularly thin market for A-grade office space. The demand for new office space is driven predominantly by government tenants. At the same time, there is limited demand for low-cost, lower grade office space. The uptake of this office space is low with car parking being cited as a large deterrent to leasing. Anecdotal evidence suggests the cost of car parking in the centre can be a big share of total costs for low-cost space.

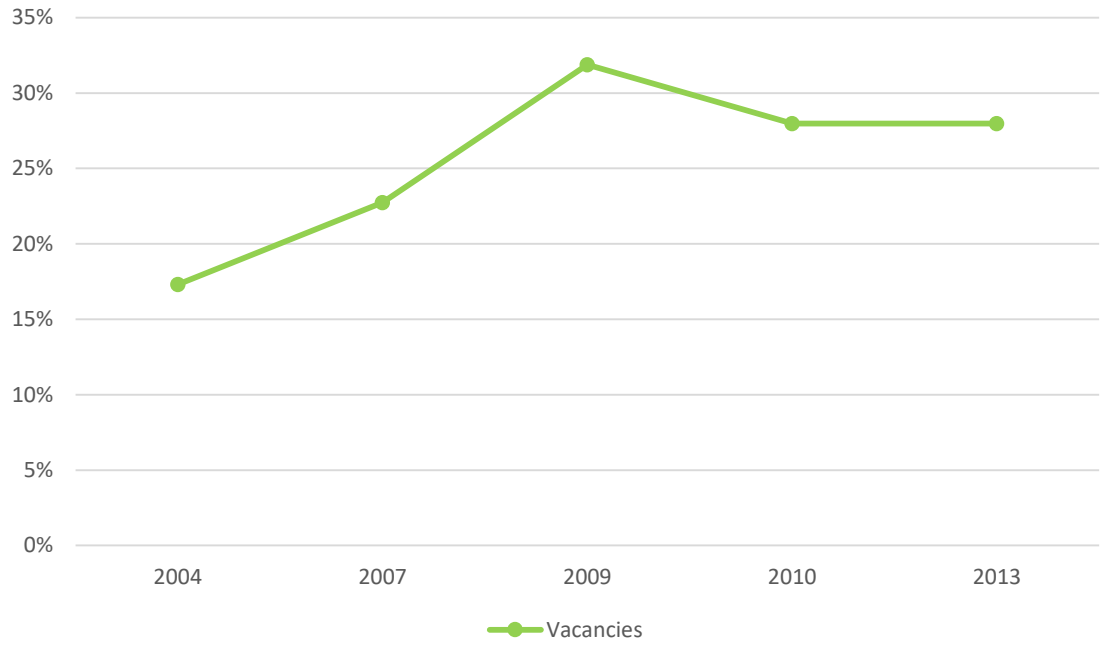
Local real estate agents revealed that funding for development in the Newcastle city centre typically requires a pre-commitment rate of at least 50%. Assembling this demand to underpin commercial office development is a major factor inhibiting feasibility. Government tenants are the biggest drivers in

[3] Including Colliers and Knight Frank.

Newcastle for A-grade office space as they have the scale and longer term stability to provide this evidence for office space demand making development viable.

The vacancy rates for retail floorspace in Newcastle city centre have been significantly high. The closure of David Jones in 2011 the Hunter Street Mall impacted heavily on retail within the centre, with many tenants unable to sustain trade without an anchor tenant to draw in foot traffic. The efforts from organisations such as Renew Newcastle have made good use of the vacant floorspace within the centre, promoting free rent for creative uses of vacant retail shops until a permanent tenant can be found for the site. The initiative draws people to the centre and creates desirable characteristics for potential tenants. However, it has not necessarily resulted in a 'thriving' retail trade within the centre. Retail vacancy rates are still high, likely impacted by the strong retail competition from centres such as Westfield Kotara and Charlestown. The graph below highlights the retail vacancies within the Newcastle city centre.

FIGURE 5. RETAIL VACANCIES: NEWCASTLE CITY CENTRE 2004-2013



Source: Newcastle NOW, 2015.

2.2 Demand for future commercial development

Newcastle city centre contained approximately 255,166 square metres of commercial floorspace at 1 January 2015. Of this floorspace, 22,163 square metres was vacant equating to a vacancy rate of 8.7%. Vacancy rates have decreased from 2014 (9.2%) primarily from an overall positive demand for floorspace. At 1 January 2015, 34% (87,786 square metres) of commercial office floorspace was A-grade, 33% (84,517 square metres) was B-grade (PCA, 2015). The quantity of A-grade floorspace available on the market has increased by 9% whilst B-grade office space has remained the same. However, the absorption of A-grade floorspace has been strong over the past year, reflecting a 2.7% vacancy rate, whilst B-grade floorspace experienced a large increase in vacancy rates. This reflects the uptake of A-grade floorspace as already existing tenants upgrading from lower grade stock (Colliers, 2015). As a result, higher vacancy rates are evident in the lower floorspace grades. The tightening market reflects strong demand for office space.

The supply of new floorspace in Newcastle has been limited over recent years. The market saw the first new A-grade supply from Watt Street Commercial since 2008 (Colliers, 2015). The strong demand for A-

grade floorspace has spurred on new development with DOMA Group proposing a new 7,500square metres building in the Honeysuckle precinct (Colliers, 2015). This development will be the next major boost of prime commercial floorspace to CBD supply.

Newcastle City Council's *Employment Lands Strategy* (Hill PDA, 2013) suggests there will be need for an additional 183,000square metres of commercial office space needed to satisfy demand over the period to 2031. According to the strategy, approximately 125,000square metres of this floorspace will be developed in Cottage Creek leaving 58,000square metres to be supplied in the Newcastle city centre.

The demand for retail floorspace is primarily driven by population growth, requiring increased need for more population serving retail such as supermarket and speciality food retailing. The Newcastle City Council's Employment Lands Strategy (Hill PDA, 2013) determined in that 2011 the Newcastle LGA residents approximately generated 404,000square metres of retail floorspace.

The *Newcastle Urban Renewal Strategy* (Department of Planning and Infrastructure, 2012) outlines significant changes to the Newcastle city centre. The proposal of a new light rail, the University of Newcastle NeW Space campus and urban renewal of the city centre have already triggered stronger demand by residential investors and owner occupiers (Colliers, 2015). It has also encouraged re-adaptive re-use of old buildings. Anecdotal evidence from agents suggests the development of the new Law courts situated on Hunter Street has been a key driver of commercial office demand within close vicinity of the new courts.

The development of a new city campus for the University of Newcastle is considered to be a major catalyst for future demand of commercial floorspace within the centre. The campus is expected to accommodate 3,000 students in the Newcastle city centre. Population serving retail jobs are likely to be stimulated by this influx of students, which will impact on demand for retail floorspace. University based research can stimulate new economic activity, and actively linking research with industry can attract concentrations of knowledge workers and demand for new office space. Universities can help drive industry growth through industry and research partnerships, knowledge transfer and work experience agreements. Subsequently, the new university campus in the centre can support demand for office floorspace.

It is estimated demand for retail floorspace will increase by 182,300square metres by 2031. This is based on future population growth, the number of households, household expenditure and other socio-demographic factors (Hill PDA, 2013).

Impact of additional floorspace

The proposal is seeking to rezone the lands within the rail corridor will provide a total of around 5,000 sqm of non-residential floorspace. The addition of the adjacent lands will contribute a further 2,077sqm of non-residential floorspace. The rail corridor lands is considered to be a lower estimate on impacts, whilst the additional adjacent lands is considered to be the upper estimate. The split between commercial office and retail is assumed to be an even 50/50 split of total non-residential floorspace. Table 7 below shows the assumed allocation of non-residential floorspace.

TABLE 7. ALLOCATION OF NON-RESIDENTIAL FLOORSPACE

	Commercial Floorspace (square metres)	Retail Floorspace (square metres)	TOTAL (square metres)
Rail corridor land (Lower estimate)	2,020	2,020	4,040

Source: UGNSW, 2015; Macroplan, 2015.

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Commercial floorspace

The rezoning of the rail corridor will be able to accommodate a small proportion of total demand for commercial office floorspace. As mentioned above, there is estimated to be demand for approximately 58,000sqm of commercial office floorspace by 2031 (Hill PDA, 2013). The delivery of the rail corridor land alone will only contribute to 3.5% of total floorspace demand. Given the forecast increase in employment within the centre – particularly for Professional services – and the findings from the Newcastle *Employment Lands Strategy*, the Newcastle city centre will be able to absorb the new commercial office floorspace proposed. Furthermore, given the difficulty in securing pre-commitments to provide new office floorspace, the provision of commercial office floorspace as a part of mixed-use development is a cost effective and viable way to deliver commercial office floorspace. In essence, the residential component of the mixed use development would effectively cross-subsidise the construction of commercial floorspace without the need to secure pre-commitments.

Retail floorspace

As with the commercial office floorspace, the rezoning proposal will accommodate a small proportion of total retail floorspace demand. As referred to above, 183,000sqm of additional retail floorspace will be required within Newcastle LGA. The delivery of retail floorspace from the rail corridor alone is around 1.1% of total retail demand. The growth in population within the Newcastle city centre and the forecast of employment growth in Retail highlights the need for to provide retail floorspace to accommodate this demand.

2.3 Impact of employment development

This section will also qualitatively discuss the competitive impact of employment development in the city centre. This assessment will focus on the potential employment development for the rail corridor lands only.

Assessing the impact of increasing employment development in the Newcastle city centre through rezoning is important to consider as it may impact on existing and planned centres in the retail hierarchy.

The Newcastle city centre is the Regional City of the Hunter Valley region according to the Department of Planning and Environment's Lower Hunter Regional Strategy. Therefore, increasing the retail capacity in the centre is consistent with this hierarchy principle. The rezoning proposal will be increasing the supply of commercial floorspace within the CBD. It will not diminish the trading performance of the centre overall, whilst reinforcing the strategic directions for Newcastle city centre as outlined in the Lower Hunter Regional Strategy and the Newcastle City Council's *Local Planning Strategy* (2015).

The additional floorspace associated with the rezoning proposal will deliver approximately 1.1%of total demand for commercial and retail floorspace within Newcastle LGA. Based on the *Newcastle Employment Lands Development Strategy*, expected annual demand for retail and commercial office space is approximately 18,300sqm for Newcastle LGA. The rezoned floorspace will deliver around 22%of total annual commercial and retail floorspace to the centre. Given the expected population growth in the Newcastle city centre, there will be increased demand for non-residential floorspace for population serving jobs. For example, the additional 822 residents associated with the proposal would generate demand for up to 1,620 square metres of retail floorspace, of which 710 square metres could locate in the Newcastle city centre (see Section 3 for further details).

The NSW *Draft Centres Policy* (DPI, 2009) specifies that rezoning's that promote new retail development should contribute to, rather than detract from, the retail hierarchy. The rezoning of the rail corridor and surrounding adjacent lands would support the Newcastle city centre – the Regional City – and hence contributes to the retail hierarchy. The likely risk of impact to other centres trade performance is low given that the proposed floorspace will be accommodating forecast demand for the Newcastle city centre.

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2.4 Benefits of increasing employment in Newcastle city centre

There are distinct benefits of increasing employment in the Newcastle city centre. The concentration of activity in the city centre contributes to more sustainable travel, enhanced agglomeration economies and optimising the use of existing infrastructure within the centre.

More sustainable travel

Activity centres play a critical role in promoting sustainable travel behaviour across a metropolitan area by providing access to goods, services and activities. Lower order activity centres provide for the day-to-day needs of residents while higher order activity centres encourage multi-purpose trips and create viable markets for public transport networks. These factors contribute to the reduced passenger Vehicle Kilometres Travelled (VKT) per year per capita, which can be broken down into the following benefits:

- reduced travel time (this may provide greater time for social and family activities)
- reduced vehicle operating costs
- reduced vehicle accidents
- reduced vehicle congestion
- reduced greenhouse gas emissions and other pollutants such as noise.

Transport mode shifts in favour of public transport can also divert private resources from non-productive car ownership/ parking provisions to more productive investments. While the relationship between urban form and travel patterns is complex, international and Australian evidence suggests that sustainable travel behaviour is encouraged by an activity centres-based urban form.

- In Portland, Oregon urban form characterised by public transport based, mixed use activity centres, are associated with greater public transport use (11.5%) and reduced vehicle miles travelled (9.8 miles per capita) compared to elsewhere in the region (1.2% and 21.8 miles per capita respectively).
- In Australia, the structural shift in the Victorian economy away from dependency on manufacturing based employment to service based employment has been a contributing factor to a reduction in the VKT. These growing sectors has relocated the 'jobs engine' of the Victorian economy to the inner urban region of Melbourne.
- Sydney, with its strengthening polycentric character, has a higher share of motorised trips for retailing by public transport (6.9%) and a much lower average length shopping trip (4.5 kilometres) compared to Melbourne (5.9% and 6.3 kilometres respectively)

A study published by the Victorian Department of Transport suggests that an urban form that is developed along the principles of activity centres and supported by necessary investments in public transport (to alleviate any capacity constraints) will lead to higher public transport mode share and lower transport energy consumption and greenhouse gas emissions, relative to the base case/ current trend urban form scenario.

Agglomeration

The most widely recognised competition and investment benefits associated with improved accessibility are those relating to agglomeration economies. An activity centres policy can enhance agglomeration by enabling greater concentrations of employment in designated activity centres and providing transport to these activity centres. This benefits firms through:

- economies of scale
- economies of scope
- The ability to achieve economies of scale and scope through specialisation given the large numbers of potential customers that are readily accessible
- The availability of numerous supply sources and potentially specialised infrastructure, and the competitive environment that stems from this, and

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- Access to a deep and diverse pool of skilled labour, often complemented by high levels of technological/ knowledge transfer between firms, which helps bolster innovation.

Economies of agglomeration associated with the critical mass of larger centres confer a range of economic benefits including 'knowledge spillovers' and access to 'thick' labour markets. Larger centres are also more likely to gain 'momentum' – a circular and cumulative growth pattern, where new jobs feed off existing jobs, in turn stimulating additional jobs. This is particularly true for retail and services sectors being stimulated by the knowledge industry. The fragmentation of planned large employment precincts and centres into smaller centres (or out-of-centre development) can seriously diminish the positive economic effects of clustering. Therefore of the clustering of new employment floorspace – particularly new commercial office or retail industries– would contribute to the positive externalities associated with agglomeration economies.

Optimising the centre

Across Australia there is considerable convergence in planning strategies and policies for major metropolitan areas. This is at its most obvious when it comes to activity centres policies which form a part of almost all metropolitan spatial plans. An activity centres policy provides direction for development of a metropolitan area characterised by the concentration of employment and population within a network or hierarchy of activity centres, well serviced by transport infrastructure, particularly public transport.

Activity centres vary in size and diversity within a hierarchy ranging from higher-order activity centres to lower order activity centres to serve regional to local geographic spheres of influence.

At all levels in the hierarchy, retail floorspace is the principal attractor of people; it can be conceptualized as the 'glue' which holds vibrant activity centres together. Shopping centres are a good example of how retailers like to cluster, with supermarkets and department stores drawing in a diverse range of speciality retailers. Community and cultural facilities are ideally located in conjunction with core retail attractors for the benefit of users and to achieve acceptable rates of utilisation. A sound retail base is also essential if activity centres are to attract mutually supportive commercial and residential development.

It is argued that laissez faire planning (i.e. allowing retailers freedom to locate where they choose) would result in increased retail competition. This is based on the belief that retailers establishing where they choose would result in a much greater amount of retail floorspace and support various innovative retail forms. It is argued that this would provide more choice for consumers, greater competition for retail spending, and therefore lower costs to the consumer. However, while laissez faire planning may allow for additional retail development, this does not necessarily translate into a more competitive retail environment, or more specifically, benefits for activity centre patrons. An activity centres policy supports retailers locating near competitors, therefore supporting comparison shopping and giving consumers greater choice.

Concentrating employment within an activity centre also makes use of existing infrastructure. Establishing employment outside of a centre will mean an inefficient redistribution of resources away from the activity centre. The marginal cost of building upon the existing infrastructure is likely to be much lower than constructing something new. Encouraging employment within the city also makes best use of existing land and thus reduces the loss of valuable rural and agricultural land.

Newcastle city centre is considered to be the highest order activity centre (Regional City), which aims to serve the regional population of the Lower Hunter. The development of the rail corridor lands endeavours maintain and promote the use of the role and function of the Newcastle city centre as a Regional City.

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2.5 Residential market effects

Recent population growth in the Newcastle city centre

The recent population growth in the city centre will be outlined.

Population in the Newcastle city centre grew by 4.2% (CAGR) between 2001 and 2011.Over the same period, population growth in Newcastle LGA was considerably lower, growing at 0.8%. Comparatively, population growth in NSW over the same period was also 0.9% (Table 8).

TABLE 8. HISTORICAL POPULATION GROWTH: 2001-2011

	2001	2006	2011	% Change (01-11)	CAGR (2001-2011)
Newcastle city centre	4,019	4,926	6,050	50.5%	4.2%
Newcastle LGA	148,073	153,511	160,812	8.6%	0.8%
Hunter Region	550,943	567,941	604,597	9.7%	0.9%
NSW	6,575,217	6,742,690	7,218,529	9.8%	0.9%

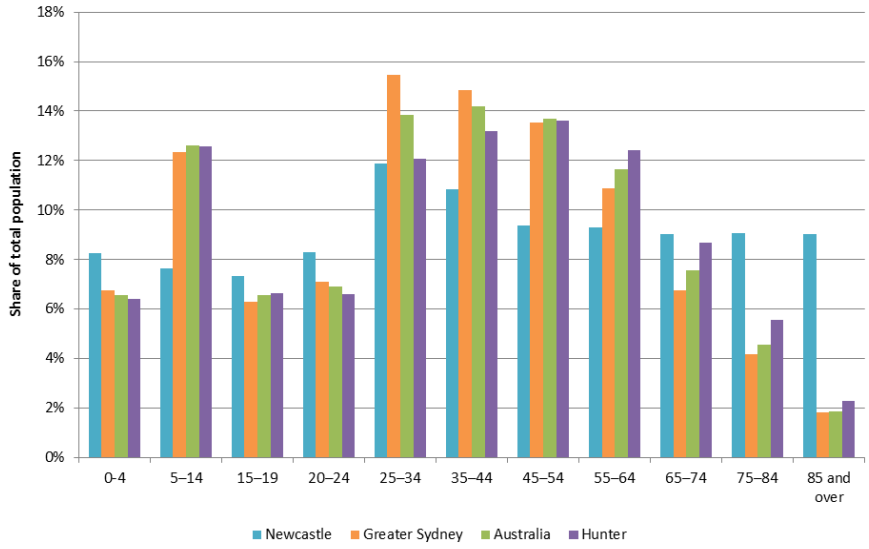
Source: Department of Planning and Environment 2011, 2014, BTS, 2014,

Demographic trends

Age profile

Analysis of the most recent Census data (2011) reveals that the Newcastle LGA has a different age profile component to Greater Sydney and the rest of Australia (Figure 6). Similar to Greater Sydney, the most represented age cohort in the Newcastle LGA is the 25-34 year old group. The Newcastle LGA has a higher share of the population aged 0-4 and 15-24 and over 65 compared to the Greater Sydney Region and Australia in general.

FIGURE 6. NEWCASTLE LGA COMPARATIVE AGE PROFILE



Source: ABS Census, 2011.

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An intensifying 'dependency ratio'[4] will have an adverse impact on the future tax and wealth base of the Newcastle LGA and Hunter Region, as older people draw down their savings, and increase the demands on health infrastructure and services. In the absence of major and countervailing growth and investment elsewhere in the Hunter economy it can be expected that expenditure on health and aged care would lead to structural changes in the economy. The health care sector, senior living services and other services for senior citizens would increase their share of the Hunter economy.

A previous study by the University of Newcastle[5] examining the changing demographics of the Lower Hunter also noted the increasing dependency ratio. The study observed that the major driver of population growth in the region is likely to be internal migration by older age groups. It also noted that since the Lower Hunter does not attract large numbers of overseas migrants (who are generally younger), only a significant economic 'jolt' and/or an expanding disparity in house prices between Lower Hunter and metropolitan Sydney (thereby increasing the relative attractiveness of the former) is likely to alter this projected pattern.

Migration data

Recent data released by the Department of Planning and Environment [6] reveals that (internal and external) migration is an important driver of growth across all LGAs in NSW. For Newcastle, between 2006-07 and 2013-14 there was internal migration of 93,193 and external migration of 88,867, resulting in a net migration gain of 4,326. This increasing trend in net migration suggests there will be increased demand for housing within the Newcastle LGA.

Demand for future residential development in the city centre

This section discusses the market dynamics for residential development in the city centre, including future demand and how the rezoned rail corridor lands could address future needs.

The demand for future residential development in Newcastle city centre is influenced by future population growth and the expected mix of household types. Table 9 shows the forecast growth of population within the Newcastle city centre. Population is expected to increase by 11,000 people by 2036. This is a significant growth and will impact positively on the demand for dwellings.

TABLE 9. NEWCASTLE CITY CENTRE POPULATION FORECAST: 2011-2036

	2001	2006	2011	2031	2036	Population Change	% of Newcastle LGA Population Growth
Newcastle city centre	4,000	5,000	6,100	12,000	15,000	11,000	25%

Source: BTS, 2014.

Table 10 shows the household forecast from the Department of Planning & Environment for the Newcastle LGA. The household forecast directly reflects the expected population growth in Newcastle LGA. It highlights between 2011 and 2031 the key apartment market household types, couples only (20,000, 25%) and lone person (25,450, 31%) households will make up 56% of households in Newcastle (Table 10). That is, there could be 45,450 households who would have a high propensity to live in apartments. Newcastle LGA can also expect an increase in 16,000 dwellings.

[4] The dependency ratio is an age-population ratio of those typically not in the labour force (the dependent part) and those typically in the labour force (the productive part).

[5] McGuirk, P., 2007, *People in the Lower Hunter Region.* Presentation at the Biodiversity Conservation and our Region Forum, University of Newcastle, 18 May 2007.

[6] Department of Planning and Environment, *PopulatioNSW:* Issue 4, April 2014

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TABLE 10. HOUSEHOLD FORECAST FOR NEWCASTLE LGA: 2011-2031

Household types	2011	2016	2021	2026	2031	2031 Share	Growth 2011-31	Contribution to Growth
Couple only	15,200	16,500	17,850	19,000	20,000	25%	4,800	30%
Couple with children	16,550	17,300	18,200	19,050	19,750	24%	3,200	20%
Single parent	7,250	7,600	7,950	8,350	8,700	11%	1,450	9%
Other family households	700	700	750	750	800	1%	100	1%
Multiple-family households	850	900	1,000	1,050	1,050	1%	200	1%
Total family households	40,500	43,050	45,750	48,200	50,350	62%	9,850	62%
Lone person	19,850	21,150	22,500	23,950	25,450	31%	5,600	35%
Group	5,150	5,450	5,550	5,550	5,700	7%	550	3%
Total	65,500	69,600	73,750	77,700	81,500	100%	16,000	100%

Source: DP&E, 2014, SGS 2015.

The average proportion of studio, one and two bedroom dwellings in NSW is around 14.6% of total dwelling stock (Housing NSW, 2015). According to Housing NSW, Newcastle LGA has a higher proportion of these types of dwellings – 23.1%. It shows there is a good dwelling mix that caters to the demographics of the Newcastle LGA as the Table 11 above highlights there is a high proportion of couple only and lone person households who invariably have a higher preference for smaller dwelling types.

The low income households make up the largest share of households in Newcastle LGA (DFAC, 2015). Implicitly, the demand for affordable housing in the LGA is expected to be strong. However, only 32% of rental housing stock in Newcastle was accessible to low income households. Given this, there is clear demand for apartments. Recently, the vacancy rates in Newcastle LGA show there had been some gains in housing stock during the first quarter of 2015. An average annual vacancy rate of 3% in Newcastle LGA is indicative of a relatively 'healthy' rental market. The range is usually between 3%-4%.

TABLE 11. RENTAL VACANCY RATES: 2014-2015

	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	May-15	Jun-15	Jul-15	Aug-15
Newcastle LGA	2.7%	1.9%	1.8%	1.8%	2.4%	2.7%	3.4%	4.6%	4.2%	3.8%	3.8%	3.0%
Hunter Region	3.3%	3.1%	3.4%	3.4%	3.4%	3.3%	3.1%	3.9%	3.1%	3.5%	3.7%	3.1%

Source: REINSW, 2014 & 2015.

Housing Preferences

To better understand the specific housing preferences of residents of the Lower Hunter region, SGS undertook a phone survey of 400 households in July 2012. The purpose of the survey was to gain a better understanding of housing preferences, based on what residents might realistically be able to afford, and without restrictions imposed by the existing housing stock, in terms of its type and location.

The findings revealed that 6.8% of Lower Hunter respondents residents indicated that they had a preference for apartment living. Applying this rate to the Lower Hunter population projections indicates that in 2021 would be around 44,500 people wanting to live in apartments (Table 12). This increases to 50,000 by 2036. This is broadly consistent with the apartment demand from the DP&E household forecast outlined above in Table 10. The additional apartments will contribute between approximately 7% and 10% of total population growth in the Newcastle city centre.

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TABLE 12. LOWER HUNTER HOUSING PREFERENCE CHECK

	2011	2016	2021	2026	2031	2036
Lower Hunter (Newcastle, Lake Macquarie, Port Stephens, Maitland and Cessnock)	586,500	620,500	653,500	685,000	715,500	735,500
Potential Apartment Market (6.8%)	40,000	42,000	44,500	46,500	48,500	50,000

Source: BTS, 2014, SGS, 2015.

Impact of rezoning

As with the commercial floorspace, the residential floorspace has a lower and upper estimate of total floorspace provided. Table 13 shows breakdown of total floorspace to the number of apartments estimated to be developed on the sites.

TABLE 13. NUMBER OF APARTMENTS

	Gross Floorspace	Total apartments	Studio (20%)	1 bed (35%)	2 bed (35%)	3 bed (10%)
Rail corridor	35,200	440	88	154	154	44

Source: UGNSW, 2015

The rezoning of the Rail corridor lands will result in 440 additional apartment dwellings in the centre.

This supply of new apartments in the Newcastle city centre will place downward pressure on house prices in the area. The higher proportion of apartments to be supplied that are less than 3 bedrooms could help to address some of the shortages of supply as outlined by Housing NSW for smaller household types.

From the analysis of future population growth of Newcastle LGA, it is clear that there is a strong demand for flat and apartment type dwellings in Newcastle.

2.6 Benefits of increasing residential development in Newcastle city centre

Greater housing diversity

The benefits of increasing residential development occur in the form of saved costs in terms of land consumption and transport, and greater housing diversity.

Activity centre based urban form implies variable densities across the urban area with concentrations of employment and population in a hierarchy or network of activity centres. In the absence of an approach or policy which concentrates dwellings and employment mainly in activity centres, housing and jobs would need to be accommodated within existing urban areas and/or beyond the urban fringe (in greenfield developments).

If housing and jobs are located in dispersed locations within existing urban areas, this would lead to less housing diversity, more extensive investment to service development (thereby greater cost) and less opportunity to develop a critical mass for innovative infrastructure investment. If housing and jobs are located beyond the urban fringe, the above would also occur.

An activity centres-based approach to land use planning encourages greater housing diversity by providing high density accommodation near employment, services and transport hubs. For example, in Sydney, 72% of dwellings in out-of-centre locations are single detached dwellings. By contrast, only 28% of dwellings in in-centre locations are single detached dwellings. Compared to other Australian cities with a lesser focus on activity centres based development, Sydney has much greater housing diversity (36% of housing in flats or terrace forms compared to 23% in all the other capital cities combined).

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Improved retail viability and vitality

Increasing residential development in centres is particularly important for increasing safety and security (via passive surveillance).Importantly, residential dwellings will also stimulate the local immediate economy, as population serving jobs will be needed to cater for the additional residents. New residents will stimulate demand for services, such as restaurants, cafes, tourism, recreation, entertainment and cultural activities in the centre and drive associated local employment growth. Residential development contributes to activity outside of core business hours and on weekends. Successful city centres remain active outside of business hours and on weekends and therefore rely not just on business activities but also local residents. As highlighted in the *Newcastle Urban Renewal Strategy* (2013) "centres that are open only during business hours or do not provide supporting retail, cultural and service uses are not dynamic and will lose trade and activity to more favourable locations".

Put simply, new residents will improve the retail viability and vitality of the Newcastle city centre.

Greater cost effectiveness and environmental savings

Providing new apartments in the Newcastle city centre is a form of 'infill' development, which is a more cost effective form of development. Trubka, Newman and Billsborough (2010) summarised a number of studies that had documented the different costs and benefits of fringe versus infill growth. The results were summarised in three different papers focussed on general infrastructure and transport, transport related greenhouse emissions, and healthcare and productivity. From the first paper (2010) they included the data in Table 14, which showed the much higher transport costs for an outer area dwelling compared to those for an inner city dwelling.

Table 14. Transportation Costs for 1000 Inner-City and Fringe Dwellings

Cost For 1,000 Dwellings	Inner	Outer
Capital cost of car ownership	$2,990,802	$8,628,654
Fuel costs	$1,203,925	$3,255,349
Other Operating car costs	$1,476,392	$4,259,675
Time costs (total)	$6,158,348	$8,210,448
Private transport	$3,116,810	$8,210,448
Public transport	$3,041,538	$0
Walking And cycling	$0	$0
Road costs	$1,216,597	$3,508,806
Parking costs	$2,184,489	$7,709,869
Externalities (total)	$243,731	$703,250
Fatalities	$73,368	$211,693
Injuries	$23,627	$68,172
Property damage	$38,549	$111,228
Air pollution	$90,777	$261,925
Noise pollution	$17,409	$50,232
Transit costs (capital, and operating)	$3,136,540	$470,481
Total	$18,610,824	$36,746,532

Prices shown are calculated for 2007.

* Public transport travel time costs are not allotted a value for fringe developments because like in the outermost suburbs of Sydney and Melbourne, the level of public transport service is low to non-existent. Travel time costs are not allotted to walking and cycling because the act may also be discretionary, or done for enjoyment, and little empirical evidence exists to quantify the disutility of active commuting modes.
Source: Newman and Kenworthy, 1999

One of the key points about this analysis of the relative costs of outer or inner urban development is that it depends on transformed patterns of travel. Inevitably to realise many of the benefits there is a need for 'smart' investment in transport infrastructure including managing congestion on roads and more public transport. This investment will be counted on the cost side of the ledger. The provision of centre (infill) residential development, coupled with the efficient provision of infrastructure, generally leads to reductions in congestion and the associated negative externalities associated with car-based travel including greenhouse gas emissions, fewer accidents, productivity benefits.

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Compact Urban Development in the Netherlands (Geurs and Van Wee 2006) highlights that CBD and town centre based development saved significant costs in terms of land consumption and transport, and indeed the environmental consequences associated with both land consumption and transport:

> "…without compact urban development policies, urban sprawl in the Netherlands is likely to have been greater, car use would have been higher at the cost of alternative modes, emissions and noise levels in residential and natural environments, and the fragmentation of wildlife habitats would have been higher" (Geurs and Van Wee 2006, p. 139).

An analysis of Melbourne 2030 which assessed the higher share of infill development proposed by that plan found that:

> "The major benefits in Melbourne 2030...stem from transport savings, residential construction efficiencies and well accepted urban consolidated benefits (i.e. fringe land and network infrastructure savings)……the preliminary cost benefit analysis undertaken indicates that the reorientation towards Melbourne 2030 will provide significant resource savings...benefits are expected to outweigh the costs at least by a factor of 3" (McDougall 2007 p.25).

It is therefore critical that the planning for and provision of infrastructure occur in tandem with the land use planning. The development of residential dwellings within an activity centre will ensure synergies are met in regards to investment into infrastructure and providing greater housing diversity. The rezoning of the rail corridor in Newcastle adheres to the general principles outlined above. Residential development in activity centres will be more cost effective than greenfield development and is more likely to generate positive externalities at the same time as reducing negative externalities.

2.7 Summary

The key findings of this Section are:

- The Newcastle city centre has seen a major refocus in industry growth over the past 20 years – moving from manufacturing towards professional service jobs.
- Newcastle city centre is forecast to increase employment by approximately 9,500 by 2031. The industries expected to increase include retail, food and professional service jobs. The additional workers will drive demand for commercial and retail floor space.
- The development of NeW Space campus in the Newcastle city centre is a significant catalyst for increase development in the Newcastle city centre.
- There is an estimated 183,000 sqm demand for office floor space in the Newcastle LGA. The Newcastle city centre – as the Regional City of the Hunter Valley – should be able to accommodate a 32% of this floor space.
- The rezoning of the rail corridor will contribute approximately 3.5% of total demand for commercial office floor space within the Newcastle city centre.
- The growth in population within the Newcastle city centre and the forecast of employment growth in Retail highlights the need for an increase in retail floor space. The release of this floor space is likely to be absorbed by the market.
- Population and dwelling growth is the key driver for residential development in the Newcastle city centre. There is an undersupply of apartments in the Newcastle LGA. Preferences highlight that 6.8% of people within the LGA would prefer to live in apartment dwellings.
- The Proposal will deliver between 400-500 additional apartments to the Newcastle city centre, contributing to apartment demand within the Newcastle LGA.
- The benefits of increasing the number of residents in the centre accrue in the form of better investment decisions into infrastructure, within the centre.
- Increasing the population will assist in providing a better mix of dwellings and greater housing diversity within the Newcastle LGA. It will also improve the vitality and viability of the Newcastle city centre. New residents will stimulate demand for services, such as restaurants, cafes, tourism,

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recreation, entertainment and cultural activities in the centre and drive associated local employment growth. Residential development contributes to activity outside of core business hours and on weekends.

- Benefits of increasing the employment in the Newcastle city centre will amount to benefits including more sustainable travel, economies of agglomeration and optimising the use of existing infrastructure.

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3 JOB CREATION POTENTIAL

Overview

This section outlines the number of jobs that will result from the rezoning proposal. The use of the SGS Input-Output model estimates the number of indirect jobs. The impact of operational and construction jobs have been estimated separately given the economic impacts of construction activity are usually shorter term.

The rezoning proposal of the sites in the rail corridor assumes the following development:

- The heritage refurbishment and adaptive re-use of the Newcastle Railway Station to a hallmark destination. Job estimates based on an adaptive retail and office uses have been tested, with 'Station Markets' and an 'Innovation Hub' model used for testing.
- Mixed use development in the corridor (commercial and retail floorspace)
- The development of residential apartments

A more detailed description of each action is outlined below.

Newcastle Railway Station: Heritage refurbishment and adaptive re-use

This action aims to refurbish and fit-out the existing Newcastle station to a mix of retail, business and community uses. If the Newcastle Station was used re-used for retail purposes it could provide multiple retail functions such as café breakfast, daytime markets, and wine bar/restaurant evenings, food-based retail, market stalls and special events. It could function as a high quality shopping and dining precinct, drawing on produce from the Hunter region (e.g. wine, cheese, chocolate, small goods), and assisting in creating a sense of place for the retail offer in central Newcastle.

Retail, business and community uses could serve inner-city residents, CBD workers and students, as well as residents from across broader Newcastle, the Lower Hunter region and tourists.

The refurbishment and adaptive re-use of the station has also been tested with an 'Innovation Hub' concept.

The Innovation Hub is assumed to take up 560 square metres (equivalent to taking up the first floor of the Station Building). The concept of an Innovation Hub has been adapted from a broader initiative driven by Hunter Innovation Project (a partnership between Newcastle NOW, University of Newcastle and the City of Newcastle). It would have high-speed broadband and would accommodate start-up businesses, graduate students, short-term workers, researchers and entrepreneurs. It could provide flexible facilities for up to 300 desks within 3-5 years, and an expected total of some 500 people accessing desk spaces each month. The Innovation Hub would be supported by the development of a network linking independent, micro co-working spaces in specialty creative, professional or technical businesses through industry associations, events and workshops.

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Mixed use development in the corridor

The development of mixed use buildings in the Newcastle city centre would to deliver commercial floorspace to the Newcastle city centre. The delivery of commercial floorspace would ensure there is adequate supply within the centre.

The proposed amount of commercial floorspace is around 5,000 square metres reflecting a lower and upper estimate. It is assumed the split of this floorspace between retail and office use is an even 50/50 split, resulting in approximately 2.000 square metres of floorspace for each use.

Development of apartment dwellings

Residential development is focussed on ensuring adequate supply of residential sites to meet future demand for city living generated by the transformation program including public domain and entertainment options.

The proposal estimates between 400-500 apartments to be developed. The lower estimate of reflects apartments to be developed within the rail corridor lands only whilst the upper estimate reflects apartments within the rail corridor and adjacent lands.

3.1 Estimation of direct and indirect operational jobs

The estimation of direct jobs from the actions outlined above has been completed using industry standard per capita retail demand benchmark ratios and employment floorspace densities[7]. The estimation of indirect jobs from the actions outlined have been produced using an Input-Output Model generated for Newcastle LGA.

Input-Output Model

The Input-Output (I-O) Model is a tool which quantifies the linkages of all sectors in a given economy. A region specific model for Newcastle LGA was utilised to assess economic impacts of any project during the construction and operational phases as well as from current activities on-site. A detailed breakdown of the Input-Output Model is shown in Appendix A. I-O models measure the relationships and inter-dependence between industries in the economy. The model identifies the buyer and supplier linkages in the local economy, highlighting those industries that have the greatest economic 'multipliers'. Multipliers are measures of the total impact on all industries in an economy arising from changes in the output of a particular industry. For example, an increase in output of the construction industry (i.e. more houses) would have a flow-on effect to industries related to construction.

The Input-Output model measures the effects of additional development in a particular industry. For every dollar or unit of output from one industry there are flow-on effects to other industries in the form of goods and services required. These supply-chain effects (generally referred to as 'production induced effects') are both direct (first round effects) and indirect (second round effects). For example, a housing construction firm might require the services of a bricklayer (direct round), who would in turn require the services of a brick maker (indirect effect), and so on. There are also consumer driven effects (otherwise known as 'consumption induced effects'), which are created by the additional demand in the economy generated by the wages of those employed in the production process. The focus of this analysis is on the local 'multiplier' effects associated with an increase in production in a particular industry.

The Newcastle LGA was used as the Input-Output modelling does not accommodate for smaller geographies. Multipliers derived from the model estimate three key measures:

[7] For example, these benchmarks are used by Deep End Services, Location.IQ, MacroPlan, AEC Group.

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- Output (or income): This measures the total amount of output (or income) induced across all industries by the requirement to satisfy the additional demand from the construction work.
- Value added Gross Regional Product (GRP): This is defined as the additional wages, salaries and supplements, and Gross Operating Surplus earned by local residents and businesses in the process of producing the extra output induced by the initial stimulus from the markets.
- Full time equivalent (FTE) jobs: This refers to the full time equivalent (FTE) positions of employment generated from the economic stimulus. Both direct and indirect flow-on effects are captured from the stimulus.

Assumptions and limitations

Though a cost-effective and widely used technique for economic impact analysis, I-O modelling has some limitations. A feasible alternative to using I-O modelling for economic impact assessments is to utilise partial or general equilibrium econometric models. Hence, the I-O model is generally considered a useful starting point only. Appendix A will detail these limitations in more depth.

Benchmark metrics and per capita retail demand benchmarks to estimate generic floorspace demand as a consequence of an increased number of residents in centre. The use of industry standard floorspace ratios does not account for differences in income or other socio-demographic factors. The drivers of retail floorspace may also change over the course of the forecast as alternative retail offers such as online shopping become more dominant, resulting in less floorspace needed. These factors are not captured within the generic benchmark employment densities.

3.2 Results

Newcastle Railway Station

The direct jobs associated with heritage refurbishment and adaptive re-use of the Newcastle Station into station markets derived by estimates generated in the MacroPlan analysis. The estimates are as follows:

- 1,200 square metres allocated for the Station Building, with an employment density of 25 square metres for every employee. Approximately 41 FTE jobs are estimated to be supported by this development.
- 1,300 square metres allocated for the Market Stalls, with an employment density of 1.5 square metres per employee. Approximately 59 FTE jobs are estimated to be supported by this development.

The estimation of direct jobs associated with the development of the Innovation Hub relies on floorspace employment densities. Newcastle NOW provided an employment density estimate for a shared work space of 10 square metres per worker based on their research and similar to research report completed by Third Space. It is also assumed the hub to have a 75% occupancy rate to account for business turnover; however, it is acknowledged that the occupancy rate may start at a lower initial level and ramp up over time. With a floorspace of 560 square metres, the Innovation Hub could support between 42-56 jobs[8]. The indirect jobs that would be supported by the hub is approximately 61 additional jobs. Table 15 below shows the total number of jobs created.

[8] Assuming 100% occupancy rate equates to 56 jobs within the hub.

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TABLE 15. TOTAL NUMBER OF JOBS CREATED FROM REFURBISHMENT OF STATION

	No. of direct jobs	No. of indirect jobs	TOTAL number jobs
Station Markets	100	66	166
Innovation Hub	42	61	103
TOTAL	142	127	269

Source: SGS, 2015.

These direct job estimates associated with the heritage refurbishment and adaptive re-use of the Newcastle Station represent just two possible scenarios of utilising this space. It is acknowledged that the Station building could be used for other uses, including community uses, and that different uses would result in different employment impacts.

Mixed Use Development

The direct jobs related to the development of commercial and retail floorspace is estimated using industry standard employment densities for land use types. It is assumed total commercial floorspace is split 50/50 between retail and commercial office space. The typical employment density for a commercial office and retail is approximately 25 square metres and 30 square metres per worker, respectively. These ratios are an average and can range depending on the nature of office or retail floorspace. Given the amount of floorspace proposed to be rezoned, approximately 148 jobs can be supported by this rezoning proposal.

The number of indirect jobs supported by retail and commercial floorspace differs as the employment multipliers are not the same for all industries as the wages and therefore disposable incomes undoubtedly vary for each industry. The total number of indirect jobs supported by the commercial floorspace is approximately 180, whilst approximately 70 indirect jobs are supported by the retail floorspace. Table 16 below shows the calculation of direct and indirect jobs for the proposed lands within the rail corridor and adjacent lands. The jobs associated with the rail corridor is considered a lower estimate with the addition of the Adjacent lands an upper estimate.

TABLE 16. TOTAL NUMBER OF JOBS CREATED FROM MIXED USE DEVELOPMENT

	Floorspace (square metres)	Employment density (square metres/worker)	Direct Jobs (no.)	Indirect Jobs (no.)	Total Number of Jobs
Commercial Office floorspace	2,020	25	81	118	198
Retail floorspace	2,020	30	67	45	112
TOTAL	4,040	55	148	163	310

Source: SGS, 2015.

Development of apartment dwellings

The direct jobs associated with the development of apartment dwellings is estimated by applying benchmark ratio floorspace demand against the incoming population associated with the apartments.

Firstly, the total number of residents is estimated based on a national average housing utilisation rate. Approximately 675 residents will occupy the apartments in the centre as seen in Table 17 below.

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TABLE 17. ESTIMATED NUMBER OF RESIDENTS

	Number of apartments	Average number of persons/bedroom	Total Persons
Rail corridor lands			
Studio	88	1	88
1 Bed	154	1.3	200
2 Bed	154	1.8	277
3 Bed	44	2.5	110
Total	440	-	675

Source: SGS, 2015.

A per capita ratio of retail spend is estimated to equate to 2.4square metres demand for floorspace. This has been disaggregated firstly into retail spend in the Newcastle city centre and out of the centre and then further broken down into different types of retail spend. It is assumed that some retail spend will occur outside of the Newcastle city centre given that there is limited choice, particularly for department stores and bulky goods retailing within the Newcastle city centre. It is assumed 100% of food retailing expenditure will be consumed within the centre. 50% of department store and retail services will be spent outside of the Newcastle city centre whilst 100% of non-food specialities and bulky good purchases will also be made outside of the centre. The disaggregation of retail types allows for a better estimation of jobs based on employment densities as each category has a different employment density as shown in Table 18 below.

TABLE 18. PER CAPITA SPEND AND EMPLOYMENT DENSITY

Per capita spend	Ratio (square metres)	% of total number	Employment density (square metres/worker)
Retail type			
Newcastle city centre			
Food Retailing			
Supermarket floorspace	0.4	16%	30
Food retail specialities	0.2	7%	30
Food catering	0.3	11%	20
Non-food Retailing			
Dept. store	0.2	7%	40
Retail services	0.1	4%	25
Outside of the Centre			
Non-food Retailing			
Dept store.	0.2	7%	40
Non-food specialities	0.4	16%	40
Bulky goods	0.7	30%	40
Retail services	0.1	4%	25
TOTAL	2.4	100%	

Source: SGS, 2015.

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Table 19 summarises the total number of jobs estimated to be created from the residential development component of the rezoning proposal. The number of retail jobs created from apartment development is approximately 80 jobs reflecting a lower and upper estimate.

TABLE 19. TOTAL NUMBER OF JOBS CREATED FROM APARTMENT DEVELOPMENT

	Direct Jobs within Newcastle city centre	Direct jobs outside of the Newcastle city centre	Total Number of Direct Jobs	Indirect jobs	Total number of jobs
Rail corridor	26	24	50	33	83

Source: SGS, 2015.

The number of direct jobs that will be supported by the development of 400-500 apartments is approximately 26 jobs within the CBD. The additional jobs created outside of the Newcastle city centre is estimated to be around 24 jobs. This is based on the assumption that not all retail spend will be based within the Newcastle city centre as highlighted in Table 18 above. The number of indirect jobs that will be established from the direct jobs created within the centre is approximately 33 jobs.

3.3 Estimation of construction jobs

The impact assessment of construction activity from the development of the sites has been completed using an Input-Output model.

Estimates of overall development costs were provided by UrbanGrowth NSW. This includes building construction, public domain construction, site infrastructure planning costs, program establishment and program delivery costs, and lastly, professional fees. These costs have been allocated to the appropriate industry represented in the Input-Output model, which uses ANZSIC categories. This breakdown was determined using ANZSIC category definitions and assumptions regarding the most suitable industry for each use.

TABLE 20. CONSTRUCTION COSTS BY INDUSTRY

	Total Cost ($M)
Residential Building Construction	$173.9
Non-Residential Building Construction	$24.7
Heavy and Civil Engineering Construction	$7.4
Construction Services	$34.5
Professional, Scientific and Technical Services	$22.9
Accommodation	$0.2
Water Supply, Sewerage and Drainage Services	$4.6
TOTAL (Exc. GST)	$268.2

Source: UGNSW, 2015; SGS, 2015.

The BTS Journey to Work patterns were used to approximate the spatial economy linkages between the location of activity and where the source of labour is coming from. Not all labour and services will come from within the Newcastle LGA. The Journey to Work patterns have been adjusted to capture workers that do not necessarily live within the LGA but will temporarily relocate for the construction phase. Table 21 summarises the assumptions used behind each industry to determine the direct output impact for Newcastle LGA.

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TABLE 21. LABOUR SOURCE INSIDE AND OUTSIDE OF THE NEWCASTLE LGA: SGS ADJUSTED

Industry	Sourced within the LGA (SGS adjusted)	Sourced outside of the LGA (SGS adjusted)	Sourced within the LGA (Unadjusted)	Sourced outside of the LGA (Unadjusted)
Residential Building Construction	52%	48%	45%	55%
Non-Residential Building Construction	52%	48%	45%	55%
Heavy and Civil Engineering Construction	42%	58%	35%	65%
Construction Services	55%	45%	50%	50%
Professional, Scientific and Technical Services	57%	43%	57%	43%
Accommodation	62%	38%	62%	38%
Water Supply, Sewerage and Drainage Services	52%	48%	45%	55%

Source: BTS, 2015.

The direct impact related to the construction phase is based on where the construction activity occurs, opposed to where labour and services were sourced. The extent of which this direct activity is contained within the Newcastle LGA is dependent on where workers, goods and services are located rather than were the activity site is. That is, determining the amount of wages and profit captured within the local economy from the labour sourced from outside of the LGA. Those who live outside of the LGA are likely to spend a portion of their income where they live rather than within the LGA.

Comparing and analysing the industry specialisation of the Newcastle LGA to the LGA's within the Lower Hunter indicated that, of the labour sourced from outside of the LGA, an average of 21% of the production induced flow-on activity would be retained within the LGA. The number of indirect jobs that will be retained within the LGA will again rely on Journey to Work patterns, unadjusted, as the best estimate of the spatial economy. As these are indirect jobs associated with the construction activity, thus further along the supply chain, the readjustment is unnecessary as it is unlikely there will be any temporary relocation of these workers.

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Impact Assessment

Using Table 21, total spend on construction of this project of $268.2 million is estimated to directly generate $124.5 million in industry output for businesses within the Newcastle LGA. The estimations of the direct and indirect effect of this increase in industry output is shown in Table 22below. Approximately an additional $40 million in indirect industry output for businesses.

TABLE 22. IMPACT OF CONSTRUCTION

	Direct Impacts			Indirect Impacts		
	Direct output	Gross Value Added	Employment	Output	Gross Value Added	Employment
Residential Building Construction	$90.0	$20.82	248	$30.70	$62.05	115
Non-Residential Building Construction	$12.8	$3.24	19	$4.40	$7.75	26
Heavy and Civil Engineering Construction	$3.1	$1.13	4	$1.03	$0.90	4
Construction Services	$19.0	$7.24	78	$6.14	$4.69	18
Professional, Scientific and Technical Services	$13.1	$7.20	58	$4.27	$0.78	24
Accommodation	$0.1	$0.05	1	$0.03	$0.00	0
Water Supply, Sewerage and Drainage Services	$2.4	$1.12	5	$0.49	$0.00	1
TOTAL	**$140.4**	**$40.8**	**412**	**$47.1**	**$76.2**	**189**

Source: SGS, 2015.

A total of approximately $117 million in gross value added activity is estimated to be within Newcastle LGA over the construction phase for both direct and indirect effect of activity. It is estimated a total of approximately 600 jobs will be supported by the construction activity within the Newcastle LGA.

3.4 Summary

The key findings from this section are as follows:

- An additional 550-660 jobs will be established within the Rail corridor and adjacent lands. This is based on the development of the mixed use sites as well as demand for services from the people within the apartments.
  - Newcastle Station Markets: 160-270 total jobs
  - Mixed Use development: 310 total jobs
  - Residential apartments: 80 total jobs
- The direct impact of the anticipated increase in construction activity is estimated to contribute to an additional $124.5 million in industry output, 600 additional jobs within the centre and a gross value add of $98 million to the local economy.

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4 CONCLUSION

This report considered the range of economic impacts associated with the proposed rezoning of the surplus rail corridor lands. The report included analysis of employment market dynamics within the Newcastle city centre, residential market dynamics and the job creation potential of the rezoning proposal. The key findings are displayed below.

4.1 Employment market dynamics

The Newcastle city centre has seen a major refocus in industry growth over the past 20 years – moving from manufacturing towards professional service jobs. There is forecast employment growth of approximately 9,500 by 2031. The industries expected to increase include retail, food and professional service jobs. The additional workers will drive demand for commercial and retail floor space.

Commercial floorspace

There is demand for an estimated 183,000 sqm of office floor space in the Newcastle LGA. The Newcastle city centre – as the Regional City of the Hunter Valley – should be able to accommodate a 32% of this floor space (approximately 58,000sqm). The development of NeW Space campus in the Newcastle city centre should be a significant catalyst for increased development in the Newcastle city centre. The rezoning of the rail corridor will contribute approximately 3.5% of total demand for commercial office floor space within the Newcastle city centre.

In short:

- By 2031, demand for commercial floorspace will increase by 58,000 sqm within the Newcastle centre
- The proposed development is estimated to deliver 2,020 sqm of commercial which contributes to a small (3.5%) but important addition to accommodate forecast growth to 2031.

Retail floorspace

The growth in population within the Newcastle city centre and the forecast of employment growth in Retail highlights the need for an increase in retail floor space. The release of this floor space is likely to be absorbed by the market.

In short:

- By 2031, demand for commercial floorspace will increase by 182,000 sqm in Newcastle[9]
- The proposed development is estimated to deliver 2,020sqm of retail floorspace contributing 1.1% - a small but valuable contribution to accommodate forecast growth within the LGA.

4.2 Residential market dynamics

Population growth is the key driver for residential development in the Newcastle city centre. The housing preferences of the Lower Hunter population reveal that around 6.8% of people prefer to live in apartments and that there is currently an undersupply of apartments in the Newcastle LGA.

[9] Data not available for Newcastle centre

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The Rezoning proposal will deliver between 400-500 additional apartments to the Newcastle city centre, contributing to apartment supply within the Newcastle LGA.

There are a range of benefits associated with residential development in and around centres. The benefits accrue in the form of more sustainable travel, economies of agglomeration and optimal use of infrastructure. It will also improve the vitality and viability of the Newcastle city centre, given that new residents will stimulate demand for services, such as restaurants, cafes, tourism, recreation, entertainment and cultural activities in the centre and drive associated local employment growth. Residential development contributes to activity outside of core business hours and on weekends.

Increasing the population will assist in providing a better mix of dwellings and greater housing diversity within the Newcastle LGA.

4.3 Job creation potential

An additional 550-660 jobs will be established within the rail corridor and adjacent lands. This is based on the development of the mixed use sites as well as demand for services from the people within the apartments:

- Newcastle Station Markets: 160-270 total jobs
- Mixed Use development: 310 total jobs
- Residential apartments: 80 total jobs

The direct impact of the anticipated increase in construction activity is estimated to contribute to an additional $124.5 million in industry output, 600 additional jobs within the centre and a gross value add of $98 million to the local economy.

4.4 Consistency with s117 Directions

The NSW Minister for Planning and Environment issues a list of Directions (s117 Directions) to relevant planning authorities under section 117(2) of the *Environmental Planning and Assessment Act 1979*. These directions apply to planning proposals lodged with the Department of Planning and Environment on or after the date the particular direction was issued. Given that much of the proposed rezoning is for a B4 Mixed Use zone, the consistency of this proposal was considered against the objectives and requirements for the s117 Directions for 1.1 Business and Industrial Zones (Table 23 and Table 24).

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TABLE 23. CONSISTENCY WITH OBJECTIVES

No.	Objective	Addressed by the Proposal
1	Encourage employment growth in suitable locations	• The proposal would deliver additional land zoned for commercial and retail use inside the current Regional centre. The delivery of additional employment in the Newcastle city centre optimises the existing infrastructure assets and will further bolster the role of the Newcastle city centre as the economic centre of the Hunter.
2	Protect employment land in business and industrial zones	• The proposal will increase in supply of commercial floorspace within the Newcastle city centre, which is identified as the Regional Centre and the most important employment centre in the Hunter. Therefore, the proposal will protect and promote employment land. • Delivering commercial and retail floorspace will accommodate some of the future growth in demand. • Delivering residential dwellings, will increase the local population in the centre and in turn will generate demand for retail uses in the centre; thus enhancing the role of existing employment lands within the centre.
3	Support the viability of identified strategic centres	• Delivering dwellings, jobs and providing a catalyst for increased investments in the Newcastle city centre – the Regional centre – in accordance with the planning policy • The proposal will promote employment in the strategic Newcastle city centre via the addition of commercial floorspace and new residents. The proposal therefore will support the viability of the Newcastle city centre.

Source: SGS, 2015.

TABLE 24. CONSISTENCY WITH THE REQUIREMENTS

No.	Requirement	Addressed by the Proposal
1	Give effect to the objectives of this direction	• Delivered and described in the above Table 23
2	Retain the areas and locations for existing business and industrial zones	• This requirement will be met by the Proposal as the delivery of the additional business floorspace will be provided in a suitable location, retaining and supporting the employment role of the Newcastle city centre. The proposal does not result in the loss of areas and locations for existing business and industrial zones.
3	Not reduce the total potential floorspace area for employment uses and related public services in business zones	• Again, this requirement will be met by the proposal as it would deliver additional retail and commercial office floorspace in the Newcastle city centre. This floorspace is not expected to be dependent on the transfer of investment from existing employment lands. • Demand for floorspace is considerable and the proposal will not meet the demand to its entirety. Therefore the remaining demand will adequately support the current businesses within the existing employment lands.
4	Not reduce the total potential floorspace for industrial uses in industrial zones	• This requirement will be met by the proposal as the rezoning of lands does not involve the rezoning away from industrially zoned land. It will not have any negative impacts on the existing industrial lands. Increased economic activity within the Newcastle city centre is likely to result in positive flow-on effects generating demand for industrial lands in the region. Furthermore, the reinforcing of the Newcastle city centre as the primary location for office commercial office and retail development in the region, reinforces the role of centres for these types of uses and of industrial zones for industrial uses (i.e. commercial office and retail are not encroaching on industrial areas).
5	Ensure that proposed new employment areas are in accordance with a strategy that is approved by the Director-General of the Department of Planning	• This requirement is met by the proposal which is line with the Lower Hunter Regional Strategy, which outlines the Newcastle city centre as the Regional City. It also supports local City of Newcastle strategies which outline the importance of Newcastle city centre as the primary location for centre based employment.

Source: SGS, 2015.

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6 APPENDIX A – INPUT-OUTPUT METHODOLOGY

SGS utilises an input-output (IO) econometric modelling technique to convert the direct impacts of construction and operation of the construction works into indirect impacts in terms of employment, output and wealth generation at a regional level. For the purposes of this analysis, the regional economy is defined as the Newcastle LGA.

In essence, SGS takes the inter-industry relationships (buyer-supplier transaction) that are measured by the Australian Bureau of Statistics in the National Accounts, and scales these relationships down to a state level, i.e. using available datasets and accepted mathematical techniques. The results of this scaling process are a set of regional industry specific multipliers which estimate how spending in a specific regional industry, via the assessed direct impacts (stimuli), flows through to total regional:

- Output (or income): This measures the total amount of output (or income) induced across all industries by the requirement to satisfy the additional demand from the construction work.
- Value added Gross Regional Product (GRP): This is defined as the additional wages, salaries and supplements, and Gross Operating Surplus earned by local residents and businesses in the process of producing the extra output induced by the initial stimulus from the markets.
- Full time equivalent (FTE) jobs: This refers to the full time equivalent (FTE) positions of employment generated from the economic stimulus. Both direct and indirect flow-on effects are captured from the stimulus.

Key qualifications

Though a cost-effective and widely used technique for economic impact analysis, IO modelling has some limitations, as follows. The only feasible alternative to using IO modelling for economic impact assessments is to utilise partial or general equilibrium econometric models.

- The input output (econometric) model assumes relationships between industries are static over the forecast period. That is, productivity improvements are not factored in and historic relationships are assumed to hold.
- The input output (econometric) model derives relationships between industries using total production estimates. Consequently, the relationships are 'average', whereas the stimulus used as an input is 'marginal'. Such an approach does not account for any 'underutilised capacity' at the industry level or additional economies of scale that might ensue, as production expands from its existing base.
- As already mentioned, all of the stimuli are assumed to be 'new' economic activities for each regional economy. That is, crowding out or industry substitution effects are assumed to be negligible, meaning that key economic inputs such as labour and capital are assumed to be unconstrained, i.e. there is sufficient slack in the economy to service these stimuli without transferring significant resources from other productive uses. It also means that the activities that are promoted by the subject project do not adversely affect operations elsewhere.

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Contact us

CANBERRA

Level 6, 39 London Circuit
Canberra ACT 2601

+61 2 6263 5940
sgsact@sgsep.com.au

HOBART

PO Box 123
Franklin TAS 7113

+61 421 372 940
sgstas@sgsep.com.au

MELBOURNE

Level 14, 222 Exhibition Street
Melbourne VIC 3000

+61 3 8616 0331
sgsvic@sgsep.com.au

SYDNEY

209/50 Holt Street
Surry Hills NSW 2010

+61 2 8307 0121
sgsnsw@sgsep.com.au

SGS Economics & Planning

Attachment L - Servicing Investigation

By ADW Johnson, dated March 2017

ADW JOHNSON PTY LIMITED
ABN 62 129 445 398

Central Coast
5 Pioneer Avenue
Tuggerah NSW 2259
Ph. 02 4305 4300
Fax. 02 4305 4399
coast@adwjohnson.com.au

Hunter Region
7/335 Hillsborough Road,
Warners Bay NSW 2282
Ph. 02 4978 5100
Fax. 02 4978 5199
hunter@adwjohnson.com.au

Engineering

Working Beyond Expectations

Servicing Investigation

Newcastle Urban Transformation and Transport Program

Rezoning of Surplus Corridor Lands

Date:
March 2017

Document Control Sheet

Issue No.	Amendment	Date	Prepared By	Checked By
DRAFT	Preliminary Issue	26/06/2015	HW	AC
A	Draft	20/07/2015	HW	AC
B	Rezoning Submission	2/12/2015	HW	AC
C	Draft Report for client review	5/2/2016	HW	MK
D	Final Report	1/4/2016	MK	MK
E	Final Report	2/5/2016	MK	MK
F	Post Gateway Report	28/2/2017	MK	MK
G	Minor Amendments	20/3/2017	MK	MK

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1.0 Introduction

1.1 GENERAL

This report has been prepared to support the amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor land ('rail corridor land') between Worth Place and Watt Street in Newcastle city centre (Figure 1).



Source: Hassell

Figure 1 – Rezoning Study Area

The Newcastle Urban Transformation and Transport Program ('Program') has been established to deliver on NSW Government's more than $500m commitment to revitalise the city centre through: the truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange; the provision of a new light rail line from Wickham to the Beach; and the delivery of a package of urban transformation initiatives.

The transformation element of the Program aims to bring people back to the city centre by strengthening connections between the city and the waterfront, creating employment opportunities, providing more public space and amenity, and delivering better transport.

The proposed rezoning of the rail corridor land forms a part of the delivery of urban transformation initiatives, comprising a package of transport, built form and public domain improvements.

1.2 NEWCASTLE URBAN TRANSFORMATION

The Newcastle Urban Renewal Strategy (NURS) sets out the NSW Government's long term approach and vision for the revitalisation of Newcastle city centre to the year 2036.

The NURS identifies three (3) character precincts in Newcastle city centre (West End, Civic and East End), within which significant housing and employment opportunities, together with built form and public domain changes and improvements exist. The NURS describes these precincts as:

- East End: residential, retail, leisure and entertainment;
- Civic: the government, business and cultural hub of the city;
- West End: the proposed future business district including the western end of Honeysuckle (Cottage Creek).

UrbanGrowth NSW has been directed by NSW Government to deliver on NURS through the Program, in partnership with Transport for NSW (TfNSW), the Hunter Development Corporation (HDC) and the City of Newcastle Council (Council).

1.3 SITE LOCATION

The rezoning site is located in Newcastle city centre and comprises a collection of land holdings within the surplus rail corridor lands.

The site is approximately 2.1km in length generally bounded by Wharf Road to the north, Watt Street to the east, Hunter and Scott Streets to the south and Worth Street to the west. The site includes Civic and Newcastle Stations.

Current Zoning

All rezoning sites are affected by the SP2 Infrastructure (Railway) zone under NLEP.

1.4 PROPOSED REZONING

UrbanGrowth NSW seeks to amend the Newcastle Local Environmental Plan 2012 (NLEP) to enable the delivery of the Program and the objectives of NURS planning outcomes.

Vision

The vision for the Program has been informed by feedback from the community, Council, government agencies and urban renewal experts.

> Our vision is an activated city centre and waterfront that attracts people, new enterprises and tourism. Overtime, we see great opportunities to build on the strengths of the city centre to encourage innovative and enterprising industries to survive. In the longer term, we see an opportunity to strengthen Newcastle's position on the regional, national and international stage, with a view to stronger ties with Asia Pacific.

Program Objectives

The Program is underpinned by five (5) objectives which will drive successful urban revitalisation:

- **Bring people back to the city centre.** Reimagining the city centre as an enhanced destination, supported by new employment, educational and housing opportunities and public domain that will attract people;
- **Connect the city to its waterfront.** Unite the city centre and the harbour to improve the experience of being in and moving around the city;
- **Help grow new jobs in the city centre.** Invest in initiatives that create jobs, with a focus on innovative industries, higher education initiatives to encourage a range of businesses to the city centre;
- **Create great places linked to new transport.** Integrate urban transformation with new, efficient transport to activate Hunter and Scott's Streets and return them to thriving main streets;

- **Creating economically sustainable public domain and community assets.** Leave a positive legacy for the people of Newcastle. Ensure that new public domain and community facilities can be maintained to a high standard into the future;
- **Preserve and enhance Heritage and culture**. Respect, maintain and enhance the unique heritage and character of Newcastle city centre through the revitalisation activities.

Urban Transformation Proposed Concept Plan

Rail corridor land runs through the East End and Civic city centre precincts (established by NURS).

Based on this vision and the results of extensive stakeholder and community engagement, an overall urban transformation concept plan ('concept plan') has been prepared for rail corridor (rezoning sites), as well as surrounding areas.

The concept plan considers and integrates with the delivery of light rail. It is also coordinated with the proposed Hunter Street Mall development to create an interactive, synergised and cohesive city centre and foreshore area.

The concept plan (as shown in Figure 4) includes five (5) key 'key moves', two (2) that relates to the Civic precinct and three (3) of which relate to the East End.

1. Civic Link (Civic)

This area is the civic heart of Newcastle and includes some of the regions most important civic and cultural assets, including Civic Park, City Hall, Civic Theatre and Newcastle Museum. Current investment in the area includes the law courts development and the University of Newcastle NeW Space campus – both of which are under construction.

The focus of this key 'move' is to leverage best value from new investments by creating new open space and walking and cycling connections that link Newcastle's civic buildings to the waterfront and the light rail system.

- **Civic Green.** Creating a new civic focused public space linking Hunter Street to the Newcastle Museum that will provide direct visual and physical connection from Wheeler Place to the harbour, activate light rail on Hunter Street and meet the needs of the incoming legal and student populations;
- **Built form improvements.** Sensibly scaled mixed use development that forms part of the Honeysuckle development.

2. Darby Plaza (Civic)

Darby Street is Newcastle's premier 'eat street', offering a mix of shops, cafes, restaurants and night life. At present Darby Street ends at the intersection with Hunter Street, and this key 'move' seeks to create a new node of activity and linkage through to the harbour that complements the delivery of light rail.

- **Darby Plaza.** A new community focused public space with play facilities, including provision of new walking and cycling facilities from Hunter Street to the harbour;

- **Built form improvements.** Zoning of rail corridor land between Merewether Street and Argyle Street to allow for future mixed use development in conjunction with surrounding lands in the longer term.

3. Hunter Street Revitalisation (East End)

Hunter Street features some of Newcastle's best heritage buildings and offers a mix of shops, cafes, restaurants and other local business. Hunter Street has experienced decline in recent years, and the opportunity exists to reinstate Hunter Street as the regions premier main street and complements light rail.

- **Built form improvements.** Sensibly scaled mixed use development consistent with the adjoining land uses to create an activated street with 'two edges', celebrate heritage and create new linkages from Hunter Street to the waterfront, provide activation around light rail stops and improve walking and cycling facilities.

4. Entertainment Precinct (East End)

This key move aims to create a place where people can come to play, relax and reconnect with the harbour in a new public space stretching from Scott Street to the waterfront incorporating a new connection from Market Street to Queens Wharf. This key 'move' assist to activate the area with a variety of activities to create an exciting place for the East End.

- **Recreational opportunities.** This precinct will incorporate the adaptive re-use of the signal box and provision of recreation opportunities for all ages and abilities. Public domain will be, designed to provide a thoughtful series of character areas and experiences as one walks the length. The area will also provide opportunities for viewing and interpretation of heritage character that respect the unique qualities of place.

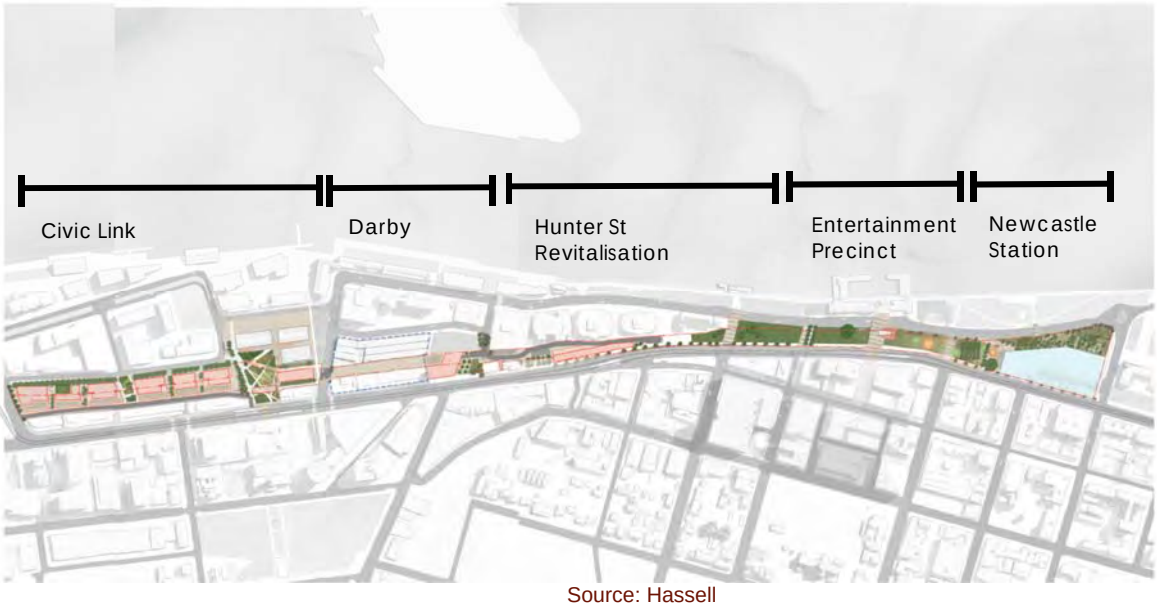
5. Newcastle Station (East End)

Newcastle Railway Station is proposed to be re-purposed into a hallmark destination and focal point for the new East End, accommodating enterprises and activities that attract visitors and stimulate the economy.

Refurbishment would fully respect and celebrate the heritage integrity of the Station, and could accommodate a range of different activities including community, retail, leisure and commercial uses.

Rezoning Concept Plan

The proposed rezoning of the rail corridor lands is the focus of this report. Figure 2 provides a red line to define the site rezoning area within the broader program planning outcomes.



Source: Hassell

Figure 2 – Rezoning Concept Plan

Amendments to the NLEP are required to deliver part of the concept plan. The proposed amendments are on surplus rail corridor land only.

Necessary amendments to the NLEP 2012 include:

- Amending the Land Use Zoning Map to introduce B4 Mixed Use, SP3 Tourism and RE1 Public Recreation zones to sites along the corridor; and
- Amending the Height of Building and Floor Space Ratio maps to apply appropriate development standards to selected parcels of land.

The approach taken to the amendments is to support the NURS planning approach and to remain consistent with surrounding planning controls in terms of zones, floor space ratio (FSR) and height.

The concept plan will also form the basis for updates to the Newcastle City Centre Development Control Plan design controls to guide development and public domain works for rezoning sites.

Proposed Rezoning

This planning proposal seeks to rezone rail corridor land (rezoning sites) to enable the delivery of the proposed urban uses established in the concept plan.

An indication of the location of the proposed rezoning parcel is indicated in the map in Figure 3.



Source: Hassell

Figure 3 – Rezoning Explanatory Map – Parcels

The planning proposal concept plan includes public domain, entertainment, mixed use and commercial and residential development.

In general, the proposed rezoning will provide a mix of uses with between 400-500 dwellings which will comprise a variety of styles and types, and around 5,000m² of commercial, restaurant and other entertainment uses, as described in Table 3, excluding any education or associated uses.

Proposed rezoning controls respect existing controls that apply to surrounding land. This applies to maximum building height and floor space ratio standards.

Table 1 – Sites for Rezoning – Proposed Development Summary

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 01 B4 Mixed Use 3,370m²	Parcel 01	3,370m²	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 02 B4 Mixed Use 408m²	Parcel 02	408m²	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 03 B4 Mixed Use 3,146m²	Parcel 03	1,869m²	B4 Mixed Use	FSR – 3:1	Height - 30m
	Parcel 04	900m²	B4 Mixed Use	FSR – 3:1	Height - 24m
Parcel 04 RE1 Public Recreation 2,464m²	Now parcel 05 (and small corner of old 03 where western boundary of park realigned)	2,839m²	RE1 Public Recreation	N/A	N/A
Parcel 05 B4 Mixed Use 1,603m²	Now parcel 06	1,604m²	B4 Mixed Use	FSR – 3:1	Height – 18m

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 06 B4 Mixed Use 295m²	Now parcel 07	295m²	B4 Mixed Use	FSR – 2.5:1	Height – 30m
Parcel 07 B4 Mixed Use 2,040m²	Now parcel 08	2,040m²	B4 Mixed Use	FSR – 2.5:1	Height – 30m
Parcel 08 B4 Mixed Use 988m²	Now parcel 09	988m²	B4 Mixed Use	FSR – 4:1	Height – 24m
Parcel 09 B4 Mixed Use 467m²	Now parcel 10	467m²	RE1 Public Recreation	N/A	N/A
Parcel 10 SP2 Infrastructure 386m²	Now parcel 11	386m²	SP2 Infrastructure	N/A	N/A
Parcel 11 B4 Mixed Use 4,542m²	Now parcel 12*	4,542m²	B4 Mixed Use	FSR – 1.5:1	Height – 14m
Parcel 12 B4 Mixed Use 1,544m²	Now parcel 13 (and has been reduced in size)	659m2	SP2 Infrastructure	N/A	N/A
Parcel 13 RE1 Public Recreation 303m²	Now parcel 14 (new parcel 14 encompasses part of old parcel 12, and the whole of old parcel 13, 14 and 15)	11,151m²	RE1 Public Recreation	N/A	N/A
Parcel 14 B4 Mixed Use 2,251m²					
Parcel 15 RE1 Public Recreation 7,713m²					
Parcel 16 SP3 Tourist 10,698m²	Now parcel 15	10,698m²	SP3 Tourist	FSR – 1.5:1	Height – 10-15m

- Refer Parcel 12 note below.

This report has been based upon the proposed zoning under the Planning Proposal as submitted for Gateway determination, with the inclusion of Parcel 13. It is noted that this parcel has been removed from the current Planning Proposal in accordance with the Gateway determination as issued by the NSW Department of Planning and Environment. Nevertheless, for completeness, this report has considered the potential for some development occurring within this parcel in the future (subject to outcomes of a separate Planning Proposal). The recommendations of this report discuss whether there are any specific implications arising from this additional parcel.

Potential Rezoning Yields

Table 2 provide an estimate of possible gross floor area and Table 3 provides possible dwelling yield for the rezoning sites.

Table 2 – Anticipated Gross Floor Area

Precinct	Parcel	Gross Floor Area		
		Total	Non-resi (m²)	Resi (m²)
Civic Link	01	**10,200**	1,100	9,100
	02			
	03	**5,650**	600	5,050
	04	**2,670**	270	2,400
	05			
	06	**4,780**	480	4,300
	07			
Darby Plaza	08	**5,100**	500	4,600
	09	**3,900**	400	3,500
	10			
Hunter St Revitalisation	11			
	12	**6,790**	690	6,100
	13			
	14			
Newcastle Station	15			
	TOTAL	**39,090**	**4,040**	**35,050**

* Assumed that all sites can achieve full GFA entitlement
** Assumed GFA split =10% non-residential + 90% residential
Source: Hassell
***The end use of Newcastle Station is not yet known. For the purposes of load calculations it has been assumed that 100% of this Precinct will be developed. Loads have been based off commercial yields.

Table 3 – Anticipated Dwelling Yield

Parcel		Number of dwellings				
		Total	*Studio*	*1 bed*	*2 bed*	*3 bed*
			20%	*35%*	*35%*	*10%*
Civic Link	01	**114**	23	40	40	11
	02					
	03	**63**	13	22	22	6
	04	**30**	6	11	11	3
	05					
	06	**54**	11	19	19	5
	07					
Darby Plaza	08	**57**	11	20	20	6
	09	**44**	9	16	16	4
	10					
Hunter St Revitalisation	11					
	12	**77**	15	27	27	8
	13					
	14					
Newcastle Station	15					
	TOTAL	**440**	**88**	**154**	**154**	**44**

* Assumed GFA per apartment = 80m² average (Source: Hassall)

UrbanGrowth NSW has been tasked to play a coordinating role in the repurposing of surplus land along the former heavy rail corridor between Wickham and Newcastle Beach. This entails the delivery of significant public domain spaces along with retail and residential development to support the revitalisation of Newcastle.

The scale and mix of the redevelopment is subject to ongoing refinement based on community and stakeholder engagement.

ADW Johnson has been engaged to investigate available services to support this project and to identify any existing system constraints in terms of water, wastewater, electricity, communications and stormwater.

For the purposes of investigation, the overall development site was broken down into seven (7) discrete catchments representing areas proposed for retail and residential development.

On the basis of the above, assessment of the existing services available to the site was undertaken and is presented below.

2.0 Development Mix

Based on the rezoning proposal, the development footprint was broken into wastewater and water servicing catchments. These areas are shown on Exhibit 1 along with surrounding existing water and wastewater infrastructure and the rezoning parcels.

It is noted that at this point in time development types and yields are indicative only for the purposes of estimating preliminary demands and are subject to ongoing refinement. The estimated development Equivalent Tenements (ET) are summarised in Table 4 below.

Table 4 – Assumed Development Demand

Catchment	Rezoning Parcel	ET
1	1, 2, 3 &4	140
2	5,6 & 7	37
3	8 & 9	69
4	10,11&12	53
5	13	0
6	14	0
7	15	15*
TOTAL		**314**

*The end use of Newcastle Station is not yet known. For the purposes of load calculations it has been assumed that 100% of this Precinct will be developed. Loads have been based off commercial yields.

Based on this development proposal, indicative water demand, wastewater loads and electrical and communications demands were determined. The water and wastewater demands calculated were referred to Hunter Water Corporation (HWC) for their advice on system capacity and Ausgrid and NBN Co were consulted in relation to the electrical and communications demands.

3.0 Water and Wastewater

3.1 DESIGN FLOWS

Design sewer and water flows based on the development proposal were estimated in accordance with the Water and Sewer Codes of Australia – Hunter Water Corporation Editions. These estimates are presented in Table 5 below. The location of the proposed development sites and a full breakdown of the calculated flows is shown on the attached drawings (Exhibit 2).

Table 5 – Design Water and Wastewater Flows

Catchment	Water 95% ile + fire flow (l/s)	Wastewater Peak wet weather sewer flow (l/s)
1	22.4	12.9
2	20.7	3.7
3	21.3	6.6
4	21.0	5.2
5	20	0.0
6	20	0.0
7	20.3	1.1

Previous estimates of demands were forwarded to HWC to determine if the existing system is capable of supporting the proposed development. The HWC response is presented in Appendix A and is summarised below noting that the current development yields (approx. 314 ET) are significantly lower than those referred to HWC (600 ET), and lower than the previous estimate (370 ET).

3.2 SERVICING CONSTRAINTS TO DEVELOPMENT - WATER

Based on the advice from HWC, water servicing for the redevelopment area is straightforward. Small reticulation upgrades are required to service some of the catchments as outlined in Table 6 below and as shown on the attached drawings (Exhibit 3).

Table 6 – Indicative Upgrade Requirements

Catchment	Required Works *
1	DN150 x 400m watermain along Wright Lane. Thrust bore
2	No leadin works. Connect to ND200 PE main fronting site.
3	No leadin works. Connect to ND150 main fronting site.
4	Link DN250 to DN150 Hunter St to Wharf Road. DN150 x 150m. Thrust bore Hunter Street
5	-**
6	-**
7	No leadin. Connect to ND150 main fronting site.

*Pressure and fire requirements within the future buildings are subject to building hydraulic analyses. Works listed above are the requirements to supply in accordance with HWC licence obligations at the boundary of the development.

** Previous iterations of the project included some development within these catchments, and as such an upgrade from the existing 100mm water main to a 150mm main was required. Development is no longer proposed within this catchment, removing the need for the main upgrade. Should Parcel 13 in Catchment 5 be developed I the future, the existing 100mm main would require an upgrade to a 150mm main.

3.3 SERVICING CONSTRAINTS TO DEVELOPMENT - WASTEWATER

The majority of the proposed development sites sit within the wastewater pumping station area of Newcastle 2 Waste Water Pumping Station (WWPS). These are Catchments 2 – 7 with Catchment 1 located within Newcastle 12 WWPS. The location of these pumping stations is shown on the attached drawings (Exhibit 1).

Initial advice from HWC was that some upgrades to Newcastle 2 WWPS, however further advice indicated that no upgrades would be required based on the lower expected yield, other than potentially minor reticulation upgrades to transfer flows to the pump stations.

Confirmation based on the latest yields has been sought from HWC, however at the time of writing formal advice is not available. Given the anticipated yields have reduced to 314 ET, from the previous estimate of 370 ET (which was reduced from 600 ET when advice was first sought) it is considered unlikely that infrastructure requirements will change.

4.0 Electrical

Power Solutions has been engaged to undertake an assessment of electrical and communications services for the Newcastle Urban Transformation project. Their report is attached at Appendix B. On the basis of preliminary discussions with Ausgrid, the load from the proposed development mix could be serviced off the existing 11kV HV network via a number of substations. The scale and type of likely substations is summarised from the Power Solutions report in Table 7 below. It is noted that the below upgrades are based on a higher demand than what is currently proposed.

Table 7 – Indicative Electrical Substation Requirements

Catchment	Suggested substation type	Indicative substation size (kVA)
1	Chamber	2 x 1,000
2	Kiosk	400
3	Chamber	750
4	Kiosk	600
5	-*	-
6	-*	-
7	Kiosk	600

- Previous iterations of the project included some development within these catchments, and a 600KVA kiosk was proposed. Development no longer proposed within this catchment.

There is an existing Ausgrid substation located on the northern side of the Hunter Street and Darby Street intersection. As part of the redevelopment of Catchment 3, this substation would either be relocated or incorporated into the proposed development. It should be noted that further investigation will be required to determine where the substation could be relocated considering the length of cable required and the subsequent voltage drops. Ausgrid would also need access arrangements and a potential easement created as part of any relocation.

5.0 Communications

NBN Co have been approached in relation to the communications servicing for the precinct. Whilst their policy is to not indicate service availability until a formal application is received, their preliminary advice is that servicing of the precinct with high bandwidth fibre can be installed as part of the development.

6.0 Gas

Gas services are readily available at the site. Jemena has advised that they will consider servicing the site once the full details are known. Due to the high density of the development and proximity of the site to existing services, it is considered likely that gas service will be provided as part of the development.

7.0 Stormwater

7.1 DESIGN CRITERIA

This section of the report refers to local stormwater treatment only. For flooding analysis refer to separate flooding report.

Stormwater management for this proposal will need to address the requirements in Newcastle Development Control Plan -7.06 Stormwater, and supplementary references.

Broadly, the development will need to:

- Match Post development run-off to Pre Development conditions;
- Prevent pollutants such as litter, sediment, nutrients and oils from entering waterways, in this case the Hunter River;
- Minimise soil erosion and sedimentation from site disturbance.

Options for achieving the above are broad in nature and suitable controls will need to be developed on site by site basis once the built form is known, which is at the development application stage.

7.2 SITE CATCHMENT

Each site parcel located along former rail corridor along Hunter Street. As such, the catchment is characterised by flat grades. Runoff from upstream is conveyed to Hunter Street, where stormwater is conveyed from Hunter Street via minor and major networks in Parcels 7, 10 and 14, which are not proposed for development.

Based on LiDAR contours, the proposed development sites are not located within overland flow paths and hence will need to manage runoff from the individual development site only.

For the purposes of this report, it has been assumed that each site, when developed, will be 100% impervious.

Table 8 – Impervious Area of Developer Parcels

Parcel	Area (Ha)	%Impervious
1	0.33	100
3	0.18	100
4	0.09	100
6	0.16	100
8	0.2	100
9	0.1	100
12	0.45	100
13	.06	100
15	10.6	100

7.3 SOURCE CONTROLS

As noted in Section 7.1 above, a variety of source controls could be utilised on this site, and should be designed once the built form is known, however stormwater detention and treatment will need to be provided on lot and be owned and maintained by the future land owner.

Given the nature of the site, the following source controls are considered most appropriate:

- *Onsite Detention and Retention Tank*. Given the high value nature of the site, it is considered that most developers will elect to provide detention in an underground tank, rather than a small basin which would reduce available land for development.

  Down pipes from the roof will be directed into underground detention tanks. These tanks can also be utilised to hold approximate 10-20kl for reuse for on potable uses such as toilet flushing, irrigation or laundry (subject to detailed water balance).

- *Media Filtration.* Discharge from the detention tank will flow to a second pit, where low volume flows will be treated through a filter medium which will provide water quality treatment prior to discharge to the public drainage network. This pit will also collect run off from surrounding paths, and basement drainage (if required) for treatment prior to discharge.

Approximate sizes are shown in Table 9 below. Note these are approximately only and are subject to individual hydrological and water balance modelling.

Other source controls, may be considered appropriate for this site include:

- *First Flush Devices.* These could be fitted to downpipes to prevent litter entering the retention tank.

- *Gross Pollutant Trap.* There are a range of property devices that can provide stormwater quality treatment.

- *Bioretention Rain Gardens.* Rain gardens may provide water quality treatment measures for relatively small land take and serve as an architectural feature.

Table 9 – Detention and Retention approx. requirements

Parcel	Detention Volume (m3)	Retention Volume (m3)
1	82.5	70
3	45	45
4	22.5	24
6	40	40
8	50	50
9	25	25
12	112.5	100
13	15	15
15	*Subject to detailed hydrological modelling.	*Subject to detailed water balance.

Sediment and Erosion Control will also need to be managed through the construction process. Future contractors will need to prepare a Sediment and Erosion plan prior to disturbing the site in accordance with the "Soils and Construction – Managing Urban Stormwater- Landcom 2004" manual- or the "Blue Book", and Council requirements.

Specific features of the sediment and erosion control strategy would likely include:

- Sediment Basin(s);
- Silt fencing;

- Clean water diversions;
- Inlet protection of downstream stormwater pits.

7.4 SOURCE CONTROLS

As on lot drainage will remain in private ownership, and therefore AS3500 – Plumbing and Drainage will guide the design of the minor network, AS3500 requires that commercial/mixed use facilities should be free from nuisance flooding in the 10% AEP (Annual Exceedance Probability) and hence the minor network has been design to accommodate the runoff in from the 10%AEP.

Developed parcels will drain to the existing drainage network on surrounding roads as shown in the attached drawings (Exhibit 4). The remaining parcels are predominantly open space, pervious areas, and as such no specific stormwater treatment is proposed. Depending on final landscape design, the may be a required for localised pit and pipe networks.

8.0 Conclusion

Based on the anticipated land uses and densities, the total proposed development footprint can be supplied with water with limited upgrades to the existing system as outlined above.

Advice received from HWC is that there will be no requirement for pump station upgrades. Minor upgrades to reticulation mains may be required.

Ausgrid has advised that there is sufficient capacity within their high voltage network to cater for the scale and type of development envisaged. It is noted that substations will be required off the high voltage network to service the individual catchments as outlined in the Power Solutions Report.

NBN Co were approached and provided preliminary advice that their network can be extended to provide broadband and communications servicing to the proposed development sites.

Concept stormwater management that been considered. Whilst final treatment options will be developed based on built form, there is a range of suitable measures that could be incorporated into the final design to control stormwater runoff.

On the basis of those analyses, there are no significant issues that would preclude the proposed rezoning on the basis of stormwater, water and wastewater infrastructure servicing, electricity, gas and communications.

Appendix A

HUNTER WATER CORPORATION ADVICE

Hunter Water Corporation
ABN 46 228 513 446

PO Box 5171
HRMC NSW 2310
36 Honeysuckle Drive
NEWCASTLE NSW 2300
1300 657 657 (T)
(02) 4979 9468 (F)
enquiries@hunterwater.com.au
hunterwater.com.au

8 April 2015

Our Ref: HW2014 1017/1.009

UrbanGrowth NSW
PO Box 33
Newcastle NSW 2300

Attention: Steve Aebi

Dear Steve

COMMERCIAL-IN-CONFIDENCE
PROPOSED URBAN RENEWAL PROJECT – NEWCASTLE

I refer to your request for Hunter Water to provide the points of connection and system augmentations required to service the design water and wastewater demands and loads for the possible redevelopment sites included in the Newcastle Urban Renewal Project. The information on the following pages is provided in response to this request on a catchment by catchment basis.

Please note that this information is based on Hunter Water's knowledge of its system performance and other potential development in the area at the present time and, as such, capacity availability and system performance may vary over time. As a consequence, the advice provided herein regarding servicing availability is indicative only. A detailed analysis of available capacity will be undertaken upon lodgement of an application for a Notice of Formal Requirements.

Please also note that due to complex nature of system analysis arising from surrounding developments, network capacity constraints, aging infrastructure, and licence compliance issues in the inner city area, Hunter Water is proposing to undertake a detailed review of the potential servicing options within the inner city area; followed by a feasibility assessment of those potential options. Due to the intricacies involved, is expected that this review could take 12 or more months to complete. It is expected that whatever the outcome of these investigations, the new inner city developments affected would only be required to contribute proportionally toward a new wastewater pump station option (refer final section of this letter "New Inner City WWPS" for details). Liaison with new developers is likely to be required to confirm staging, location of well, sizing of station and emergency storage requirements, rising main easements and future upgrade requirements.

Should you require further clarification or assistance please do not hesitate to contact me on 02 4979 9545.

Yours Sincerely

MALCOLM WITHERS
Rel. Manager Developer Services

Catchment 1

Water

This development has access to a DN100 UPVC-HD20 water main from Wright Lane and an initial connection could be made to this main. Security of supply could be provided by installing approximately 400m of DN150 water main as shown in the figure below. This will provide frontage to the development and access to street hydrants for firefighting. The pressure results in **Table 1** below were taken from the modelled connection point shown in **Figure 1** below.

Table 1

Catchment	Connection Point	Main Size	Assumed Elevation (m)	Average Day Max Pressure (m)	Peak Day Min Pressure With Development (m)	95 Peak day + 10FF Pressure With Development (m)	95 Peak Day + 20FF Pressure With Development (m)
1	1062230 – Wright Lane	100	2.1	59.5	48.8	50.1	44.6

Figure 1 – Catchment 1 Water Connection Point.



Wastewater

Catchment 1 can be serviced by draining to Newcastle 12 WWPS, with connection directly to the receiving manhole (as shown in **Figure** 2 below). This station is theoretically at capacity (61L/s), however is performing well in wet weather. A pump and switchboard upgrade is likely to be required to service this development and may be also required to service other surrounding vacant lots (85-90L/s). Further assessment of the catchment performance and likely development will be undertaken over the next 12 months to confirm upgrade likely requirements at this station.

Figure 2 – Catchment 1 Wastewater Connection Point.



Catchment 2

Water

The development has access to a DN200 PE water main from Merewether St. The pressure results in **Table 2** below were taken from the modelled connection point shown in **Figure 3** below.

Table 2

Catchment	Connection Point	Main Size	Assumed Elevation (m)	Average Day Max Pressure (m)	Peak Day Min Pressure (m)	95 Peak day + 10FF Pressure With Development (m)	95 Peak Day + 20FF Pressure With Development (m)
2	1062075 – Merewether St	200	17.5	59.4	48.8	51.1	51.0

Figure 3 – Catchment 2 Water Connection Point.



Wastewater

The development has access to a DN150 sewer main (as shown in **Figure 4** below), which drains to Newcastle 2 WWPS. Newcastle 2 WWPS is currently at capacity. A pro-rata contribution may be required toward a new wastewater pump station servicing the new development within the inner city catchment. Refer final section of this letter "New Inner City WWPS" for details.

Figure 4 - Catchment 2 Wastewater Connection Point.



Catchment 3

Water

Catchment 3 has access to a DN150 CICL main from Hunter Street. The pressure results in **Table 3** below were taken from the modelled connection point shown in **Figure 5** below.

Table 3

Catchment	Connection Point	Main Size	Assumed Elevation (m)	Average Day Max Pressure (m)	Peak Day Min Pressure (m)	95 Peak day + 10FF Pressure With Development (m)	95 Peak Day + 20FF Pressure With Development (m)
3	411710 – Cnr Hunter/Darby st	150	2.8	58.8	48.0	50.5	49.7

Figure 5 – Catchment 3 Water Connection Point.



Wastewater

The development can be serviced by MH 141E (as shown in **Figure 6** below), which drains to Newcastle 2 WWPS. Newcastle 2 WWPS is currently at capacity. A pro-rata contribution may be required toward a new wastewater pump station servicing new development within the inner city catchment. Refer final section of this letter "New Inner City WWPS" for details.

Figure 6 – Catchment 3 Wastewater Connection Point



Catchment 4

The development can be serviced by extending a DN150 from either the DN250 from the other side of Hunter St (Option 1) or from the DN150 on Wharf Rd (Option 2). The minimum size water main for commercial, industrial and high density residential development is DN150. If the development exceeds 100 lots then two connection points may be required. In this event, Hunter Water's preference would be to link options 1 and 2 to improve interconnectivity in the inner city. The pressure results in **Table 4** below were taken from the modelled connection point for each option as shown in **Figure 7** below.

Table 4

Catchment	Connection Point	Main Size	Assumed Elevation (m)	Average Day Max Pressure (m)	Peak Day Min Pressure (m)	95 Peak day + 10FF Pressure With Development (m)	95 Peak Day + 20FF Pressure With Development (m)
4	Option 1	Connection from a DN250	2.3	59.2	50.5	50.8	49.2
4	Option 2	Connection from a DN150	2.4	59.5	50.7	51.1	50.3

Figure 7 – Catchment 4 Water Connection Point



Wastewater

Catchment 4 can be serviced by MH A2B (as shown in **Figure 8** below), which drains to Newcastle 2 WWPS. Newcastle 2 WWPS is currently at capacity. A pro-rata contribution is likely to be required toward a new wastewater pump station servicing new development within the inner city catchment. Refer final section of this letter "New Inner City WWPS" for details.

Figure 8 – Catchment 4 Wastewater Connection Point



Catchment 5

Water Supply

Catchment 5 has frontage to a DN100 CICL water main on Wharf Road (highlighted in yellow). The minimum size water main for commercial, industrial and high density residential development is DN150. Therefore the developer will be required to extend a DN150 along the frontage of their development (as shown in blue ~50m). The pressure results in **Table 5** below were taken from the modelled connection point as shown in **Figure 9** below.

Table 5

Catchment	Connection Point	Main Size	Assumed Elevation (m)	Average Day Max Pressure (m)	Peak Day Min Pressure (m)	95 Peak day + 10FF Pressure With Development (m)	95 Peak Day + 20FF Pressure With Development (m)
5	CICL Main on Wharf Road	100	2.4	59.1	48.3	48.5	41.1

Figure 9 – Catchment 5 Water Connection Point



Wastewater

Catchment 5 currently has access to a DN150 sewer main, with the connection at the Dead End on line N32886 (as shown in **Figure 10** below). The development is currently located within the Newcastle 2 WWPS catchment. Newcastle 2 WWPS is currently at capacity. A pro-rata contribution is likely to be required toward a new wastewater pump station servicing new development within the inner city catchment. Refer final section of this letter "New Inner City WWPS" for details.

Figure 10 – Catchment 5 Wastewater Connection Point



Catchment 6

Water Supply

Catchment 6 has frontage to a DN100 CICL water main on Wharf Road (as shown highlighted in yellow in **Figure 11** below). The minimum size water main for commercial, industrial and high density residential development is DN150. Therefore the developer will be required to extend a DN150 along the frontage of their development (as shown in blue). This would be an extension of the DN150 constructed by catchment 5 and is expected to be approximately 70-80m and interconnect into the existing DN100. The pressure results in **Table 6** below were taken from the modelled connection point as shown in **Figure 11** below.

Table 6

Catchment	Connection Point	Main Size	Assumed Elevation (m)	Average Day Max Pressure (m)	Peak Day Min Pressure (m)	95 Peak day + 10FF Pressure With Development (m)	95 Peak Day + 20FF Pressure With Development (m)
6	CICL main on WHARF Road	100	2.4	59.1	48.3	42.7	20.9

Figure 11 – Catchment 6 Water Connection Point



Wastewater

Catchment 6 has access to a DN150 sewer main as shown in **Figure 12** below, with the connection at the Dead End on line N32886. The development is located within the Newcastle 2 WWPS catchment. Newcastle 2 WWPS is currently at capacity. A pro-rata contribution is likely to be required toward a new wastewater pump station servicing new development within the inner city catchment. Refer final section of this letter "New Inner City WWPS" for details.

Figure 12 – Catchment 6 Wastewater Connection Point



Catchment 7

Water Supply

Catchment 7 can use existing supply or if required the development has frontage to DN150 water mains on Watt Street and Scott Street. The pressure results in **Table 7** below were taken from the modelled connection point as shown in **Figure 13** below.

Table 7

Catchment	Connection Point	Main Size	Assumed Elevation (m)	Average Day Max Pressure (m)	Peak Day Min Pressure (m)	95 Peak day + 10FF Pressure With Development (m)	95 Peak Day + 20FF Pressure With Development (m)
7	440341 – From Watt St	150	2.9	50.9	49.6	49.8	48.7

Figure 13 – Catchment 7 Water Connection Point



Wastewater

Catchment 7 has access to 3 manholes along Scott Street, from which the development can be serviced (as shown in **Figure 14** below). The flows will drain to Newcastle 2 WWPS. Newcastle 2 WWPS is currently at capacity, however the early works loads could be accepted at Newcastle 2 WWPS prior to a new WWPS being required in the inner city. A pro-rata contribution may be required toward a new wastewater pump station servicing new development within the inner city catchment for the ultimate loading from this site. Refer final section of this letter "New Inner City WWPS" for details.

Figure 14 – Catchment 7 Wastewater Connection Point



New Inner City WWPS

Due to capacity constraints at Newcastle 2 WWPS a new wastewater pump station will be required to service new development within the inner city. The final scope of this is unclear at this stage, but is likely to be located near the existing Newcastle 2 WWPS site (possible in the rail corridor), and discharge to Newcastle 1 WWPS (see figure below). Other possible discharge locations will be considered during an internal review of options for servicing the inner city over the next 12 months.

1. New WWPS servicing Urban Growth Identified development only (~35L/s) pumping to Newcastle 1 WWPS. An easement along the rail corridor would be required (as shown in **Figure 15** below).
2. New WWPS servicing Urban Growth Identified development plus GPT development (~65-70L/s) pumping to Newcastle 1 WWPS (could be staged). An easement along the rail corridor would be required.
3. New WWPS servicing Urban Growth Identified development, GPT development plus other new development in the Newcastle 2 catchment (~90L/s (tbc)) pumping to Newcastle 1 WWPS (could be staged). An easement along the rail corridor would be required.
4. New WWPS servicing Urban Growth Identified development, GPT development, other new development in the Newcastle 2 catchment plus capability to decommission existing Newcastle 2 WWPS (~300L/s (tbc)) then pumping to Newcastle 1 WWPS. This upgrade would be undertaken in a staged manner. An easement along the rail corridor would be required with potentially two mains running down the same corridor.

Note that each pump station option would be required to ensure 4hrs of emergency storage is available at average dry weather flow and adequate space would need to be set aside for this purpose.

Figure 15 – Servicing New Development within the Inner City



Appendix B

ELECTRICAL AND COMMUNICATIONS SUPPLY REPORT

Urban Growth NSW

Newcastle Urban Transformation
CBD Infrastructure Servicing
Electrical & Telecommunications



power solutions
215 Pacific Hwy CHALESTOWN NSW
810 Pacific Hwy GORDON NSW
PO BOX 278 CHARLESTOWN NSW 2290
1300 732 293 f: (02) 4923 8199
office@powersol.com.au

1. ELECTRICAL

1.1 Electrical Maximum Demand Estimates

The concept plans for the 7 nominated sites indicate an estimated total electrical load in the order of 3,300 kVA as detailed in the table below.

Site	*Approx Location*	*No of Apartments*	*Commercial Space m2*	*Est. Load (kVA)*
1C	Worth Place	380	7000	1600
2C	Merewether St	40	500	200
3C	Darby St	50	500	300
4D	Crown St	120	1500	500
5E	Brown St	140	2000	600
6E	Perkins St	100	1000	400
7F	Scott St	80	2000	500
Sum				4100
Diversity				0.8
Total				**3280**

1.2 Existing Services

Adjacent to the sites there are several existing Ausgrid 11kV underground cables which can be utilised to supply new substations at the development sites.

Preliminary advice from Ausgrid has been received indicating that at the present time their HV network has capacity to supply the proposed loads, subject to confirmation once formal connection applications are made.

Refer to Appendix A for full details of the advice they provided.

1.3 Proposed Substations

Each site is likely to require a dedicated substation to provide the required electrical service to the buildings. These substations, including the connection to the HV cables, are fully funded by the developer.

Until the building layouts and footprint on the development lots are determined, final details of the substations cannot be provided.

To assist in high level concept planning, we provide the following preliminary estimate of the likely substation types and rating.

Site	*Suggested Substation Type*	*Substation Size (kVA)*
1C	Chamber	2 x 1000 kVA
2C	Kiosk	400 kVA
3C	Chamber	750 kVA
4D	Kiosk	600 kVA
5E	Kiosk	600 kVA
6E	Kiosk	600 kVA
7F	Kiosk	600 kVA

1.4 Summary

Ausgrid has capacity in their existing HV network near the development sites to provide electrical servicing. This would be confirmed by them once load estimates are firmed up and formal connection applications are submitted.

To supply the proposed developments, dedicated substations will be required on each development lot.

These would be connected to the existing 11kV underground cables in the vicinity of the sites.

2. TELECOMMUNICATIONS – NBNCO

Under current Federal Government policy, NBN Co is to be the standard provider of telecommunications services to new larger developments.

2.1 NBNco Servicing Advice

Comment from NBNco regarding their potential servicing of the developments was requested.

As their policy is not to indicate service availability until a formal application for service is made, they would only provide a general response as listed in Appendix B.

NBNco has given preliminary advice that provision of high bandwidth optical fibre broadband can be installed as part of the developments.

APPENDIX A – RESPONSE FROM AUSGRID

APPENDIX B – RESPONSE FROM NBN CO

Address all relevant correspondence to:

Ausgrid Contestability Section
PO Box 487
Newcastle NSW 2300

E: Contestability@ausgrid.com.au
F: 02 49101842

05.05.2015

Power Solutions Pty Ltd
PO Box 278
Charlestown NSW 2290

Project Number: 700001816

Dear Dave

Electricity Network Connection Application at: Multiple locations along the Newcastle CBD Rail Corridor.

I refer to your preliminary enquiry received regarding the electricity connection at the above address and provide the following information.

The proposed Newcastle CBD rail corridor development is classified as urban type load and may require an alternate 11kV supply for the proposed development stages.

Outcome

- ❑ All sites have access to feeders that can supply the proposed load. Minor network alterations will be needed for connections.
- ❑ The future network capacity is also dependant on other developments in the area.
- ❑ The proposed Newcastle CBD rail corridor development will be classified as an 'Urban' development and will require further analysis for the proposed stages/sites.
- ❑ The 11kV connection options and network upgrade works will be dependent upon the final arrangement and staging of the development. Additional information is required from the developer to determine a preferred 11kV supply strategy.
- ❑ We advise that you need to submit a Connection Application Form, which will then be managed by the Contestability group.

The information presented is based on high level analysis. Further information on designs and loading are required for a detailed analysis.

Planning Considerations

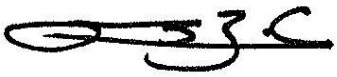
There are many influencing factors that could affect the available supply capacity including but not limited to other developments, future network augmentation, load growth and policy changes. This preliminary response is based on information available at the time and may change into the future.

It should be noted that the above advise is based on Ausgrid's polices and network status as of today. Both of these are subject to change.

Connections to the Ausgrid network are governed by a set of laws and rules referred to as the National Energy Customer Framework (NECF). Included in the NECF is the National Electricity Rules (NER). Under these rules, a binding contract may only be formed after a connection application is lodged and Ausgrid has made a connection offer in response to that application. Accordingly, to make arrangements for the electricity connection of the development to the Ausgrid network you should lodge a completed connection application.

Should you require any further information please contact me on the phone number or email address detailed below.

Yours sincerely,



Jacob Bayley
Contestability Project Coordinator
Ausgrid

Direct Telephone Number: 02 43258582
Email: jbayley@ausgrid.com.au
Facsimile: 02 49101842

Tuesday 26 May 2015

Steve Goman
Powersol
sgoman@powersol.com.au

Dear Developer,

You have contacted NBN Co in relation to the possible installation of fibre infrastructure at **Hunter St, Newcastle NSW**.

NBN Co has determined that your new development is within the NBN fibre footprint.

Once Powersol has submitted a formal application and we have concluded an agreement on NBN Co's terms and conditions (including in relation to the construction of pit and pipe infrastructure at the development), then provided you comply with the terms and conditions of that agreement, NBN Co will agree to procure the installation of fibre infrastructure at the development.

Regards,



NBN Co New Developments

Erica Kearnes
Contracts Administrator

Exhibits

190174E-SK-005E&6D

REFER DRAWING 190174E-SK-006

100mm AT FULL SIZE

HUNTER RIVER

HUNTER RIVER

HONEYSUCKLE DRIVE

WHARF ROAD

CENTENARY ROAD

HUNTER STREET

HUNTER STREET

AUCKLAND STREET

DARBY STREET

KING STREET

NEWCASTLE 12 WWPS

CONNECT TO EXISTING SEWER

CONNECT TO EXISTING WATER

SECONDARY OVERLAND FLOW PATH

DISCHARGE TO PUBLIC NETWORK

PARKS AND OPEN SPACE NO DETENTION PROPOSED

RW

GENERAL NOTES:

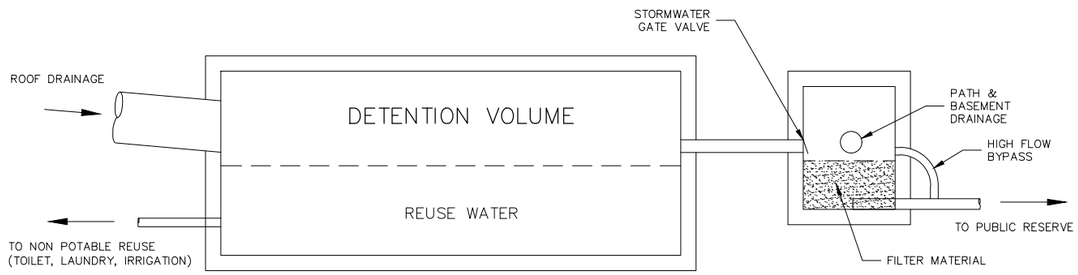
STORMWATER DETENTION AND TREATMENT WILL BE PROVIDED ON LOT AND BE OWNED AND MAINTAINED BY THE FUTURE LAND OWNER. DOWN-PIPES FROM THE ROOF WILL BE DIRECTED INTO UNDERGROUND DETENTION TANKS. THESE TANKS WILL HOLD APPROXIMATELY 10KL FOR REUSE FOR NON POTABLE USES SUCH AS TOILET FLUSHING, IRRIGATION OR LAUNDRY (SUBJECT TO DETAILED WATER BALANCE),AND A FURTHER 10-15 KL FOR DETENTION, DEPENDING ON THE EXTENT OF IMPERVIOUS AREA FOR EACH SITE.

DISCHARGE FROM THE DETENTION TANK WILL FLOW TO SECOND PIT, WHERE LOW VOLUME FLOWS WILL BE TREATED THROUGH A FILTER MEDIUM WHICH WILL PROVIDE WATER QUALITY TREATMENT PRIOR TO DISCHARGE TO THE PUBLIC DRAINAGE NETWORK. THIS PIT WILL ALSO COLLECT RUN-OFF FROM SURROUNDING PATHS, AND BASEMENT DRAINAGE (IF REQUIRED) FOR TREATMENT PRIOR TO DISCHARGE. BACK FLOW INTO THE RETENTION TANK WILL BE PREVENTED BY A ONE WAY STORM GATE.

GENERALLY, PARCELS WILL DRAIN TO THE EXISTING DRAINAGE NETWORK ON CENTENARY ROAD (MEREWETHER STREET AND ARGYLE STREET FOR PARCELS 5 AND 8 RESPECTIVELY).

PARCELS THAT ARE PREDOMINANTLY OPEN SPACE, PERVIOUS AREAS, WILL REQUIRE NO SPECIFIC STORMWATER TREATMENT. DEPENDING ON FINAL LANDSCAPE DESIGN, THERE MAY BE A REQUIREMENT FOR LOCALISED PIT AND PIPE NETWORKS.

SERVICE LOCATIONS SHOWN DIAGRAMMATICALLY AND SUBJECT TO DETAILED DESIGN.



CONCEPT ON LOT STORMWATER TREATMENT DETAIL

NOT TO SCALE

LEGEND

- RW — RAINWATER/TREATMENT TANK REFER DETAIL
- OVERLAND FLOW PATH
- SW — STORMWATER DRAINAGE NETWORK DIAGRAMMATIC ONLY (PROPOSED)
- S — PROPOSED SEWER
- W — PROPOSED WATER
- ex s — EXISTING SEWER
- ex w — EXISTING WATER

CONTOUR INTERVAL = 0.2m

DIAL 1100 BEFORE YOU DIG

REV.	DATE	AMENDMENT	DESIGN	DRAWN	CHECKED	APPROVED
A	12/12/16	ISSUED FOR INFORMATION	M.K.	B.C.	M.K.	
B	19/12/16	GENERAL REVISION	M.K.	A.M.	M.K.	
C	23/12/16	AMEND FLOWPATH	M.K.	T.M.	M.K.	M.K.
D	18/01/17	SEWER & WATER AMENDMENTS	M.K.	C.B.	M.K.	M.K.
E	20/03/17	PARCELS AMENDED	M.K.	J.D.	M.K.	M.K.

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DESIGN FILE S:\

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adw Johnson
Central Coast
5 Pioneer Avenue
P.O. Box 3717,
Tuggerah N.S.W. 2259
Phone: (02) 4305 4300
Fax: (02) 4305 4399
email: coast@adwjohnson.com.au
www.adwjohnson.com.au
ABN 62 129 445 398

CLIENT: UrbanGrowth NSW

PROPERTY DESCRIPTION: NEWCASTLE RAIL CORRIDOR

SURVEYED: ADWJ

DATUM: A.H.D.

PROJECT: INFRASTRUCTURE SERVICING

PLAN TITLE: CONCEPT SERVICES STRATEGY SHEET 1

PROJECT No.	DISCIPLINE	NUMBER	REV.
190174E	SK	005	E

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190174E-SK-005E&6D

REFER DRAWING 190174E-SK-005

HUNTER RIVER

HUNTER RIVER

CONNECT TO EXISTING WATER

WHARF ROAD

CONNECT TO EXISTING SEWER

DISCHARGE TO PUBLIC NETWORK

CONNECT TO EXISTING SEWER

DISCHARGE TO PUBLIC NETWORK

WHARF ROAD

CONNECT TO EXISTING SEWER

CONNECT TO EXISTING WATER

NEWCASTLE 2 WWPS

SCOTT STREET

HUNTER STREET

SCOTT STREET

BROWN STREET

PERKINS STREET

WOLFE STREET

KING STREET

HUNTER STREET

NEWCOMEN STREET

BOLTON STREET

WATT STREET

LEGEND

- PROPOSED LANDSCAPING AREA
- RW — RAINWATER/TREATMENT TANK REFER DETAIL
- OVERLAND FLOW PATH
- SW — STORMWATER DRAINAGE NETWORK DIAGRAMMATIC ONLY (PROPOSED)
- S — PROPOSED SEWER
- W — PROPOSED WATER
- ex s — EXISTING SEWER
- ex w — EXISTING WATER

CONTOUR INTERVAL = 0.2m

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REV.	DATE	AMENDMENT	DESIGN	DRAWN	CHECKED	APPROVED
A	12/12/16	ISSUED FOR INFORMATION	M.K.	B.C.	M.K.	
B	19/12/16	GENERAL REVISION	M.K.	A.M.	M.K.	
C	23/12/16	AMEND FLOWPATH	M.K.	T.M.	M.K.	M.K.
D	18/01/17	SEWER & WATER AMENDMENTS	M.K.	C.B.	M.K.	M.K.

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CLIENT

UrbanGrowth NSW

PROPERTY DESCRIPTION

NEWCASTLE RAIL CORRIDOR

PROJECT

INFRASTRUCTURE SERVICING

PLAN TITLE

CONCEPT SERVICES STRATEGY
SHEET 2

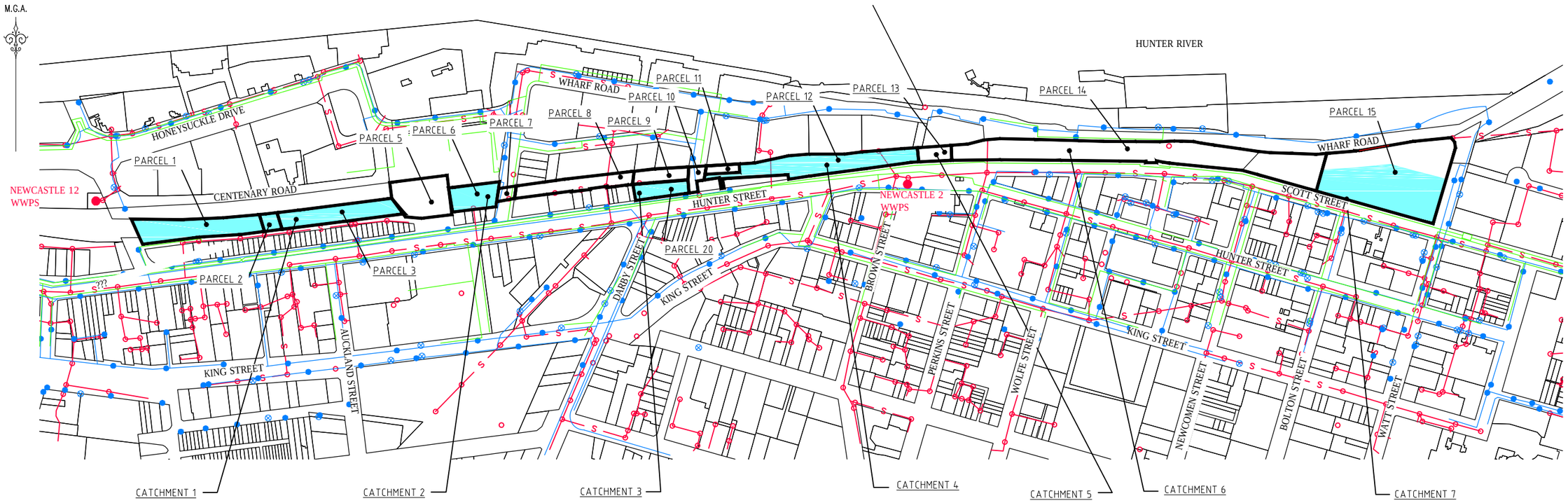
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PROJECT No.	DISCIPLINE	NUMBER	REV.
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SERVICING PLAN
N.T.S.

LEGEND

- POSSIBLE DEVELOPMENT SITE
- S — EXISTING SEWER
- EXISTING WATER
- EXISTING GAS

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REV.	DATE	AMENDMENT	DESIGN	DRAWN	CHECKED	APPROVED
A	25/06/2015	ISSUED FOR INFORMATION		H.W.	H.W.	H.W.
B	30/11/2015	DEVELOPMENT PROPOSAL UPDATED		H.W.	H.W.	H.W.
C	1.03.2017	POST GATEWAY – PROPOSAL		G.H.	M.K.	M.K.
D	20.03.2017	PARCELS AMENDED		J.D.	M.K.	M.K.

SCALES

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adw johnson
Central Coast
5 Pioneer Avenue
P.O. Box 3717,
Tuggerah N.S.W. 2259
Phone: (02) 4305 4300
Fax: (02) 4305 4399
email: coast@adwjohnson.com.au
www.adwjohnson.com.au
ABN 62 129 445 398

CLIENT: UrbanGrowth NSW

PROPERTY DESCRIPTION

SURVEYED: ADWJ

DATUM: A.H.D.

PROJECT: INFRASTRUCTURE SERVICING

PLAN TITLE: EXHIBIT 1
DEVELOPMENT CATCHMENTS AND EXISTING
WATER AND WASTEWATER INFRASTRUCTURE

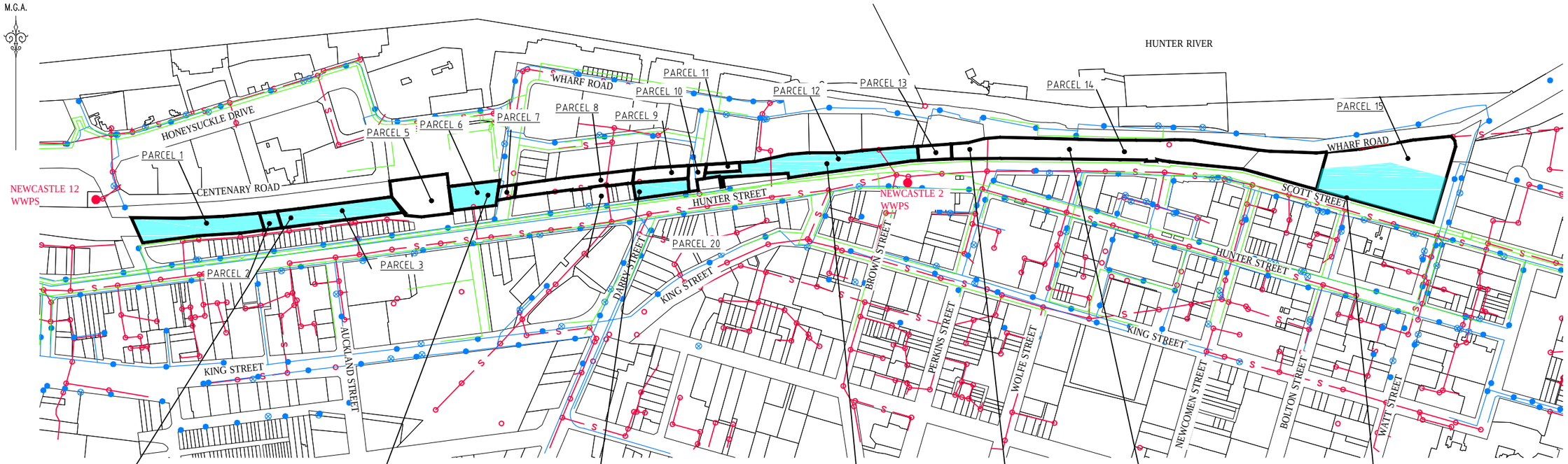
PROJECT No.	DISCIPLINE	NUMBER	REV.
190174E –	SK –	101	D

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190174E-SK-102-D

M.G.A.



SERVICING PLAN
N.T.S.

CATCHMENT 1

WATER DEMANDS:
- AVERAGE DAY DEMAND = 1.0 L/s
- PEAK DAY DEMAND = 2.7 L/s
- EXTREME DAY DEMAND = 3.4 L/s
- 95th% DAY DEMAND = 2.4 L/s
- 95th% PEAK HOUR DEMAND + FF = 22.4 L/s

WASTEWATER LOADS:
- AVERAGE DRY WEATHER FLOW = 1.5 L/s
- PEAK DRY WEATHER FLOW = 4.7 L/s
- PEAK WET WEATHER FLOW = 12.9 L/s

CATCHMENT 2

WATER DEMANDS:
- AVERAGE DAY DEMAND = 0.3 L/s
- PEAK DAY DEMAND = 0.9 L/s
- EXTREME DAY DEMAND = 1.0 L/s
- 95th% DAY DEMAND = 0.7 L/s
- 95th% PEAK HOUR DEMAND + FF = 20.7 L/s

WASTEWATER LOADS:
- AVERAGE DRY WEATHER FLOW = 0.4 L/s
- PEAK DRY WEATHER FLOW = 1.6 L/s
- PEAK WET WEATHER FLOW = 3.7 L/s

CATCHMENT 3

WATER DEMANDS:
- AVERAGE DAY DEMAND = 0.5 L/s
- PEAK DAY DEMAND = 1.5 L/s
- EXTREME DAY DEMAND = 1.8 L/s
- 95th% DAY DEMAND = 1.3 L/s
- 95th% PEAK HOUR DEMAND + FF = 21.3 L/s

WASTEWATER LOADS:
- AVERAGE DRY WEATHER FLOW = 0.8 L/s
- PEAK DRY WEATHER FLOW = 2.6 L/s
- PEAK WET WEATHER FLOW = 6.6 L/s

CATCHMENT 4

WATER DEMANDS:
- AVERAGE DAY DEMAND = 0.4 L/s
- PEAK DAY DEMAND = 1.2 L/s
- EXTREME DAY DEMAND = 1.4 L/s
- 95th% DAY DEMAND = 1.0 L/s
- 95th% PEAK HOUR DEMAND + FF = 21 L/s

WASTEWATER LOADS:
- AVERAGE DRY WEATHER FLOW = 0.6 L/s
- PEAK DRY WEATHER FLOW = 2.1 L/s
- PEAK WET WEATHER FLOW = 5.2 L/s

CATCHMENT 5

- NO PROPOSED DEMAND DEVELOPMENT

CATCHMENT 6

- NO PROPOSED DEMAND DEVELOPMENT

CATCHMENT 7

WATER DEMANDS:
- AVERAGE DAY DEMAND = 0.16 L/s
- PEAK DAY DEMAND = 0.2 L/s
- EXTREME DAY DEMAND = 0.22 L/s
- 95th% DAY DEMAND = 0.19 L/s
- 95th% PEAK HOUR DEMAND + FF = 20.2 L/s

WASTEWATER LOADS:
- AVERAGE DRY WEATHER FLOW = 0.1 L/s
- PEAK DRY WEATHER FLOW = 0.5 L/s
- PEAK WET WEATHER FLOW = 1.1 L/s

NOTE:
DESIGN DEMANDS AND FLOWS DETERMINED IN ACCORDANCE WITH HWC WSAA DESIGN METHODS

LEGEND
- WATER AND WASTEWATER CATCHMENT
- WATER AND WASTEWATER CATCHMENT
- EXISTING SEWER
- EXISTING WATER
- EXISTING GAS

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REV.	DATE	AMENDMENT	DESIGN	DRAWN	CHECKED	APPROVED
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D	20.03.2017	PARCELS AMENDED		J.D.	M.K.	M.K.

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adw johnson
Central Coast
5 Pioneer Avenue
P.O. Box 3717,
Tuggerah N.S.W. 2259
Phone: (02) 4305 4300
Fax: (02) 4305 4399
email: coast@adwjohnson.com.au
www.adwjohnson.com.au
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PROPERTY DESCRIPTION

SURVEYED: ADWJ
DATUM: A.H.D.

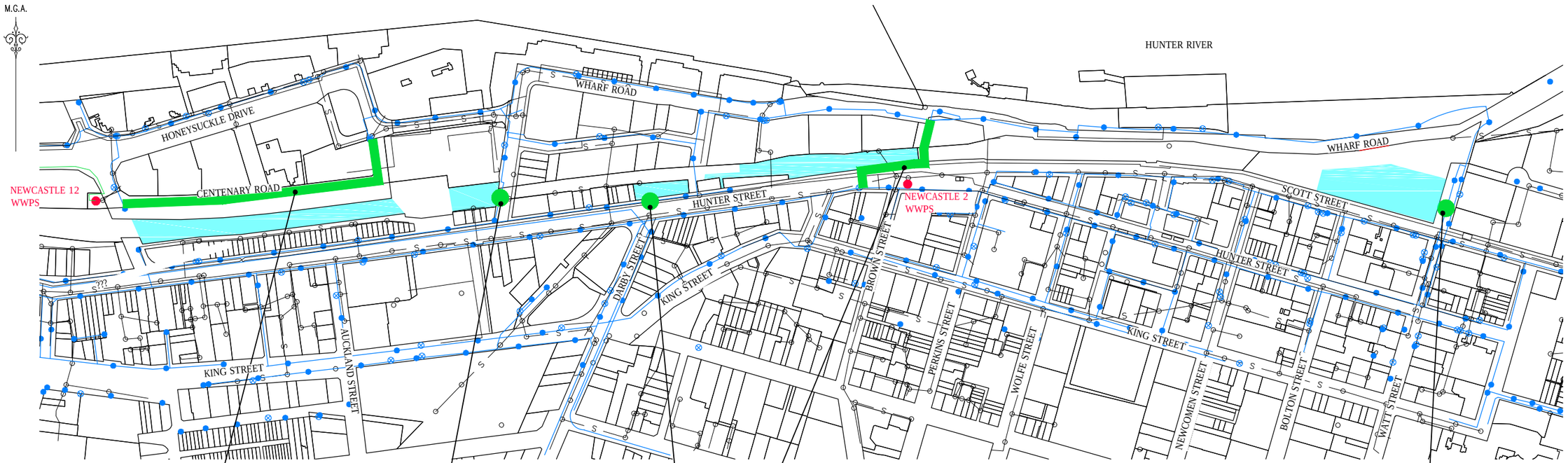
PROJECT: INFRASTRUCTURE SERVICING
PLAN TITLE: EXHIBIT 2 ESTIMATED DEVELOPMENT LOADS AND FLOWS

PROJECT No.	DISCIPLINE	NUMBER	REV.
190174E	SK	102	D

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190174E-SK-103-D



CATCHMENT 1 - REQUIRED WORKS
- CONNECT DN100 WRIGHT LANE TO DN150 WORKSHOP WAY
- DN150 x 400m
- THRUST BORE UNDER CENTENARY ROAD

CATCHMENT 2 - REQUIRED WORKS
- CONNECT TO EXISTING DN200 PE MAIN

CATCHMENT 3 - REQUIRED WORKS
- CONNECT TO EXISTING DN150 CICL MAIN

CATCHMENT 4 - REQUIRED WORKS
- LINK DN250 SOUTH SIDE HUNTER STREET TO DN150 IN WHARF ROAD
- DN150 x 150m
- THRUST BORE HUNTER STREET

CATCHMENT 7 - REQUIRED WORKS
- CONNECT TO EXISTING DN150 MAIN

SERVICING PLAN
N.T.S.

LEGEND
- POSSIBLE DEVELOPMENT SITE
- EXISTING SEWER
- EXISTING WATER
- EXISTING GAS
- PROPOSED WATER

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adw johnson
Central Coast
5 Pioneer Avenue
P.O. Box 3717,
Tuggerah N.S.W. 2259
Phone: (02) 4305 4300
Fax: (02) 4305 4399
email: coast@adwjohnson.com.au
www.adwjohnson.com.au
ABN 62 129 445 398

CLIENT
UrbanGrowth NSW

PROPERTY DESCRIPTION

SURVEYED ADWJ

DATUM A.H.D.

PROJECT INFRASTRUCTURE SERVICING

PLAN TITLE
EXHIBIT 3
REQUIRED WATER INSTRUSTRUTRE UPGRADES

PROJECT No.	DISCIPLINE	NUMBER	REV.
190174E –	SK –	103	D

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Attachment M - Post Gateway Noise and Vibration Assessment

By SLR global environmental solutions dated 22 March 2017

SLR

global environmental solutions

Newcastle Urban Transformation and Transport Program

Post Gateway Noise and Vibration Assessment

Report Number 630.11026-R1

22 March 2017

Elton Consulting Pty Ltd

PO Box 1448

Bondi Junction NSW 1355

Revision: v3.1

Newcastle Urban Transformation and Transport Program

Post Gateway Noise and Vibration Assessment

PREPARED BY:

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
10 Kings Road
New Lambton NSW 2305 Australia
(PO Box 447 New Lambton NSW 2305 Australia)
T: +61 2 4037 3200 F: +61 2 4037 3201
newcastleau@slrconsulting.com www.slrconsulting.com

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
630.11026-R1	Revision v3.1	22 March 2017	Martin Davenport	Mark Blake	Mark Blake
630.11026-R1	Revision v3.0	10 March 2017	Martin Davenport	Mark Blake	Mark Blake
630.11026-R1	Revision 2	3 June 2016	Martin Davenport	Stephen Kozakiewicz	Stephen Kozakiewicz
630.11026-R1	Revision 1	28 April 2016	Martin Davenport	Stephen Kozakiewicz	Stephen Kozakiewicz
630.11026-R1	Revision 0	4 April 2016	Martin Davenport	Stephen Kozakiewicz	Stephen Kozakiewicz

Executive Summary

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Elton Consulting on behalf of Urban Growth NSW to prepare a Noise and Vibration Impact Assessment (NVIA) to support the amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor land ('rail corridor land') between Worth Place and Watt Street in Newcastle city centre.

The primary purpose of this report was to consider the feasibility of rezoning rail corridor land with regard to potential noise and vibration impacts only. The following methodology was utilised in considering potential noise and vibration impacts:

- Review studies and investigations relevant to noise and vibration upon the rail corridor land.
- Establish relevant noise and vibration goals for the rail corridor land.
- Qualitatively assess suitability of the subject land for urban purposes.
- Provide recommendations regarding potential noise and vibration mitigation requirements.

Road Traffic Noise

Predicted road traffic volumes indicate a negligible increase of up to 0.5 dB could be expected within the study area as a result of development related traffic within the rezoning sites.

Operational Noise Impacts

Details of development specific noise emissions would be assessed at the DA stage for each development associated with the rezoning.

It is envisaged that the operational noise emissions from any proposed mixed use development would be controllable by common engineering methods.

Noise from parcels proposed to be rezoned RE1 Public recreation would be limited to general urban pedestrian activities, parkland, entertainment and 'events.' Any noise emissions from entertainment, activation and proposed 'events' would be required to be considered and assessed as part of a DA and in line with a plan of management. Noise generated from general urban use of these areas would be minimal and akin to that of an urban centre, and as such any noise impacts from these sites are predicted to be negligible.

External Noise and Vibration Intrusion

It is unlikely that noise and vibration from the operation of the light rail and road traffic would preclude mixed use developments, or public recreation on rezoned land parcels. Noise from existing industrial activities such as the Newcastle Port and other noise generating developments as well as public spaces would also need to be considered on a case by case basis at the DA stage. It is envisaged for any proposed mixed use developments external noise and vibration impacts could be mitigated by common engineering methods and that particularly onerous construction would not be required to reduce internal noise levels to acceptable levels.

Conclusion

It is concluded that development on rail corridor land would not be precluded on the basis of noise and vibration. It is noted that it is unlikely that particularly onerous construction or mitigation measures would be required to meet relevant noise criteria and that potential noise impacts would be addressed on a case by case basis at the DA stage for each development to assesses any potential noise impacts.

Executive Summary

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Elton Consulting on behalf of Urban Growth NSW to prepare a Noise and Vibration Impact Assessment (NVIA) to support the amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor land ('rail corridor land') between Worth Place and Watt Street in Newcastle city centre (**Figure 1**).

Figure 1 Rezoning Study Area



Source: Hassel

The Newcastle Urban Transformation and Transport Program (the Program) has been established to deliver on NSW Government's more than $500 million commitment to revitalise the city centre through:

- The truncation of the heavy rail line at Wickham and creation of the Wickham Transport Interchange.
- The provision of a new light rail line from Wickham to the Beach.
- The delivery of a package of urban transformation initiatives.

The transformation element of the Program aims to bring people back to the city centre by strengthening connections between the city and the waterfront, creating employment opportunities, providing more public space and amenity, and delivering better transport.

The proposed rezoning of the rail corridor land forms a part of the delivery of urban transformation initiatives, comprising a package of transport, built form and public domain improvements.

1.1 Report Purpose

The primary purpose of this report was to consider the feasibility of rezoning rail corridor land with regard to potential noise and vibration impacts only. The following methodology was utilised in considering potential noise and vibration impacts:

- Review studies and investigations relevant to noise and vibration upon the rail corridor land.
- Establish relevant noise and vibration goals for the rail corridor land.
- Qualitatively assess suitability of the subject land for urban purposes.
- Provide recommendations regarding potential noise and vibration mitigation requirements.

2 NEWCASTLE URBAN TRANSFORMATION AND TRANSPORTATION PROJECT - PROJECT DESCRIPTION

2.1 Newcastle Urban Transformation

The Newcastle Urban Renewal Strategy (NURS) sets out the NSW Government's long term approach and vision for the revitalisation of Newcastle city centre to the year 2036.

The NURS identifies three (3) character precincts in Newcastle city centre (West End, Civic and East End), within which significant housing and employment opportunities, together with built form and public domain changes and improvements exist. The NURS describes these precincts as:

- East End: residential, retail, leisure and entertainment
- Civic: the government, business and cultural hub of the city
- West End: the proposed future business district including the western end of Honeysuckle (Cottage Creek)

UrbanGrowth NSW has been directed by NSW Government to deliver on NURS through the Program, in partnership with Transport for NSW (TfNSW), the Hunter Development Corporation (HDC) and the City of Newcastle Council (Council).

2.2 Proposed Rezoning

UrbanGrowth NSW seeks to amend the Newcastle Local Environmental Plan 2012 (NLEP) to enable the delivery of the Program and the objectives of NURS planning outcomes.

2.2.1 Vision

The vision for the Program has been informed by feedback from the community, Council, government agencies and urban renewal experts.

> *Our vision is an activated city centre and waterfront that attracts people, new enterprises and tourism. Over time, we see great opportunities to build on the strengths of the city centre to encourage innovative and enterprising industries to thrive. In the longer term, we see an opportunity to strengthen Newcastle's position on the regional, national and international stage, with a view to stronger ties with the Asia Pacific.*
>
> *UrbanGrowth NSW, 2015*

2.2.2 Program Objectives

The Program is underpinned by five objectives which will drive successful urban revitalisation:

- **Bring people back to the city centre.** Reimagining the city centre as an enhanced destination, supported by new employment, educational and housing opportunities and public domain that will attract people.
- **Connect the city to its waterfront.** Unite the city centre and the harbour to improve the experience of being in and moving around the city.
- **Help grow new jobs in the city centre.** Invest in initiatives that create jobs, with a focus on innovative industries, higher education initiatives to encourage a range of businesses to the city centre.
- **Create great places linked to new transport.** Integrate urban transformation with new, efficient transport to activate Hunter and Scott's Streets and return them to thriving main streets.

- **Creating economically sustainable public domain and community assets.** Leave a positive legacy for the people of Newcastle. Ensure that new public domain and community facilities can be maintained to a high standard into the future.
- **Preserve and enhance heritage and culture.** Respect, maintain and enhance the unique heritage and character of Newcastle city centre through the revitalisation activities.

2.2.3 Urban Transformation Proposed Concept Plan

Surplus rail corridor land runs through the East End and Civic city centre precincts as established by NURS.

Based on this vision and the results of extensive stakeholder and community engagement, an overall urban transformation concept plan ('concept plan') has been prepared for rail corridor (rezoning sites), as well as surrounding areas.

The concept plan considers and integrates with the delivery of light rail. It is also coordinated with the proposed Hunter Street Mall development to create an interactive, synergised and cohesive city centre and foreshore area.

The concept plan (as shown in **Figure 2**) includes five (5) 'key moves,' two (2) that relates to the Civic precinct and three (3) of which relate to the East End.

Civic link (Civic)

This area is the civic heart of Newcastle and includes some of the regions most important civic and cultural assets, including Civic Park, City Hall, Civic Theatre and Newcastle Museum. Current investment in the area includes the law courts development and the University of Newcastle NeW Space campus – both of which are under construction.

The focus of this key 'move' is to leverage best value from new investments by creating new open space and walking and cycling connections that link Newcastle's civic buildings to the waterfront and the light rail system.

- **Civic Green.** Creating a new civic focused public space linking Hunter Street to the Newcastle Museum that will provide direct visual and physical connection from Wheeler Place to the harbour, activate light rail on Hunter Street and meet the needs of the incoming legal and student populations.
- **Built form improvements.** Sensibly scaled mixed use development that forms part of the Honeysuckle development.

Darby Plaza (Civic)

Darby Street is Newcastle's premier 'eat street', offering a mix of shops, cafes, restaurants and night life. At present Darby Street ends at the intersection with Hunter Street, and this key 'move' seeks to create a new node of activity and linkage through to the harbour that complements the delivery of light rail.

- **Darby Plaza.** A new community focused public space including provision of new walking and cycling facilities from Hunter Street to the harbour.
- **Built form improvements.** Zoning of rail corridor land between Merewether Street and Argyle Street to allow for future mixed use development in conjunction with surrounding lands in the longer term.

Hunter Street Revitalisation (East End)

Hunter Street features some of Newcastle's best examples of heritage buildings and offers a mix of shops, cafes, restaurants and other local business. Hunter Street has experienced decline in recent years, and the opportunity exists to reinstate Hunter Street as the regions premier main street and complements light rail.

- **Built form improvements.** Sensibly scaled mixed use development consistent with the adjoining land uses to create an activated street with 'two edges', celebrate heritage and create new linkages from Hunter Street to the waterfront, provide activation around light rail stops and improve walking and cycling facilities.

Entertainment Precinct (East End)

This key 'move' aims to create a place where people can come to play, relax and reconnect with the harbour in a new public space stretching from Scott Street to the waterfront incorporating a new connection from Market Street to Queens Wharf. This key 'move' assists to activate the area with a variety of activities to create an exciting place for the East End.

- **Recreational opportunities.** This precinct will incorporate the adaptive re-use of the signal box and provision of recreation opportunities for all ages and abilities. Public domain will be, designed to provide a thoughtful series of character areas and experiences as one walks the length. The area will also provide opportunities for viewing and interpretation of heritage character that respect the unique qualities of place.

Newcastle Station (East End)

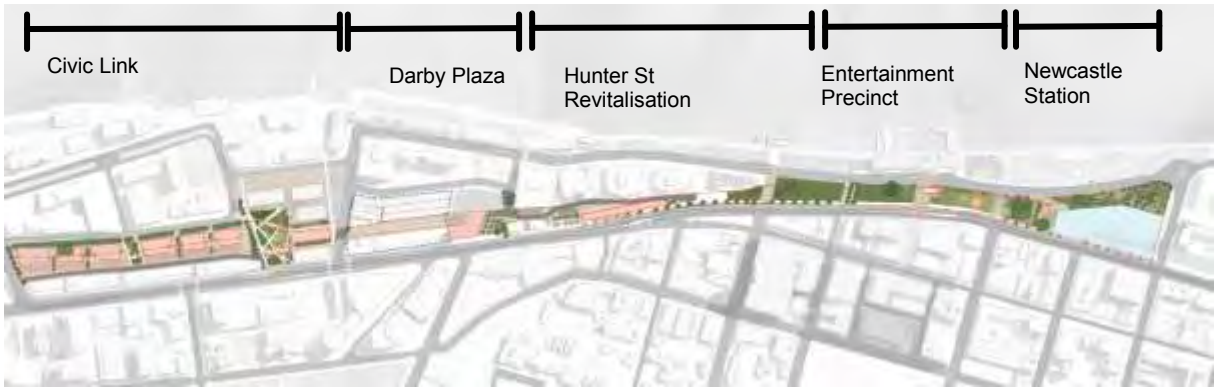
Newcastle Railway Station is proposed to be re-purposed into a hallmark destination and focal point for the new East End, accommodating enterprises and activities that attract visitors and stimulate the economy.

Refurbishment would fully respect and celebrate the heritage integrity of the Station, and could accommodate a range of different activities including community, retail, leisure and commercial uses.

2.2.4 Rezoning concept plan

The proposed rezoning of the rail corridor lands (the Project) is the focus of this report. **Figure 2** provides a red line to define the site rezoning area within the broader program planning outcomes (the full extent of the rezoning area is provided in **Figure 3**).

Figure 2 Rezoning Concept Plan



Source: Hassell

Amendments to the NLEP are required to deliver part of the concept plan. The proposed amendments are on surplus rail corridor land only.

Necessary amendments to the NLEP include:

- Amend the Land Use Zoning Map to introduce new B4 Mixed Use, SP3 Tourism and RE1 Public Recreation zones
- Amend the Height of Building and Floor Space Ratio maps to facilitate development on select parcels of land

The approach taken to the amendments is to support the NURS planning approach and to remain consistent with surrounding planning controls in terms of zones, floor space ratio (FSR) and height.

The concept plan will also form the basis for updates to the Newcastle City Centre Development Control Plan design controls to guide development and public domain works for rezoning sites.

2.2.5 Proposed Rezoning

This planning proposal seeks to rezone rail corridor land (rezoning sites) to enable the delivery of the proposed urban uses established in the concept plan.

An indication of the location of the proposed rezoning parcels is indicated in the map in **Figure 3**.

This report has been based upon the proposed zoning under the Planning Proposal as submitted for Gateway determination, with the inclusion of Parcel 13. It is noted that this parcel has been removed from the current Planning Proposal in accordance with the Gateway determination as issued by the NSW Department of Planning and Environment. Nevertheless, for completeness, this report has considered the potential for some development occurring within this parcel in the future (subject to outcomes of a separate Planning Proposal). The recommendations in this report discuss whether there are any specific implications arising from this additional parcel.

Figure 3 Rezoning Explanatory Map - Parcels



Source: Hassell

The planning proposal concept plan includes public domain, entertainment, mixed use and commercial and residential development.

In general the proposed rezoning will provide a mix of uses with between 400-500 dwellings which will comprise a variety of styles and types, and around 5,000m^2 of commercial, restaurant and other entertainment uses, excluding any education or associated uses.

Proposed maximum building height and floor space ratio controls are consistent with the current controls that apply to surrounding land. A proposed development summary is provided in **Table 1**.

Table 1 Sites for Rezoning – Proposed Development Summary Post Gateway

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 01 B4 Mixed Use 3,370m^2	Parcel 01	3,370m2	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 02 B4 Mixed Use 408m^2	Parcel 02	408m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
Parcel 03 B4 Mixed Use 3,146m^2	Parcel 03	1,869m^2	B4 Mixed Use	FSR – 3:1	Height - 30m
	Parcel 04	900m^2	B4 Mixed Use	FSR – 3:1	Height - 24m
Parcel 04 RE1 Public Recreation 2,464m^2	Now parcel 05 (and small corner of old 03 where western boundary of park realigned)	2,839m^2	RE1 Public Recreation	N/A	N/A
Parcel 05 B4 Mixed Use 1,603m^2	Now parcel 06	1,604m^2	B4 Mixed Use	FSR – 3:1	Height – 18m
Parcel 06 B4 Mixed Use 295m^2	Now parcel 07	295m^2	B4 Mixed Use (Road)	FSR – 2.5:1	Height – 30m
Parcel 07 B4 Mixed Use 2,040m^2	Now parcel 08	2,040m^2	B4 Mixed Use	FSR – 2.5:1	Height – 30m
Parcel 08 B4 Mixed Use 988m^2	Now parcel 09	988m^2	B4 Mixed Use	FSR – 4:1	Height – 24m
Parcel 09 B4 Mixed Use 467m^2	Now parcel 10	467m^2	RE1 Public Recreation	N/A	N/A
Parcel 10 SP2 Infrastructure 386m^2	Now parcel 11	386m^2	SP2 Infrastructure	N/A	N/A
Parcel 11 B4 Mixed Use 4,542m^2	Now parcel 12	4,542m^2	B4 Mixed Use	FSR – 1.5:1	Height – 14m
Parcel 12 B4 Mixed Use 1,544m^2	Now parcel 13 (and has been reduced in size)	659m2	SP2 Infrastructure	N/A	N/A
Parcel 13 RE1 Public Recreation 303m^2	Now parcel 14 (new parcel 14 encompasses part of old	11,151m^2	RE1 Public Recreation	N/A	N/A

Previous Parcel Number prior to Gateway	Updated Parcel Number post Gateway	Size	Proposed Zoning	Proposed FSR	Proposed Height
Parcel 14 B4 Mixed Use 2,251m^2	parcel 12, and the whole of old parcel 13, 14 and 15)				
Parcel 15 RE1 Public Recreation 7,713m^2					
Parcel 16 SP3 Tourist 10,698m^2	Now parcel 15	10,698m^2	SP3 Tourist	FSR – 1.5:1	Height – 10-15m

2.2.6 Newcastle Light Rail

The NSW Government has approved the Newcastle Light Rail (NLR) as part of a strategy to revitalise the Newcastle city centre. The NLR will travel from a new transport interchange at Wickham, through the Newcastle city centre to Pacific Park in the east.

The truncation of heavy rail services at Wickham and the building of a new interchange are the first steps in delivering an urban renewal and transport solution for Newcastle.

Transport for NSW has been working closely with UrbanGrowth NSW, Newcastle City Council and Roads and Maritime Services in planning for the NLR. NLR will help improve public transport and access, reunite the city centre with its waterfront and improve the attractiveness of public spaces. The NLR route will travel east from the new transport interchange at Wickham along the existing rail corridor to Worth Place, before moving south to connect with Hunter Street and Scott Street before reaching Pacific Park, near the beach.

The Review of Environmental Factors assessment has been approved and implementation has commenced.

2.2.7 Hunter Street Mall

A 15,000m^2 landholding within Newcastle's Hunter Street Mall was compiled by UrbanGrowth NSW and joint venture partners GPT Group. The site has recently been sold and the developer will commence redevelopment of the Mall sites.

The project ambitions are to:

- Revitalise Hunter Street Mall
- Provide an urban renewal catalyst for the East End Precinct, in support of Government's broader Urban Transformation and Transport Program.
- Provide for a staged development, broadly bounded by Hunter, King, Perkins and Newcomen Streets, which will include a mixed use development comprising approximately:
  - 4,900m^2 GFA retail premises
  - 2,700m^2 GFA commercial premises
  - 47,800m^2 GFA residential uses comprising residential flat buildings and shop top housing.
- Car parking with a capacity for approximately 491 vehicles to be accessed from King, Perkins, Wolfe, Thorn, Laing, Morgan and Newcomen Streets, and service vehicular access from Perkins, Thorn, Laing and Morgan Streets.

3 ASSESSMENT OVERVIEW

Potential noise and vibration impacts associated with the Project can be categorised as follows:

- Road and rail traffic noise and vibration intrusion to proposed noise-sensitive developments.
- Noise emissions from proposed public lands, residential and commercial/retail venues at existing and proposed noise-sensitive receivers.

The Review of Environmental Factors assessment for the Newcastle Light Rail project has been approved and implementation has commenced.

SLR has reviewed the current noise and vibration assessment for this project prepared by GHD titled *Newcastle Light Rail – Technical Paper 2 – Noise and vibration assessment* dated April 2016 (herein referred to as the Light Rail Noise Report) in order to determine likely noise levels from the Light Rail project on the Project and future road traffic volumes on the surrounding road network.

A traffic impact assessment has been prepared to accompany the Project. SLR has reviewed the current traffic impact assessment prepared by GHD titled *Newcastle Urban Transformation and Transport Project – Rezoning of surplus rail corridor lands - Traffic Impact Assessment* dated April 2016 (herein referred to as the Traffic Impact Assessment) in order to determine the increase in likely road traffic volumes on the road network due to the Project.

Road noise intrusion has been considered with reference to the *Development near Rail Corridors and Busy Roads – Interim Guideline* (the Guideline). Provisions of the Guideline are discussed further in **Section 5.1**.

Potential noise impacts from any Project related proposed residential, commercial and retail venues at any existing noise-sensitive developments would be considered later in the planning process, during the development application (DA) stage through project specific noise impact assessments. Assessment methodology and relevant guidelines and procedures that would be required to be considered for DA's for the proposed mixed use buildings are outlined in **Table 2** as well as any relevant condition in the Newcastle Development Control Plan 2012. Further guidance regarding potential operational noise impacts is provided in **Section 4.2**.

Table 2 Consideration of Noise and Vibration Impacts – Development Applications

Type of potential impact	Relevant policy / guideline to be considered
Road / rail traffic noise intrusion	Development near Rail Corridors and Busy Roads – Interim Guideline (DoP, 2008) NSW Road Noise Policy (RNP) (EPA, March 2011) State Environmental Planning Policy (Infrastructure) 2007 NSW Rail Infrastructure Noise Guideline (RING) (EPA, 2013) AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors AS3671 – 1989 Acoustics – Road traffic noise intrusion – Building siting and construction
Vibration from road / rail traffic	Assessing Vibration: a technical guideline (DEC, 2006)
Noise and vibration from mechanical plant associated with the subject development	National Construction Code (Building Code of Australia) NSW Industrial Noise Policy (INP) (EPA, 2000) and the associated Application Notes (EPA, last updated July 2013)
Noise emissions from commercial / retail facilities	NSW Industrial Noise Policy (INP) (EPA, 2000) and the associated Application Notes (EPA, last updated July 2013)
Construction noise	Interim Construction Noise Guideline (ICNG) (DECC, 2009)
Noise associated with live music and/or patron noise from entertainment venues	NSW Office of Liquor, Gaming and Racing standard noise conditions Newcastle City Council's Interim Technical Guideline for the Assessment and Control of Low Frequency Noise from the Development of Musical Entertainment Venues

4 NOISE AND VIBRATION IMPACT ASSESSMENT

4.1 Road Traffic Noise Impact Assessment

4.1.1 Road Traffic Noise Assessment Criteria

The NSW Road Noise Policy (RNP) presents guidelines for road traffic noise assessment. **Table 3** presents the most relevant RNP criteria for the Project which has the potential to increase road traffic noise levels due to additional traffic on existing roads utilising the rezoned land.

Table 3 Road Traffic Noise Assessment Criteria for Residential Land Uses

Location	Land Use	Total Traffic Noise Criteria dBA[1] (External)	Relative Increase Criteria (External)
Residential Receivers	Existing residences affected by additional traffic on existing arterial/sub-arterial roads generated by land use developments	Daytime 60 $L_{eq(15hour)}$	Existing $L_{eq(15hour)}$ plus 12 dB
		Night-time 55 $L_{eq(9hour)}$	Existing $L_{eq(9hour)}$ plus 12 dB

Note 1: Daytime 0700 hours to 2200 hours, Night-time 2200 hours to 0700 hours.

It is noted that in all cases, where the nominated criteria are already exceeded, traffic associated with a development should not be permitted to lead to an increase in the existing traffic noise levels of more than 2 dBA and this generally arises from a greater than 60% traffic increase due to a project.

4.1.2 Predicted Road Traffic Noise Impacts

The Traffic Impact Assessment provides am and pm peak traffic volumes at two (2) screenlines across three (3) east-west traffic routes (Honeysuckle Drive/Wharf Road, Hunter Street and King Street) through the study area both with and without Project related traffic for 2018 and 2028. The maximum percentage increase in traffic due to the Project during either 2018 or 2028 and the relevant increase in road traffic noise are provided in **Table 4**.

Table 4 Predicted % Increase in Traffic Volumes and Relative Noise Increase

Route	Maximum Percentage Increase	Change in Noise Level (dB)
Honeysuckle Drive/Wharf Road	13%	0.5
Hunter Street	11%	0.4
King Street	5%	0.2

Predicted road traffic volumes indicate a negligible increase of up to 0.5 dB could be expected within the study area with rezoning sites related traffic.

4.2 Operational Noise and Vibration Impacts

Details of development specific noise emissions would be assessed at the DA stage for each development associated with the rezoning to ensure that operation of any proposed development does not adversely impact upon neighbouring noise sensitive receivers and receivers within the development itself.

Noise from entertainment venues and activities supporting the 'night-time economy' that may be proposed as part of the rezoning would be assessed on a case by case basis at the relevant DA stage.

It is envisaged that the operational noise emissions from any proposed development associated with the rezoning would be controllable by common engineering methods that may consist of, but not be limited to:

- Selection of low-noise units.
- Judicious location of noisy plant and equipment.
- Barriers/enclosures.
- Silencers.
- Acoustically lined ductwork.

Noise from parcels proposed to be rezoned RE1 Public recreation would be limited to general urban pedestrian activities, parkland and occasional 'events.' Any noise emissions from a proposed 'event' would be required to be considered and assessed as part of a DA and development of a plan of management. Noise generated from general urban use of these areas would be minimal and akin to that of an urban centre, and as such any noise impacts from these sites are predicted to be negligible.

5 EXTERNAL NOISE AND VIBRATION INTRUSION ASSESSMENT

A qualitative noise and vibration assessment has been conducted for each parcel proposed for rezoning to B4 (mixed use) with reference to the preceding assessment requirements, noise and vibration criteria, as well as proposed land use. The parcel references referred to in the following sections are consistent with those presented in **Table 1**.

Long-term ambient noise monitoring was conducted within the Project area as part of the Light Rail Noise Report with existing daytime ambient $L_{Aeq(period)}$ noise levels within study area found to range from 58 dBA to 72 dBA with night-time ambient $L_{Aeq(period)}$ noise levels ranging from 52 dBA to 67 dBA.

Daily traffic volume data has been obtained from the Light Rail Noise Report for the 2028 design year following the implementation of the Light Rail. A summary of daily 2028 traffic volumes on major roads across the study area is provided in **Table 5**.

Table 5 Predicted Traffic Volumes 2028 – With Light Rail

Road Segment	2028 Daily Traffic Volumes
Hunter Street between Union Street and Worth Place	13,094
Hunter Street between Auckland Street and Merewether Street	15,913
Hunter Street between Merewether Street and Darby Street	12,442
Hunter Street between Darby Street and Perkins Street	8,843
Scott Street between Newcomen Street and Watt Street	4,788
Honeysuckle Drive between Steel Street and Worth Place	15,375
Merewether Street between Centenary Road and Hunter Street	6,700
Wharf Road between Merewether Street and Argyle Street	9,202

Where noise and vibration impacts are identified as a potential issue at the subject parcels, generic noise and vibration mitigation measures are provided in **Section 6.1** and **Section 6.2**.

5.1 Development Near Rail Corridors and Busy Roads – Interim Guideline (DP&E 2008) (the Guideline)

5.1.1 Overview

The Guideline aims to assist in reducing the health impacts of rail and road noise and vibration by promoting consideration of their potential impacts in the planning and design of development in, or adjacent to, rail corridors and busy roads.

Applications for proposed development specified under the State Environmental Planning Policy (Infrastructure) 2007 (hereafter referred to as *Infrastructure SEPP*) are required to consider The Guideline. Where developments do not fall under the Infrastructure SEPP but may be impacted by, or may impact on, rail corridors or busy roads, The Guideline provides a useful guide for assessing potential noise and vibration impacts.

The Guideline states that "*An important feature of strategic planning is the integration of land uses and transport, with a key principle of locating activities, jobs and services in accessible locations close to public transport*." It also contains general guidance on investigating possible locations for noise-sensitive developments such as residences, places of worship, health care, child care or educational buildings with the aim of reducing or avoiding the need for site-specific mitigation measures.

According to The Guideline, only new residential and noise-sensitive building developments with a clear line of sight to the road/rail traffic need to be assessed for noise mitigation measures.

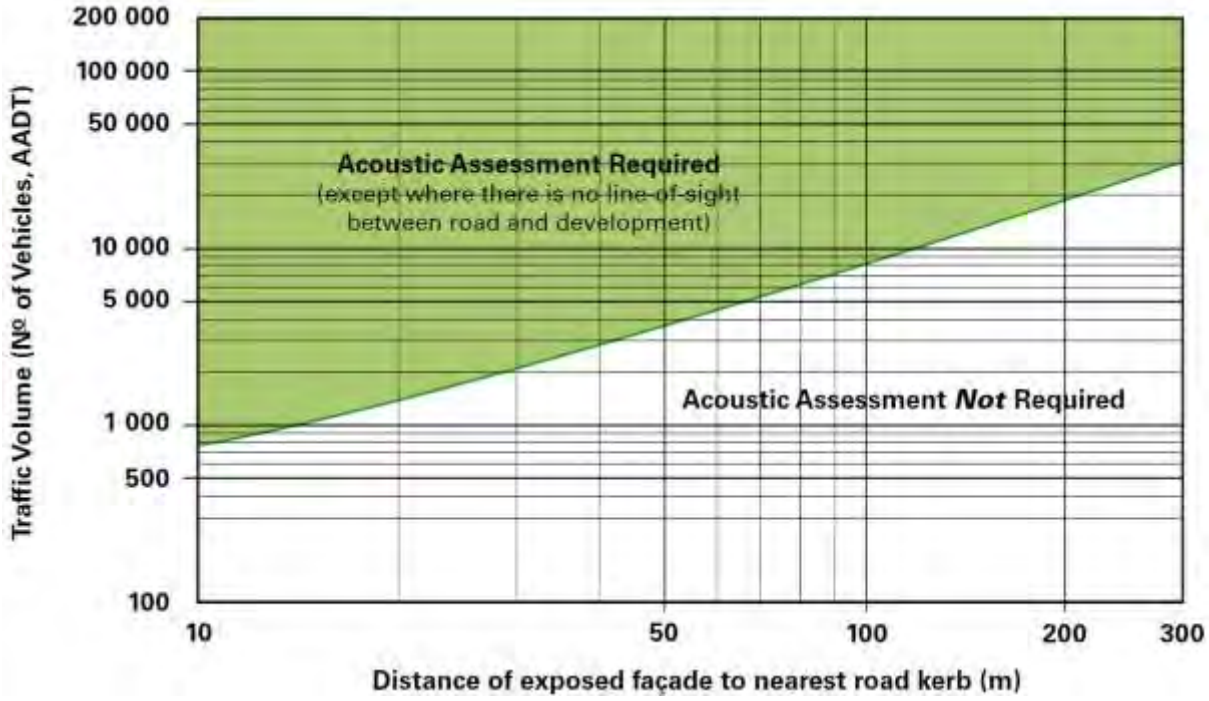
5.1.2 When is an Assessment Required?

When considering if noise and vibration are likely to be an issue it is important to note that impacts from road and rail infrastructure can vary considerably depending on site characteristics and layout as well as surrounding geography and land use. Other factors such as traffic volumes, speed, vehicle types, unobstructed distance from the road, ground cover and road/track surface also influence the level of potential impacts.

5.1.2.1 Road Noise

The Guideline provides a screen test for multiple-dwelling and other sensitive developments (refer **Figure 4**) that applies only to areas of a development (or facades of buildings) which are exposed to traffic noise and which have a direct line-of-sight to the road.

Figure 4 Screen Test 2(a) – Habitable Areas 60/70 km/h (from The Guideline)



It is noted that traffic speeds on roads that are subject of this study are likely to be typical of an urban centre and equal to or less than 60 km/h. Hence, the zone defined in **Figure 4** where acoustic assessment is required will be conservative for the purpose of this assessment.

5.1.3 Noise and Vibration Criteria

5.1.3.1 Airborne Noise Criteria

Relevant criteria for residential buildings from both road and rail traffic noise are provided in **Table 6** and are taken from the Infrastructure SEPP. **Table 6** also provides airborne noise criteria for other noise-sensitive developments which are based on the *NSW Road Noise Policy* (RNP) (DECCW, 2011). It is noted that the Guideline refers to the *Environmental Criteria for Road Traffic Noise* (EPA, 1999) in providing noise criteria for non-residential buildings however this has been replaced by the RNP.

Table 6 Airborne Noise Criteria

Type of occupancy	Noise Level (internal, except where noted)	Applicable Time Period Comments
Residential Buildings[1]		
Sleeping areas (bedroom)	35 dBA	Night (10.00 pm – 7.00 am)
Other habitable rooms (excluding garages, kitchens, bathrooms and hallways	40 dBA	At any time
Non-Residential Buildings		
School classrooms	$L_{Aeq(1hour)}$ 40 dBA	When in use[2]
Hospital wards	$L_{Aeq(1hour)}$ 35 dBA	At any time[2]
Places of Worship	$L_{Aeq(1hour)}$ 40 dBA	At any time
Childcare facilities	Sleeping areas: $L_{Aeq(1hour)}$ 35 dBA Indoor play areas: $L_{Aeq(1hour)}$ 40 dBA Outdoor play areas: $L_{Aeq(1hour)}$ 55 dBA (external)	Measurements for sleeping rooms should be taken during designated sleeping times for the facility, or if these are not known, during the highest hourly traffic noise level during the opening hours of the facility.

1. Including aged care and nursing home facilities.
2. In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the upper range of noise levels shown in Australian Standard 2107:2016.

If internal noise levels with windows open exceed the criteria by more than 10 dBA, mechanical ventilation is required to be provided to these rooms such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia.

5.1.4 Ground-Borne Noise

Generally, ground-borne noise is associated more with rail operations than roads and where residences are shielded from the masking effect of airborne noise associated with such operations (eg rail tunnels).

Ground-borne noise results from the transmission of vibration rather than the direct transmission of noise through the air. The vibration is generated by the wheel / rail interaction and is transmitted from the track via the ground into the building structure. The vibration energy can cause the floor and walls to faintly vibrate and re-radiate the energy as airborne noise within the building generating a low frequency rumbling characteristic.

The Guideline provides that "*residential buildings should be designed so that the 95th percentile of train pass-bys complies with a ground-borne L_{Amax} noise limit of 40dBA (daytime) or 35dBA (night-time) measured using the "slow" response time setting on a sound level meter.*"

In comparison to conventional heavy rail or underground rail proposals, ground-borne noise is less of an issue for light-rail as the light-rail vehicles operate generally on the surface at lower speeds than heavy rail systems. There are no tunnels proposed for the Newcastle light-rail route.

The RING states that ground-borne noise levels are relevant only where they are higher than the airborne noise from railways, and where the levels are expected to be audible within habitable rooms.

Given the preceding, it is not expected that ground-borne noise will be a risk to the Project. However, the Guideline provides that "*in some rare instances, ground-borne noise may be an issue for noise sensitive locations adjacent to surface or elevated track…These instances are uncommon, are not easily predicted, and will need to be assessed and managed on an individual basis*".

5.1.5 Vibration Criteria

Vibration levels from rail lines should comply with the criteria provided in *Assessing Vibration: a technical guideline* (AVTG) (DECC, 2006) which are based on the guidelines contained in British Standard *BS 6472:1992 Evaluation of Human Exposure to vibration in buildings (1-80Hz)* (note that this standard was updated in 2008).

The applicable human comfort vibration goal for intermittent vibration sources (ie rail pass-bys) is defined in terms of Vibration Dose Values (VDV's). The calculated VDV is dependent on the level of vibration caused by an event as well as its duration; a higher vibration level is permitted if the total duration of the vibration event(s) is small.

The AVTG nominates preferred and maximum vibration goals for critical areas, residences and other sensitive receptors. The AVTG advises that a low probability of adverse comment or disturbance to building occupants would be expected at or below the preferred values provided in **Table 7**.

Table 7 Preferred and Maximum Vibration Dose Values for Intermittent Vibration

Building Type	Preferred VDV ($m/s^{1.75}$)	Maximum VDV ($m/s^{1.75}$)
Critical working areas (e.g. hospital operating theatres, precision laboratories)	0.1	0.2
Residential Daytime	0.2	0.4
Residential Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8
Workshops	0.8	1.60

Note: Daytime is 7.00 am to 10.00 pm and Night-time is 10.00 pm to 7.00 am.

Standards relevant to assessing the risk of building damage are *German Standard DIN 4150 Part 3 1999* and *British Standard BS 7385 Part 2 1993*. It is noted that the levels of vibration likely to cause damage to buildings tend to be at least an order of magnitude (10 times) greater than levels considered acceptable by people. This also applies to heritage buildings unless they are structurally unsound.

The Light Rail Noise Report indicates that the applicable vibration goals for residential and commercial receivers are predicted to be met along the length of the proposed alignment. As such vibration impacts upon the Project from light rail is predicted to be negligible.

An assessment of noise and vibration on parcels to be rezoned for mixed use purposes is provided in **Section 5.3** to **Section 5.16**.

5.2 Noise from Industrial Activities

Noise from existing industrial activities such as the Newcastle Port and other noise generating developments would need to be considered on a case by case basis at the DA stage as industrial noise impinging upon the sites, as well as site topography and/or shielding by other developments would vary considerably across the rezoning area. It is noted however that industrial noise intrusion would not be likely to preclude residential development throughout the rezoning or that particularly onerous construction would be required to reduce internal noise levels to acceptable levels.

5.3 Parcel 1

Parcel 1 is proposed to be rezoned to B4 (Mixed use) and is likely to be used for education and related purposes. Parcel 1 has direct line of sight and is adjacent to the proposed light rail route to the west with predicted noise levels of less than 50 dBA $L_{Aeq(15hour)}$ and 45 dBA $L_{Aeq(9hour)}$ impinging across Parcel 1.

Given the predicted noise levels from light rail operations, attenuation of noise from light-rail operation may need to be a consideration at this site, however it is unlikely that special construction would be required to reduce internal noise levels to acceptable levels.

The site is approximately 35 m from Hunter Street and 75 m from Honeysuckle Drive and would require acoustic assessment. It is highly unlikely that road traffic noise intrusion would preclude residential development at this location or that particularly onerous construction would be required to reduce internal road traffic levels to acceptable levels.

5.4 Parcel 2

Parcel 2 is proposed to be rezoned to B4 (Mixed use) with a purpose for linkages/access and as such does not require any further assessment.

5.5 Parcel 3 and Parcel 4

Parcel 3 and Parcel 4 are proposed to be rezoned to B4 (Mixed use). Parcel 3 and Parcel 4 are to the north of the proposed light rail route with predicted noise levels of significantly less than 50 dBA $L_{Aeq(15hour)}$ and 45 dBA $L_{Aeq(9hour)}$ impinging across Parcel 3 and Parcel 4.

Given the predicted noise levels from light rail operations, attenuation of noise from rail operation would not need to be considered at this site.

The site does not directly face either the proposed light-rail route or any major roads. Given that Parcel 3 and Parcel 4 is surrounded by other buildings and open space it is highly unlikely that noise and vibration impacts would need to be considered at this site for the purpose of residential development, although consideration of Parcel 5 recreation activities may need to be considered.

5.6 Parcel 5

Parcel 5 is proposed to be rezoned to RE1 (Public recreation) and as such does not require any further assessment.

5.7 Parcel 6

Parcel 6 is proposed to be rezoned to B4 (Mixed use). Parcel 6 is to the north of the proposed light rail route with predicted noise levels of significantly less than 50 dBA $L_{Aeq(15hour)}$ and 45 dBA $L_{Aeq(9hour)}$ impinging across Parcel 6. Given the predicted noise levels from light rail operations, attenuation of noise from light rail operation would not need to be considered at this site.

The site fronts Merewether Street and would require acoustic assessment at DA stage. Consideration of Parcel 5 recreation may also need to be considered. It is highly unlikely that external noise intrusion would preclude residential development at this location or that particularly onerous construction would be required to reduce internal road traffic levels to acceptable levels.

5.8 Parcel 7

Parcel 7 is proposed to be rezoned to B4 Mixed use however is proposed to remain a road (Merewether Street) and as such does not require any further assessment.

5.9 Parcel 8

Parcel 8 is proposed to be rezoned to B4 (Mixed use). Parcel 8 is to the north of the proposed light rail route with predicted noise levels of significantly less than 50 dBA $L_{Aeq(15hour)}$ and 45 dBA $L_{Aeq(9hour)}$ impinging across Parcel 8. Given the predicted noise levels from light rail operations, attenuation of noise from rail operation would not need to be considered at this site.

The site fronts Merewether Street and would require acoustic assessment at DA stage should the land be considered for the purpose of residential development. It is highly unlikely that road traffic noise intrusion would preclude residential development at this location or that particularly onerous construction would be required to reduce internal road traffic levels to acceptable levels.

5.10 Parcel 9

Parcel 9 is proposed to be rezoned to B4 (Mixed use) and incorporates proposed access from Darby Street to Argyle Street. Parcel 9 has direct line of sight to the proposed light rail route to the south with predicted noise levels of approximately 55 dBA $L_{Aeq(15hour)}$ and 50 dBA $L_{Aeq(9hour)}$ impinging across the site and would require acoustic assessment.

5.11 Parcel 10

Parcel 10 is proposed to be rezoned to B4 Mixed use however is proposed to become an access way (Darby Plaza) and as such does not require any further assessment.

5.12 Parcel 11

Parcel 11 is proposed to be retained as SP2 Infrastructure and as such does not require any further assessment.

5.13 Parcel 12

Parcel 12 is proposed to be rezoned to B4 (Mixed use). Parcel 12 has direct line of sight and is adjacent to the proposed light rail route and light rail stop to the south with predicted noise levels of approximately 65 dBA $L_{Aeq(15hour)}$ and 60 dBA $L_{Aeq(9hour)}$ impinging across the site. The site also fronts Hunter Street to the south and would require acoustic assessment.

Given the predicted noise levels impinging on the site and its frontage to a major roadway an acoustic assessment at the DA stage would be required to ensure internal noise levels are met.

Notwithstanding the preceding it is unlikely that light rail and road traffic noise intrusion would preclude residential development at this location or that particularly onerous construction would be required to reduce internal noise levels to acceptable levels.

5.14 Parcel 13

Parcel 13 is proposed to be retained as SP2 Infrastructure and as such does not require any further assessment.

5.15 Parcel 14

Parcel 14 is proposed to be rezoned to RE1 (Public recreation) and as such does not require any further assessment.

5.16 Parcel 15

Parcel 15 is proposed to be rezoned to SP3 (Tourist). Parcel 15 has direct line of sight and is adjacent to the proposed light rail route to the south with predicted noise levels of approximately 65 dBA $L_{Aeq(15hour)}$ and 60 dBA $L_{Aeq(9hour)}$ impinging across the site. The site also fronts Hunter Street to the south and Wharf Road to the north.

Newcastle Railway Station is proposed to be re-purposed into a hallmark destination and focal point for the new East End, accommodating enterprises and activities that attract visitors and stimulate the economy. It is envisaged that any specialist acoustic requirements for development on the site would be addressed during the DA stage.

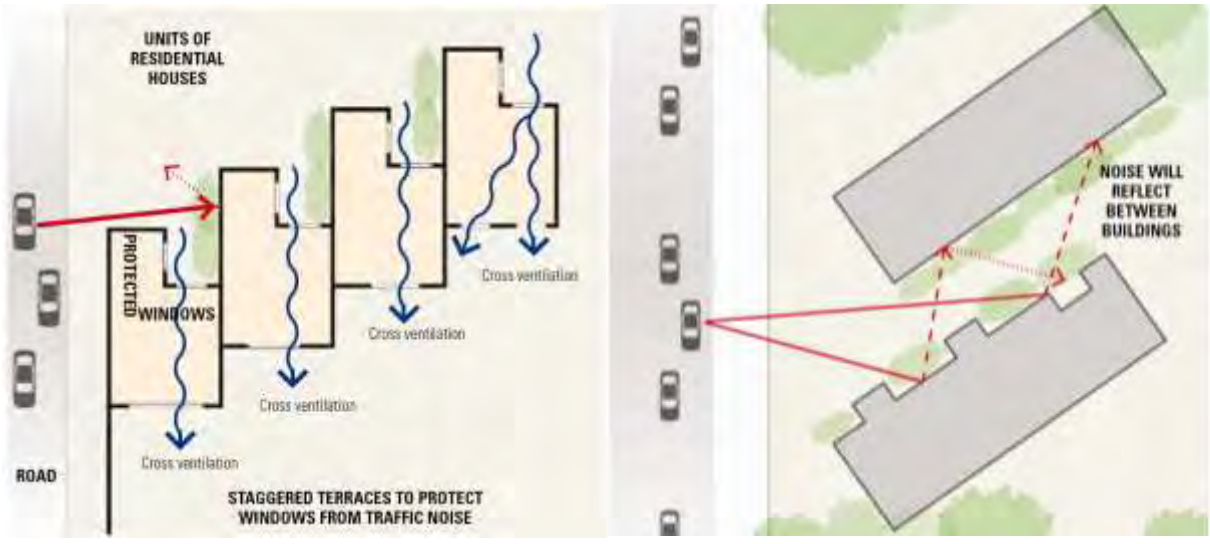
6 GENERAL RECOMMENDATIONS

6.1 General Noise Mitigation Recommendations

Section 3.8 of The Guideline provides guidance with regard to avoiding adverse airborne noise impacts by good design. These are summarised as follows:

- Consideration of noise and vibration impacts at the master planning / concept planning stage when there is greater opportunity to incorporate setbacks, building orientation and height controls or noise barriers.
- Locate sleeping and other habitable areas within buildings furthest from the noise source. Conversely, locating less sensitive areas (laundries, bathrooms, corridors, stairs, etc) towards the noise source increases the separation distance to the sensitive areas.
- Minimise the number of doors and windows facing the noise source.
- Implement noise barriers. A noise barrier may consist of a natural slope of the land, earth mounding or a solid barrier or any combination of these.
- Staggered terrace houses or angled buildings can be used to minimise noise impacts as shown in **Figure 5**.

Figure 5 Use of staggered terrace houses or angled buildings to reduce noise intrusion



Source: Development near Rail Corridors and Busy Roads – Interim Guideline (DoP, 2008)

- Use of podiums, balconies and courtyards to increase the travel path of noise to noise-sensitive areas.

- Careful consideration/design of building elements including walls, windows, doors and roofs.

6.2 Vibration Mitigation Recommendations

The Guideline provides the following with regard to potential vibration and/or ground borne noise impacts:

> *To mitigate vibration and ground-borne noise, it is necessary to inhibit the transmission of the vibration at some point in the path between railway track or road and the building. For many buildings, sufficient attenuation of ground vibration is provided by the distance from the road/track or by the vibration 'coupling loss' which occurs at the footings of the building.*

Due to the site-specific nature of potential vibration impacts it is difficult to provide generic advice in this regard. Given the findings of the Light Rail Noise Report it is not expected that vibration impacts will be a major risk to the Project. Notwithstanding, a vibration assessment should be conducted by an appropriately qualified acoustic consultant in accordance with The Guideline at the DA stage.

7 CONCLUSION

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Elton Consulting on behalf of Urban Growth NSW to prepare a Noise and Vibration Impact Assessment (NVIA) to support the amendment to the Newcastle Local Environmental Plan (NLEP) 2012 that applies to the surplus rail corridor land ('rail corridor land') between Worth Place and Watt Street in Newcastle city centre.

The primary purpose of this report was to consider the feasibility of each subject site with regard to potential noise and vibration impacts only.

It is concluded that development on rail corridor land would not be precluded on the basis of noise and vibration. It is noted that it is unlikely that particularly onerous construction or mitigation measures would be required to meet relevant noise criteria and that potential noise impacts would be addressed on a case by case basis at the DA stage for each development to assesses any potential noise impacts.