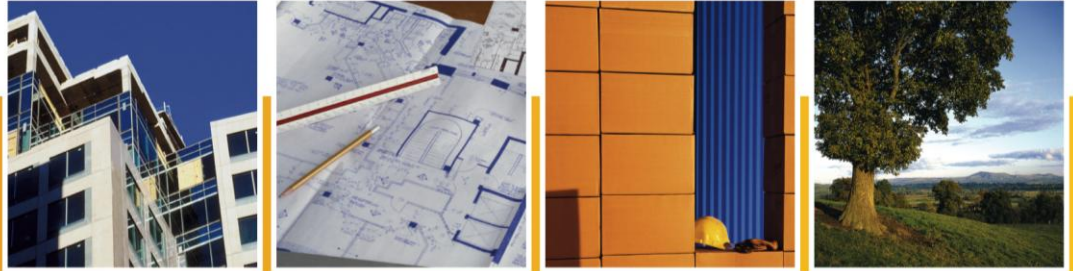


PLANNING PROPOSAL REQUEST



For

PROPOSED REZONING

At

**71 BRANXTON ST
GRETA**

Prepared For
Karl Waeger

November 2017
Report 17/015/1 Rev1

Prepared by



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Project Manager

Date: 23rd November 2017

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CONTENTS

1.0	Objectives and intended outcomes	5
1.1	Background	5
1.2	Objectives.....	6
2.0	Explanation of provisions	7
3.0	Justification.....	8
	Section A Need for the Planning Proposal.....	8
	Section B Relationship to strategic planning framework	9
	Section C Environmental, social and economic impact.....	10
	Flooding	12
	Bushfire	13
	Geotechnical	14
	Urban Capability.....	14
	Preliminary Contamination	14
	Mine Subsidence.....	14
	Heritage.....	15
	Section D State and Commonwealth interests.....	15
4.0	Mapping.....	16
5.0	Community consultation.....	17

ATTACHMENTS

Attachment 1 – Proposed Subdivision

Attachment 2 – Mapping

Attachment 3 – Flora and Fauna Assessment

Attachment 4 – State Environmental Planning Policy Compliance Table

Attachment 5 – s117 Ministerial Directions Compliance Table

Attachment 6 – Preliminary Stormwater Management Plan

Attachment 7 – Preliminary Bushfire Threat Assessment

Attachment 8 – Geotechnical Assessment

Attachment 9 – Preliminary consultation with Government agencies

FIGURES

Figure 1: Existing land zone map 5

Figure 2: Environmentally sensitive land map..... 12

Figure 3: Flood map 13

Figure 4: Bushfire prone land map 13

PHOTOS

Photo 1: Western corner of Lot 1 11

Photo 2: View of site from Water Street towards northern corner of Lot 1 11

1.0 OBJECTIVES AND INTENDED OUTCOMES

1.1 BACKGROUND

This planning proposal is prepared By *HDB Town Planning and Design* in accordance with s55 of the Environmental Planning and Assessment Act 1979 to rezone Lot 1 DP873220 from RU2 Rural Landscape to R2 Low Density Residential.

The site comprises a rural parcel located “between” residentially zoned land. To the north and west new residential land is presently being developed.

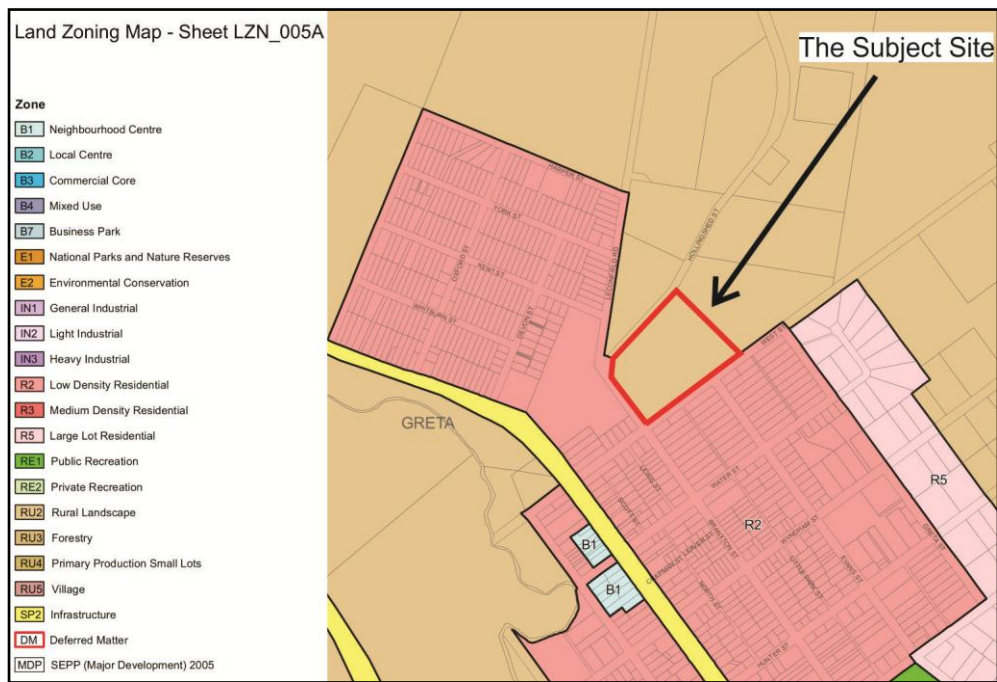


Figure 1: Existing land zone map
 Source: NSW Legislation

As the site is zoned RU2 Rural Landscape, Council has applied a 40ha minimum lot size to the property. This is in contrast to the residential area immediately adjoining the property which has a minimum lot size of 450m². The Rural Residential area further to the east is restricted to a minimum lot size of 2,000m². With the site itself having an area of only 5.8ha and largely surrounded by residential uses, there is limited opportunity for primary production activities as intended in its current zoning. Therefore a residential development with a minimum lots size of 450m² would appear to be the most suitable option for development of the site.

Cessnock Citywide Settlement Strategy 2010 identifies Greta and neighbouring settlements as being subject to significant change over the next 25 years due to their strategic location at the fringe of residential areas, alongside main infrastructure corridors providing easy access to full reticulated systems. The Strategy recommends an upgrade in the village status of Greta to ‘Low Density Residential’. Further to this, the site is closely located to the largest greenfield site outside of

Huntlee in the recently adopted Branxton Subregion Land Use Strategy and meets the housing objectives for the subregion as outlined in the document. Hence rezoning to R2 Low Density Residential Zone is required to facilitate a development more suited to the land use pattern in the locality.

1.2 OBJECTIVES

The objective of the planning proposal is:

- Amend Cessnock Local Environmental Plan 2011 as it applies to Lot 1 DP873220 to allow for low density housing.

2.0 EXPLANATION OF PROVISIONS

It is proposed to rezone the site from RU2 – Rural Landscape to R2 – Low Density Residential commensurate with the area surrounding the subject site. To compliment the proposed zoning it would also be proposed to amend the LEP to reduce the minimum lot size from 40ha to 459sqm. This will allow for a residential form which fits in with the characteristics of the existing subdivision pattern to the east and west, as well the future developments on the adjoining urban release areas. The design concept involves a standalone residential area which is clear of the flood prone parts of the site to eliminate engineering solutions and ultimately reduce the scale of development.

To facilitate this proposal the Cessnock Local Environmental Plan 2011 (LEP 2011) would be amended in the following manner:

- Amend Cessnock Local Environmental Plan 2011 as it applies to Lot 1 DP873220 in accordance with the proposed Land Zoning Map shown in *Attachment 1*;
- Amend Cessnock Local Environmental Plan 2011 as it applies to Lot 1 DP873220 in accordance with the proposed Lot Size Map shown in *Attachment 2*.

3.0 JUSTIFICATION

SECTION A NEED FOR THE PLANNING PROPOSAL

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

This proposal is not a result of any strategy or report; however it is consistent with the housing objectives identified in the Branxton Subregion Land Use Strategy and the changes to the settlement pattern envisaged in the Cessnock City Wide Settlement Strategy.

The development of the Hunter Expressway has created new opportunities for Branxton and Greta. The improved access to and from the lower Hunter allows Branxton and Greta to be considered as alternative options for people looking for a rural / country or tree change lifestyle, while remaining within close proximity to a major regional centre. This brings with it a demand for new housing. The future development of Huntlee, and the range of higher order services that this will entail, only adds to the attractiveness of Branxton and Greta.

The strategic value of allowing further development on the subject site is very much linked to the wider consideration of Branxton and Greta.

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

A planning proposal represents the only mechanism to affect the proposed changes.

The site is currently zoned RU2 – Rural Landscape. The objectives of the current zoning refer to

“preservation of the agricultural, mineral and extractive production potential of the land” and “encourage(ing) sustainable primary industry production”.

The property does not currently produce any form of agricultural outputs. Owing to its size, and the surrounding land uses, the opportunity to develop any form of commercially sustainable agricultural production is severely limited.

Surrounding the subject site is land zoned R2 - Low Density Residential and in the broader context land zoned R5 - Large Lot. These zones are considered to more accurately reflect the type and function of use associated with the subject land, both now and into the future.

It is noted that Cessnock Council has not adopted the RU1 - Primary Production zone with the Cessnock LEP 2011. As such the RU2 – Rural Landscape and RU4 - Primary Production Small Lots zones are the only rural / primary production zones used. As such the RU2 – Rural Landscape, in particular, is generally linked to a minimum lot size of 40ha, although some exceptions exist. The Cessnock City Wide Settlement Plan notes that the 40ha lot size standard, within the general rural lands, was introduced in the 1970’s as an interim measure to prevent the fragmentation of

rural lands by rural residential subdivision. This broad brush approach to the minimum lot size has resulted in the lot size map not responding to, or recognising, the variance in lot size and use within the rural lands.

The only option available to address these issues is the development of a planning proposal to seek to amend the Cessnock LEP 2011 in a manner consistent with the preferred option.

SECTION B RELATIONSHIP TO STRATEGIC PLANNING FRAMEWORK

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)?

Yes.

The Hunter Regional Plan provides an overarching framework to guide detailed land use policies, developments proposal and infrastructure funding decisions in the Hunter Region. Housing in locations with good access to public transport and services is central to this plan and it provides directions for creating a compact development pattern with special focus on infill sites.

The plan identifies New England Highway Corridor through Greta as a growth area and the continued delivery of Branxton Subregional Strategy as a regional priority. The site is located along this growth corridor in the immediate vicinity of the Urban Release Area on West Street. The proposal aligns with the plan's directions deliver housing on infill sites with good access to established services to meet the housing demand in the subregion. There is nothing in this planning proposal that is inconsistent with the plan's goals and directions for housing development in the region.

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

Yes.

The site is consistent with the criteria for residential land provided in the Branxton Subregion Land Use Strategy. The proposal is also in step with the Cessnock City Wide Strategy which recognises a higher order settlement in Greta owing to the development of the Hunter Expressway and the provisioning of infrastructural services.

The subject site is part of the Branxton Subregion Land Use Strategy and Structure Plan which outlines the vision, objectives and benchmarks for land use planning and development within the Subregion to 2041.

The criteria for identifying land for residential use are provided in Direction 3 of the Strategy. This emphasises creating settlement patterns close to existing development

to minimise extension to trunk infrastructure. The Strategy also discourages developments which result in a change to the physical boundaries of the settlement.

The subject site lies between R2 zoned areas adjoining the West and Wyndham Street precincts identified in the Strategy. The infrastructure provisioning for the site can be easily achieved from the adjoining residential zoned lands. Hence the site's attributes are typical of an infill development which fit within the existing zoning pattern representing an orderly growth of the settlement and thereby meeting the guidelines for settlement growth and housing in the subregion as set forth in the Strategy.

Is the planning proposal consistent with applicable state environmental planning policies?

A review of the applicable SEPP has been undertaken as part of the preparation of this proposal. A copy of this review is included as *Attachment 4*.

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

A review of the s.117 directions has been undertaken as part of the preparation of this proposal. A copy of this review is included as *Attachment 5*.

SECTION C ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACT.

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 as a whole is classified *environmentally sensitive land (Figure 8)* by Cessnock City Council. The “*Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project*” identifies vegetation types located within the area to include; Red Ironbark / Paperbark shrubby open forest; and Parramatta Red Gum / *Melaleuca Nodosa* shrubby woodland in the Cessnock / Kurri Kurri area. These areas are considered *Endangered Ecological Communities* within the Kurri Sand Swamp Woodland in the Sydney Basin Bioregion.

There are also a large number of introduced species, such as pine trees, which have been identified onsite.

A flora and fauna assessment has been undertaken to ascertain if there were any threatened or critically endangered species, populations, or ecological communities, or their habitats, located on the subject land. A copy of the report is provided in *Attachment 3*. It should be noted that, excluding the existing pine trees, the site is predominantly cleared with only a few scattered remnant stands of vegetation. Due to the disturbed nature of existing vegetation, the assessment concluded that the proposal was unlikely to have an impact on the threatened entities assessed and

therefore, from an ecological perspective, there would be no impediment to development consent being granted for subdivision of this land.



Photo 1: Western corner of Lot 1
Source: HDB



Photo 2: View of site from Water Street towards northern corner of Lot 1
Source: HDB

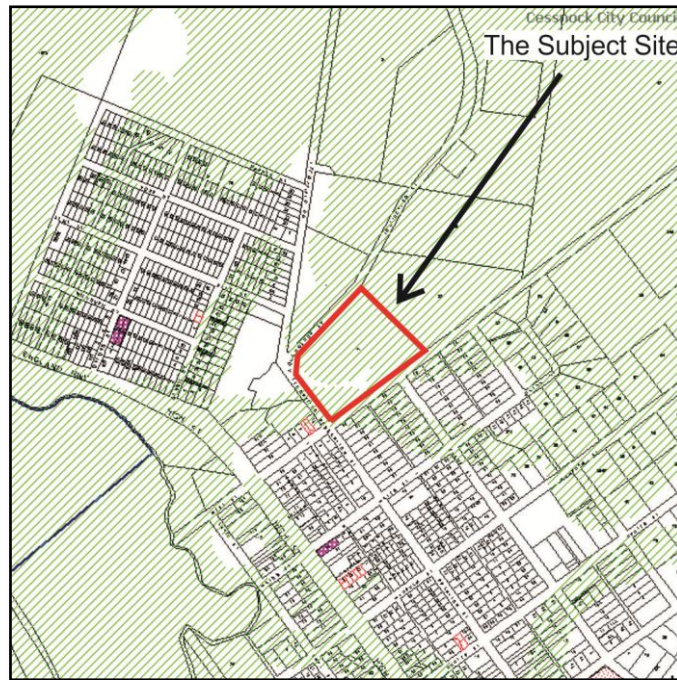


Figure 2: Environmentally sensitive land map
 Source: Cessnock City Council

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

FLOODING

The site has been identified as having areas subject to flooding. The flood mapping has indicated the north-east and south-east areas of Lot 1 are affected by the 1:100 year Average Recurrence Interval (ARI) flood event.

A preliminary Stormwater Management Plan has been developed to consider these issues (see *Attachment 6*).

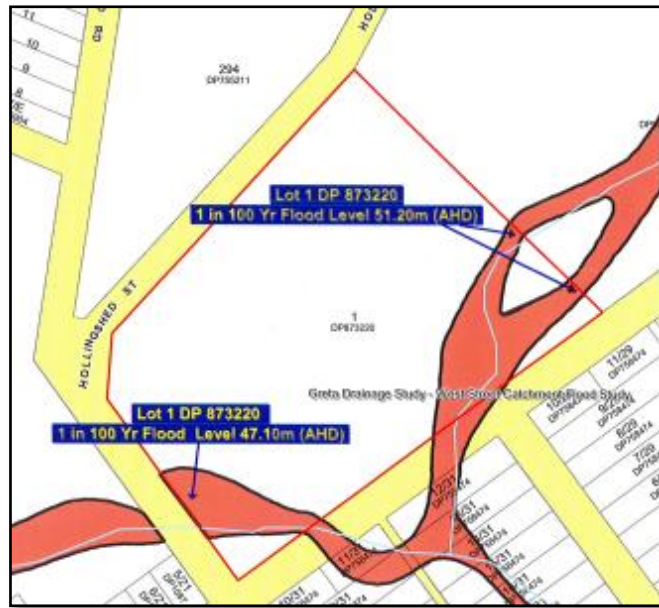


Figure 3: Flood map
Source: Cessnock City Council

BUSHFIRE

The subject site is located within bushfire prone land, as shown on the Bushfire Map below. The orange and yellow areas on the attached map indicate the presence of vegetation that has the potential to be a fire source. The red areas are the 30 metre and 100 metre bushfire buffers, which designates that land as bushfire prone. A preliminary Bushfire Threat Assessment Report is attached (see *Attachment 7*).

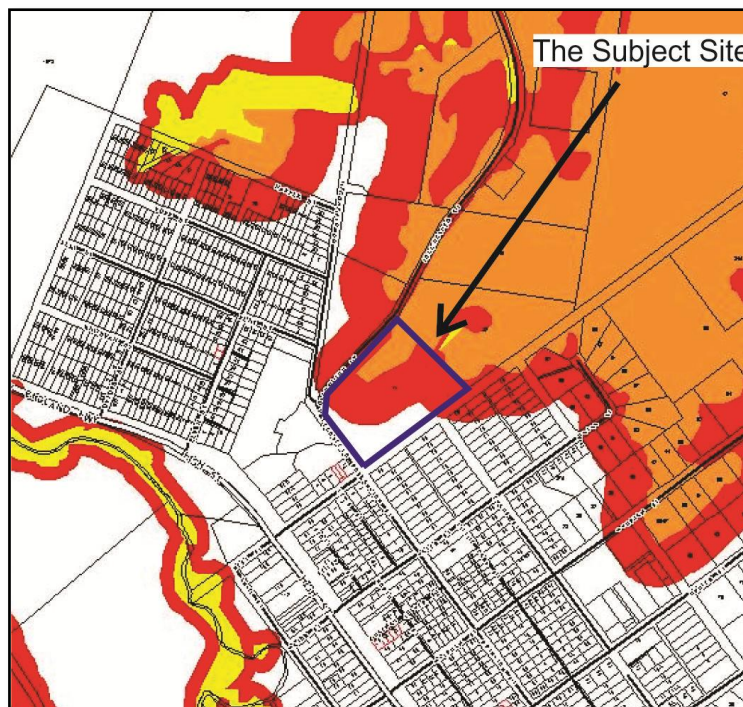


Figure 4: Bushfire prone land map
Source: Cessnock City Council

GEOTECHNICAL

Greta and its surrounds have a history of mining as well as agricultural land uses; as such a detailed assessment was made of the geotechnical conditions on the site. This included:

- Urban Capability (Qualtest Laboratory NSW);
- Preliminary Contamination Assessment (Qualtest Laboratory NSW); and
- Mine Subsidence Investigation (Regional Geotechnical Solutions).

A copy of each of the above is provided as **Attachment 8** for the Geotechnical Assessment Report.

A brief summation of the conclusions of the reports is provided below.

URBAN CAPABILITY

- The site is considered suitable for development.
- There is no evidence of slope instability.
- There are no particular constraints to the types of structures that would be considered appropriate for the site.
- Guidelines are provided to ensure future designs are prepared having regard to the conditions of the site.
- It is considered unlikely that acid sulphate soils would be present at the site.
- Similarly the proposed development presents a low risk of disturbance of acid sulphate soils.
- Test results indicate the area is non-saline.

PRELIMINARY CONTAMINATION

- Based on the site history and site inspection, it is considered that the site is suitable for the proposed residential development.
- Due to the presence of waste materials, small fill mounds, and the former mining on then northwest portion of the site, an Unexpected Finds Procedure should be prepared and implemented in association with any future development of the site.

MINE SUBSIDENCE

- Evidence of underground works were evident onsite.
- Several pot holes and some depressions were visible in the landscape.
- It is considered that the site is suitable for development subject to rectification works to address the existing issues.

HERITAGE

There are no known items of historical, Aboriginal or archaeological significance on the subject site.

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

The planning proposal will continue to support the local “development” economy that is seeing the realisation of several long planned residential developments. These broader developments will bring growth / demand for social infrastructure. While support the growth given the scale of the site this will be minor in respect to these other sites.

SECTION D STATE AND COMMONWEALTH INTERESTS.

Is there adequate public infrastructure for the planning proposal?

There will potentially be an increased demand placed on the existing public infrastructure. This would primarily relate to the local road network and the reticulated sewage system.

Any proposed upgrades resulting from this proposal would be managed and addressed by the proponent as part of the subsequent application.

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

Government Agencies have previously been consulted in determining the scope of matters which may need to be considered as part of the preparation of this planning proposal. A copy of the advice received is provided (see *Attachment 9*).

4.0 MAPPING

The amendments proposed to Cessnock Local Environmental Plan 2011 have been mapped as per Attached 1 and 2.

Specifically the proposal would require the amendment of:

- Land Zoning Map – Sheet LZN_005A; and
- Lot Site Map – Sheet LZN_005A.

5.0 COMMUNITY CONSULTATION

Community Consultation would be undertaken having regard to Council requirements and the Gateway Determination.

ATTACHMENT 1

PROPOSED SUBDIVISION PLAN



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Scale - 1:1500 @ A3
 Date - 24/07/2017
 Revision - A
 Drawn - AOB

Option 1
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ATTACHMENT 2

MAPPING



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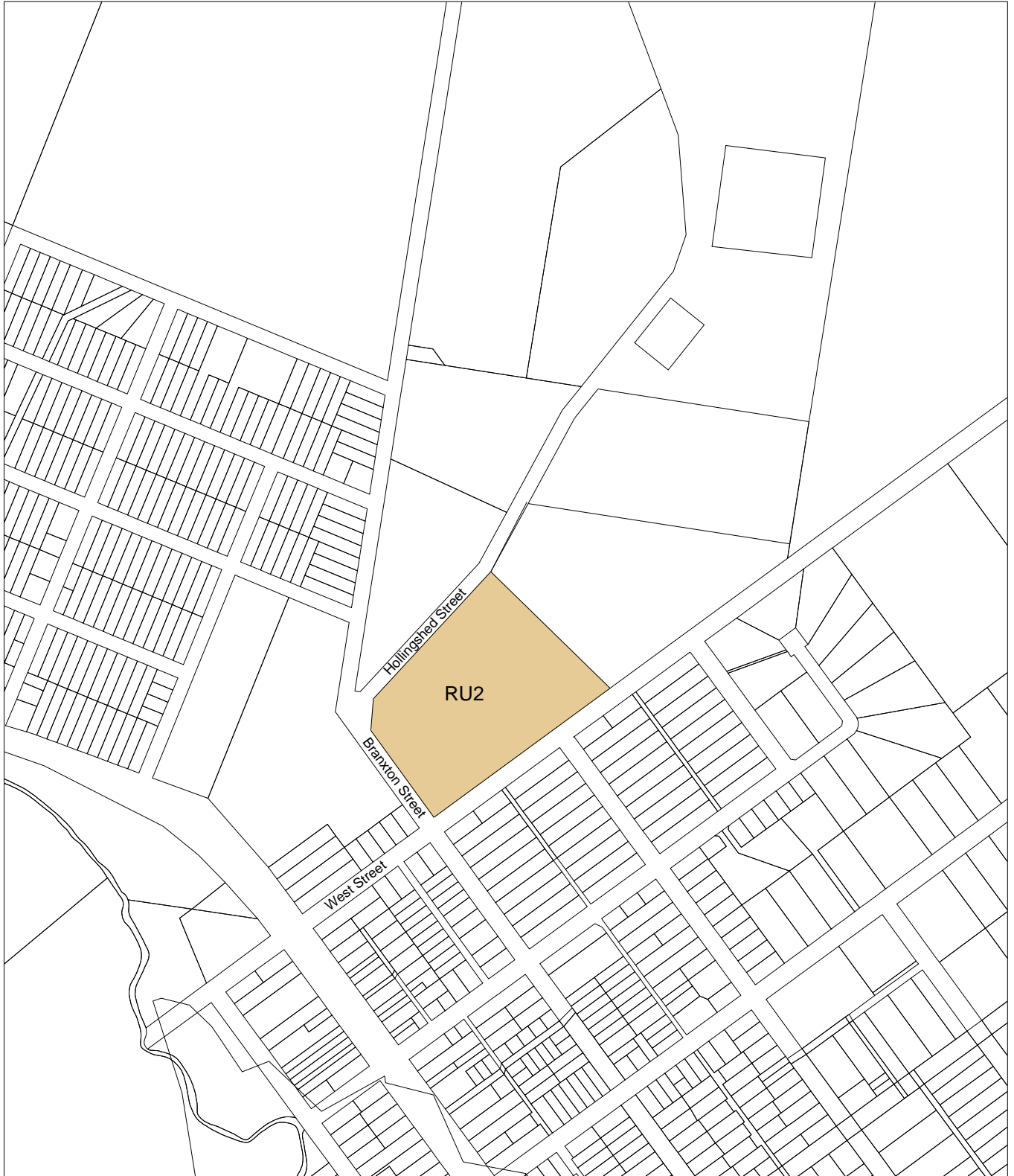
FIGURE 1 - LOCALITY MAP

PLANNING PROPOSAL- LOT 1 DP 873220,
 71 BRANXTON STREET, GRETA

DATE: 31/10/2017



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FIGURE 2 - CURRENT LAND USE ZONE

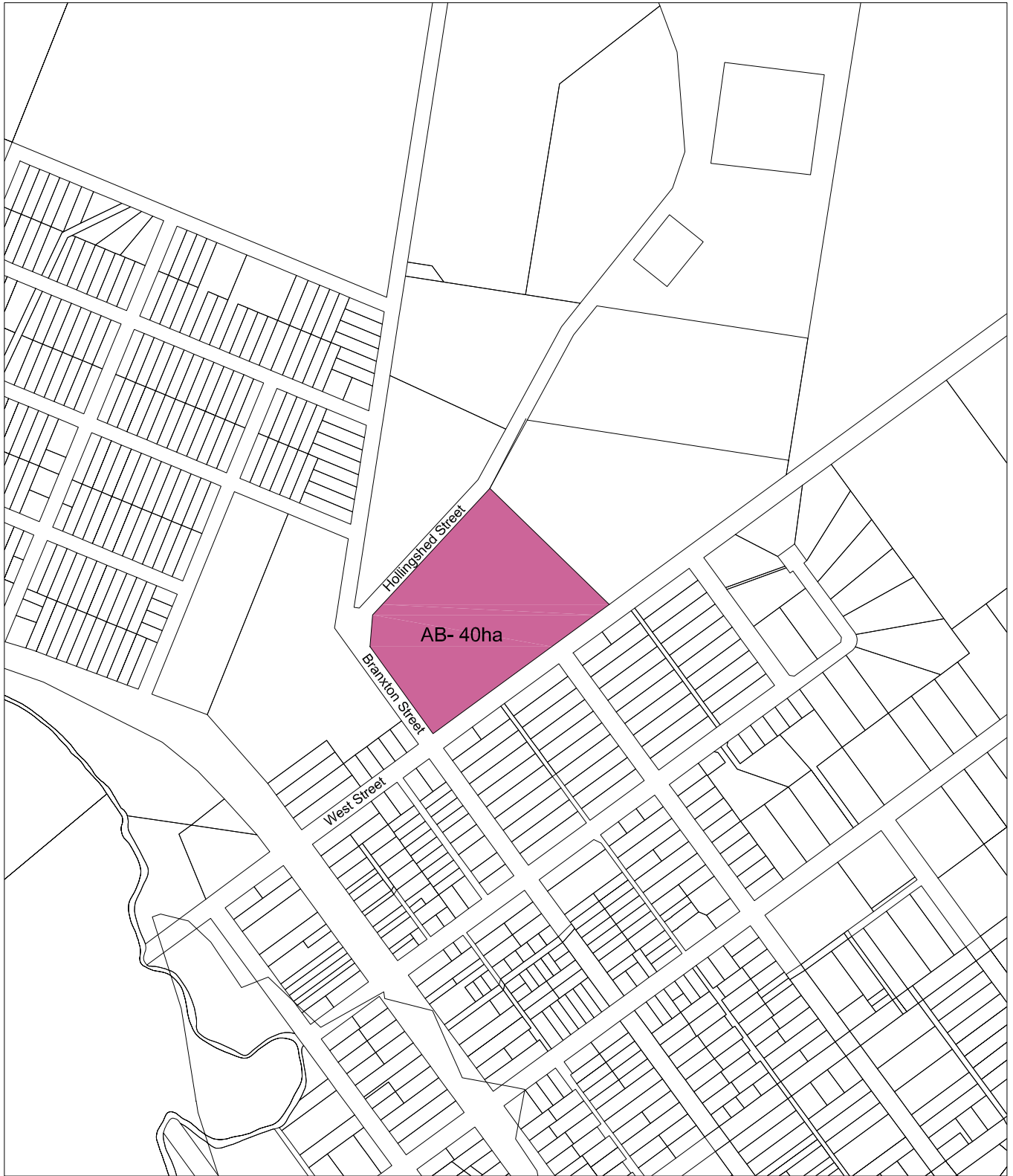
PLANNING PROPOSAL- LOT 1 DP 873220,
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SCALE 1: 200

DATE: 31/10/2017



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FIGURE 3 - CURRENT LOT SIZE

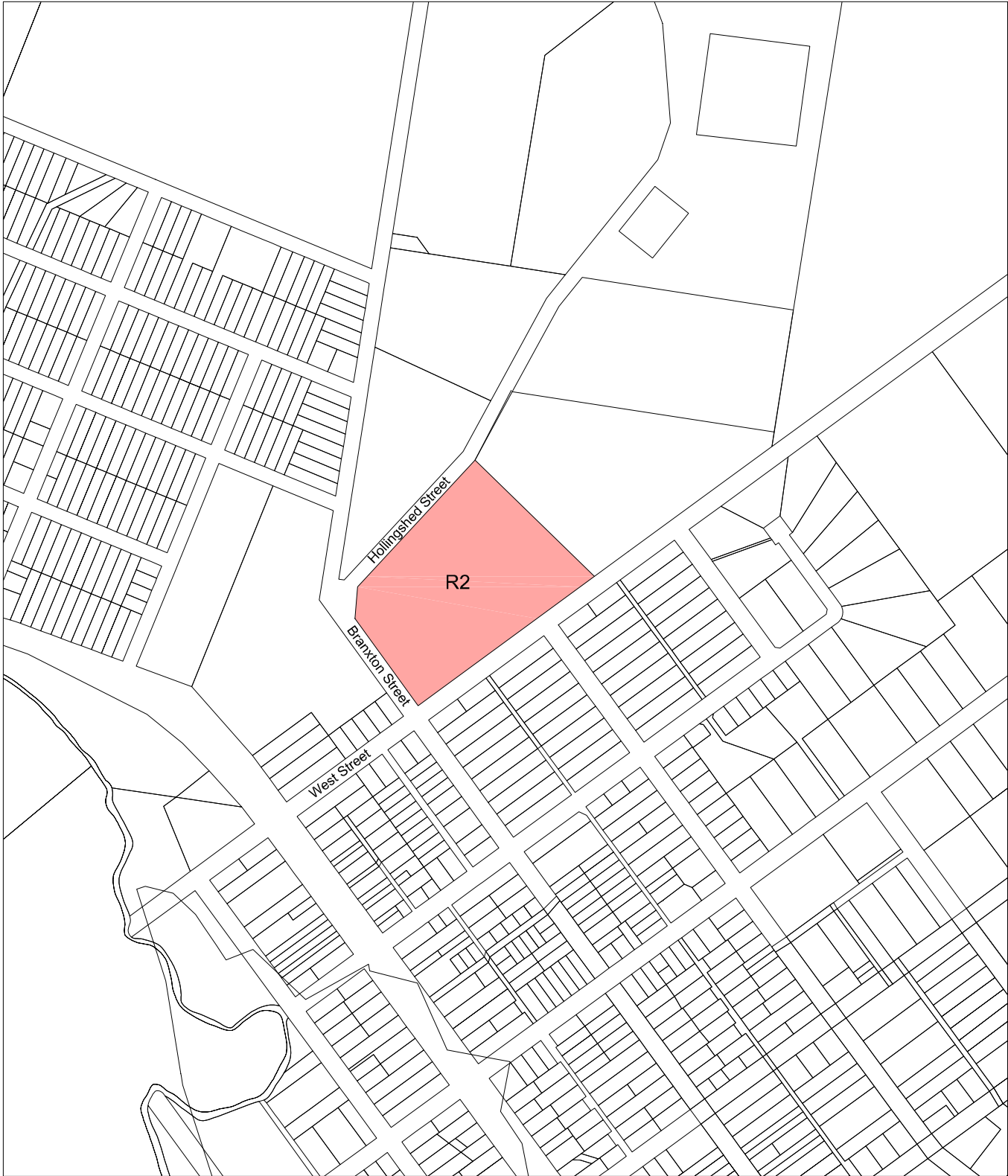
PLANNING PROPOSAL- LOT 1 DP 873220,
 71 BRANXTON STREET, GRETA

SCALE 1: 200

DATE: 31/10/2017



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FIGURE 4 - PROPOSED LAND USE ZONE

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 71 BRANXTON STREET, GRETA

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 DATE: 31/10/2017



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FIGURE 5 - PROPOSED LOT SIZE

PLANNING PROPOSAL- LOT 1 DP 873220,
 71 BRANXTON STREET, GRETA

DATE: SCALE 1: 200
 DATE: 31/10/2017



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ATTACHMENT 3

FLORA AND FAUNA ASSESSMENT



Ecological Assessment


Lot 1 DP873220, 71 Branxton Street, Greta

Prepared for

Karl Waeger C/O- HDB Planning and Design

Final / November 2017

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DOCUMENT STATUS

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Status	Final		
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V1	21/11/17	AC/ BS/MD	Draft for client review
V2	21/11/17	AC/ BS/MD	Draft for client review

Approval for use:



Matt Doherty - Director

21 November 2017

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EXECUTIVE SUMMARY

MJD Environmental has been engaged by Karl Waeger C/O- HDB Town Planning & Design, to prepare an Ecological Assessment to accompany a rezoning application for a 42 lot residential subdivision at Lot 1 DP873220, 71 Branxton Street, Greta.

NSW Biodiversity Reforms - This assessment has been prepared with due regard to the transitional arrangements set out under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (Transitional Regulations). Under Part 7 clause 27 of the Transitional Regulations, the proposal is categorised as a *pending or interim planning application* pursuant to subclause (e) as the development application has been lodged with the consent authority within 3 months of commencement of the NSW Biodiversity Reforms (25th August 2017), being before 25th November 2017. It is on this basis that the assessment aims to examine the likelihood of the proposal having a significant effect on any threatened species, populations or ecological communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act). This assessment recognises the relevant requirements of the EP&A Act 1979 (as amended by the *NSW Environmental Planning and Assessment Amendment Act 1997*). Preliminary assessment was also undertaken having regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report has been prepared with respect to the *Lower Hunter Central Coast Regional Fauna & Flora Survey Guidelines* (LHCCREMS 2002) and the *Threatened Biodiversity Survey and Assessment Guidelines* (DEC 2004). Due to the lack of native vegetation and fauna habitat on site the survey effort undertaken was modified to suit the current site conditions.

Based on a comprehensive desktop review of threatened species databases and vegetation mapping coupled with a field validation survey, the ecological assessment found:

A total of four vegetation communities across the Site as follows:

- MU 19 Hunter Lowlands Redgum Forest (Low condition);
- Pasture with Scattered trees
- Dam and degraded creekline
- Managed landscape

No threatened flora species were detected during field surveys

Two threatened species, specifically the Little Bent-wing Bat (*Miniopterus australis*) and Eastern Bent-winged Bat (*Miniopterus schreibersii oceanensis*) listed as Vulnerable under the TSC Act, were recorded on site during the field validation survey. No additional threatened species were confidently recorded within the study area.

Assessment under SEPP 44 found that no 'Potential Koala Habitat' occurs within the Site and no further assessment under SEPP 44 was required.

The ecological impact assessment considered whether the removal of vegetation and cleared areas on site would constitute a significant impact on known threatened species, populations and ecological communities from the locality such that a local extinction may occur. The assessment concluded that the proposal was unlikely to have an impact on the threatened entities assessed and therefore, from an ecological perspective, there would be no impediment to development consent being granted for subdivision of this land.

CONTENTS

1	Introduction	1
1.1	Description of Proposal	1
1.2	Aims & Scope	1
1.3	Site Particulars.....	2
1.4	Qualifications & Licencing	2
2	Methodology	4
2.1	Desktop Assessment.....	4
2.2	Field Survey.....	4
2.2.1	Vegetation & Significant Flora Survey.....	4
2.2.2	Fauna.....	5
2.2.3	Habitat Survey	7
2.3	Limitations.....	7
3	Results.....	11
3.1	Desktop Assessment.....	11
3.2	Flora Survey	17
3.2.1	Vegetation Mapping & Delineation	17
3.2.2	Significant Flora Survey.....	21
3.3	Fauna Survey	21
3.3.1	Mammals	21
3.3.2	Avifauna.....	21
3.3.3	Microchiropteran Bats.....	21
3.3.4	Herpetofauna	22
3.4	Habitat Survey	22
4	Impact Assessment	26
4.1	Potential Impacts	26
4.2	Threatened Species & Communities Likelihood of Occurrence Assessment.....	28
4.3	Other Legislative Considerations.....	45
4.3.1	Key Threatening Processes	45
4.3.2	SEPP 44 – Koala Habitat Protection	48

4.3.3	Commonwealth EPBC Act.....	49
5	Recommendations & Mitigation Measures.....	51
6	Conclusion.....	52
7	References & Bibliography.....	53

LIST OF FIGURES

Figure 1	Site Location.....	3
Figure 2	Flora Survey.....	9
Figure 3	Fauna Survey.....	10
Figure 4	Vegetation Map.....	24
Figure 5	Threatened Fauna Results.....	25

LIST OF TABLES

Table 1	Prevailing Weather Conditions.....	4
Table 2	Threatened Flora & Fauna Database Search Results.....	11
Table 3	Vegetation Community Areas.....	20
Table 4	Development Outcome.....	27
Table 5	Likelihood of Occurrence and Impact Assessment.....	29

APPENDICES

Appendix 1	Plan of Proposal
Appendix 2	Flora and Fauna Species List
Appendix 3	Assessment of Significance (7-part Test)
Appendix 4	Anabat Report

GLOSSARY OF TERMS AND ABBREVIATIONS

Term/ Abbreviation	Meaning
BC Act	Biodiversity Conservation Act 2016
Council	Cessnock City Council
DoE	Commonwealth Department of the Environment
DPE	NSW Department of Planning and Environment
DPI Water	NSW Department of Primary Industries – Water
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
ha	hectare
LGA	Local Government Area
LHCCREMS	Lower Hunter Central Coast Regional Environmental Management Strategy
LLS Act	Local Land Services Act
NV Act	Native Vegetation Act 1995 (as repealed)
OEH	NSW Office of Environment and Heritage
TSC Act	NSW Threatened Species Conservation Act 1995 (as repealed)

1 Introduction

MJD Environmental has been engaged by Karl Waeger C/O- HDB Town Planning & Design, to prepare an Ecological Assessment to accompany a rezoning application for a residential subdivision at Lot 1 DP873220, 71 Branxton Street, Greta, hereafter referred to as the 'site'. (Figure 1).

1.1 Description of Proposal

It is proposed to rezone the site to R2 Low Density Residential commensurate with the surrounding developments. This will allow for a residential form which fits in with the characteristics of the existing subdivision pattern to the east and west, as well the future developments on the adjoining urban release areas. The design concept involves a standalone residential development accommodating approximately 42 lots capable of accommodating building envelopes above the flood levels to eliminate engineering solutions and ultimately reduce the scale of development.

Refer to **Appendix A** for a plan of the proposal.

1.2 Aims & Scope

Cessnock City Council (CCC) requires the preparation of an Ecological Assessment to consider the potential for ecological impacts to occur on the site and study area as a result of the proposal.

NSW Biodiversity Reforms - This assessment has been prepared with due regard to the transitional arrangements set out under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (Transitional Regulations). Under Part 7 clause 27 of the Transitional Regulations, the proposal is categorised as a *pending or interim planning application* pursuant to subclause (e) as the development application has been lodged with the consent authority within 3 months of commencement of the NSW Biodiversity Reforms (25th August 2017), being before 25th November 2017. It is on this basis that the assessment aims to examine the likelihood of the proposal having a significant effect on any threatened species, populations or ecological communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act). This assessment recognises the relevant requirements of the EP&A Act 1979 (as amended by the *NSW Environmental Planning and Assessment Amendment Act 1997*). Preliminary assessment was also undertaken having regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report considers a number of guiding documents, including:

- Lower Hunter Central Coast Regional Flora & Fauna Survey Guidelines (LHCCREMS 2002);
- Threatened Biodiversity Survey and Assessment: Guidelines for development and activities (DECC 2004); and
- Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (DoE 2013).

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
- if required describe measures to be implemented to avoid, minimise, manage or monitor potential impacts of the proposal.

In addition to the survey work conducted within the site, consideration has been afforded to habitats within the site in order to appreciate the overall environmental context. This has included assessment of potential direct and indirect impacts.

1.3 Site Particulars

The following nomenclature has been used in this report (Refer to **Figure 1**):

- Study Area – Refers to lands owned by the proponent
- Site – Refers to the development area within the Study Area

Locality	Greta
Land Title	Lot 1 DP873220
LGA	Cessnock City Council
Area	Study Area: 5.85ha (approx.)
Zoning	The land is currently zoned RU2 Rural Landscape.
Boundaries	<p>The site is bordered to the northeast by a remnant patch of native forest surrounding a rural property, with the north and south west boundaries bordered by Hollingshed St and Branxton St respectively. The Southern boundary is currently the location of extensive civil works associated with the neighbouring to be constructed residential subdivision. When complete the boundary will be the location of a major access road to the sub division.</p> <p>Further beyond the site boundaries, the site is situated in a semi-rural area to the north and residential areas of Greta to the south and north west.</p>
Current Land Use	The land is currently being utilised for rural-residential and small hobby farm purposes.
Topography	The site topography is characterised by a gently sloping plain from a high point in the northern corner to a low point in the southern corner with an overall change in elevation less than 20 metres. A dam is found in the eastern corner which is located on a second order stream, that exists the site at the south eastern boundary and re-enters the site and exits the site in the southern corner.

1.4 Qualifications & Licencing

Qualifications

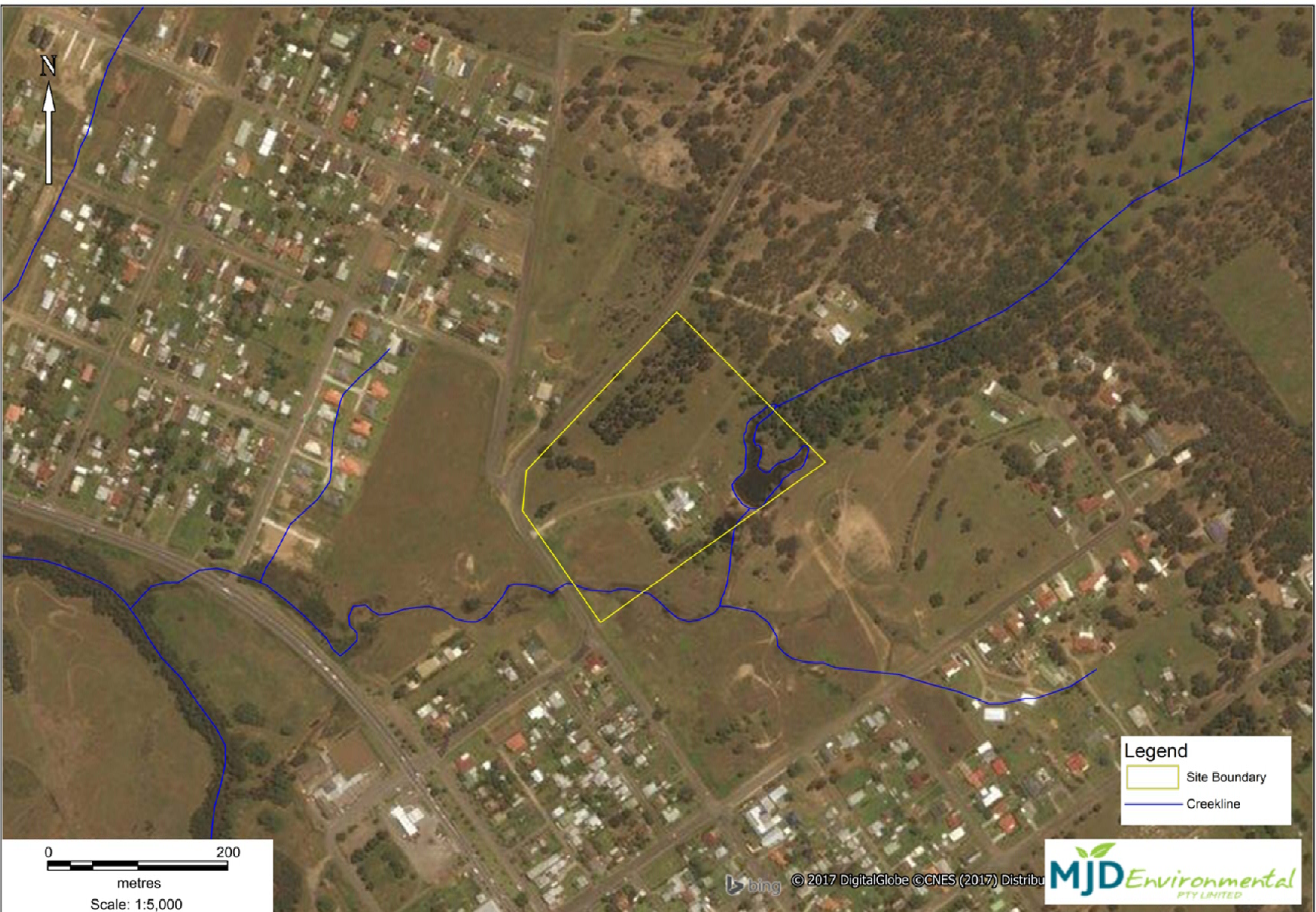
Field investigations and reporting were conducted by Matt Doherty (BLMC, Bush Regen Cert II, Accredited BioBanking Assessor) Adam Cavallaro (BEnv. Sc, Bush Regeneration Cert IV) and Bret Stewart (B. Sc.), Phoebe Smith (BEnv. Sc.(Hons)) of MJD Environmental Pty Ltd.

Licencing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence SL101684 (Valid 28 February 2018).
- Animal Research Authority (Trim File No: 16/170) issued by NSW Department of Primary Industries (Valid 8 February 2018).
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 16/170) issued by NSW Department of Primary Industries (Valid 8 February 2019).

Figure 1 Site Location



C:\Project Files\17050 - 71 Branxton Road, Greta\5. GIS\PDF Figure 1 Site Location 21-11-17

2 Methodology

The ecological assessment has been prepared generally in accordance with:

- Lower Hunter Central Coast Regional Flora & Fauna Survey Guidelines (LHCCREMS 2002);
- Threatened Biodiversity Survey and Assessment: Guidelines for development and activities (DECC 2004); and

The flora and fauna survey techniques employed for this survey have been modified in response to the scarcity of remnant native vegetation across the study area allowing for rapid assessment of flora and fauna within the highly modified landscape.

Section 3.3 *Fauna – Altered and Disturbed Habitats* of the guidelines has guided survey works at this site and carried as summarised in Table 3.4 of the guidelines.

The techniques employed to inform this impact assessment are described in further detail below.

2.1 Desktop Assessment

Online database searches involving a 10 km buffer around the site were undertaken from the NSW Bionet Wildlife Atlas and Commonwealth Protected Matters of National Significance online search tool initially on 18 October 2017. The searches provided a current list of potentially occurring threatened flora and fauna and migratory species under both the TSC Act and EPBC Act.

2.2 Field Survey

Field surveys were undertaken on the 26th and 30th October and 2nd and 7th November 2017. The prevailing weather conditions during the survey are presented in Table 1 below.

Table 1 Prevailing Weather Conditions

Date	Min Temp (°C)	Max Temp (°C)	Rain (mm)	Wind (km/h)	Sunrise-Sunset
26 th October 2017	15	29.7	0	13-20 km/h	05:32 -18:45
30 th October 2017	12.6	36.2	0	13 – 31km/h	05:28 – 18:49
2 nd November 2017	7.7	25.5	0	6 - 17km/h	05:25 – 18:51

Sources: <http://www.bom.gov.au/climate/dwo/IDCJDW2027.latest.shtml>

<http://www.ga.gov.au/bin/geodesy/run/sunrisenset>

2.2.1 Vegetation & Significant Flora Survey

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.

Confirmation of vegetation community delineation was conducted during the recent surveys, with particular emphasis upon potential direct impact areas within the site. During the field survey confirmation of vegetation community presence and delineation was undertaken within the study area to the east of the site. The survey was augmented by employing the “Random Meander Technique” described by Cropper (1993).

Due to the disturbed nature of the majority of vegetation found within the Study area a modified vegetation survey was undertaken with the follow field survey techniques:

- Establishment of one 20 X 20m vegetation quadrat to assess species presences, distribution and abundance within nominated vegetation communities.
- Establish 6 informal transects approximately 50-100m in length. To assess vegetation heterogeneity, species richness, weed density, identify community boundaries and record species presences within the study area.

No targeted threatened flora surveys were undertaken due to the generally cleared and disturbed (pasture) nature of the site.

2.2.2 Fauna

A desktop assessment of the potential use of the site by threatened fauna species (as listed under the TSC Act and EPBC Act) identified from the vicinity was undertaken prior to the commencement of field surveys (refer to section 2.1).

Based on the vegetation survey the site is considered to represent three stratification unit and is of a simple floristic structure.

A supplementary list of fauna species observed during the site survey is provided as **Appendix 2**.

Mammals

The presence of mammals was assessed via opportunistic observations during the field survey.

Nocturnal spotlighting and call-playback surveys were conducted over two separate nights.

Avifauna

The observation of avifauna within the site was undertaken via targeted diurnal census supplemented by opportunistic observations during other diurnal fieldwork (Refer to **Figure 3**). The survey was undertaken during the afternoon being a peak activity period for birds. Incidental recordings were supplemented by incidental observations.

Nocturnal bird surveys were undertaken and detail of methods employed is outlined in below under Spotlighting and call playback survey techniques

Herpetofauna

Nocturnal listening surveys were conducted at the dam location in the north east. Frogs were identified by call. Surveys of at least 20 minutes in duration occurred at each water body and were repeated over three nights. Spotlighting searches along the water's edge were conducted on each night following listening surveys.

Opportunistic reptile searches were conducted during fauna surveys with a focus on suitable habitat areas. Known occurrences of threatened reptile species from the locality were taken into account during assessment of onsite habitat, to determine the potential for the site to support such species.

Searches in likely habitat such as among fallen timber and farming debris (corrugated iron sheets) and dilapidated structures were undertaken. These searches were carried out during peak activity periods, generally during the warmer parts of the day. Stockpiles and/ or dumped rubbish was also checked for sheltering reptiles.

Microchiropteran Bats

Microbat surveys were undertaken by recording echolocation calls using the Anabat Express Detector units set to record for a number of hours between 6pm to 6am each evening. A single unit

was deployed within the study area over three nights at a single location. Anabat units were placed, with an emphasis on those areas deemed likely to provide potential foraging and flyway sites for microbats. The location 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 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; or
- Unknown - Either background 'noise' files or passes by bats which are too short and/or of poor quality to confidently identify.

Appendix 3 contains the Anabat reports with all results, whilst **Figure 3** shows the Anabat locations.

Spotlighting

Spotlighting was undertaken with the use of a Lightforce Enforcer 140mm LED (376m @ 1 LUX) hand-held spotlight and head torch whilst traversing the study area. Areas of vegetation were targeted, however, due to the lack of vegetation most isolated trees and wetlands where spotlighted and cleared/disturbed areas of land were traversed whilst spotlighting into the isolated pockets of vegetation.

A total of 2-person hours of spotlighting was conducted over three nights.

Figure 3 displays the spotlighting survey effort across the Site.

Nocturnal Call Playback

The use of pre-recorded calls of Forest Owl, and Glider species that may occur within the site and surrounding area were broadcast during the nocturnal surveys in an effort to receive a vocal response or to attract the species to the playback site. The calls were broadcast through an amplification system (25W megaphone) designed to project the sound for at least 1 km under still night conditions.

As described by Kavanagh and Peake (1993) and Debus (1995), the call of each species was broadcast for at least five minutes, followed by five minutes of listening, and stationary spotlighting. Following the final broadcast and listening, the area was spotlighted on foot. Species targeted included the Barking Owl (*Ninox connivens*) Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*) and Squirrel Glider (*Petaurus norfolcensis*).

A total of two call playback sessions (two sites) were undertaken over a seven-day period. The location of the call playback sites is shown in **Figure 3**.

Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted. Such indicators included:

- 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).

2.2.3 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 regard 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.

2.3 Limitations

Limitations associated with this Ecological Assessment report are presented herewith. The limitations have been taken into account specifically in relation to threatened species assessments, results and conclusions.

In these instances, a precautionary approach has been adopted; whereby '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.

Seasonality & Conditions

Threatened flora species should be surveyed within their respective flowering periods to ensure accurate identification. Surveys have been undertaken outside the flowering period of some cryptic species and in these cases the precautionary principle has been applied and the potential presence of these species has been analysed based on the presence of suitable habitat.

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 nomadic and opportunistic species.

Data Availability & Accuracy

The collated threatened flora and fauna species records provided by Bionet Atlas of NSW Wildlife are known to vary in accuracy and reliability. This is usually due to the reliability of information provided to the National Parks and Wildlife Service (NPWS) for collation and/or the need to protect specific threatened species locations. During the review of threatened species records sourced from Bionet Atlas of NSW Wildlife, consideration has been given to the date and accuracy of each threatened species record in addition to an assessment of habitat suitability within the study area.

Similarly, EPBC Protected Matters Searches provide a list of threatened species and communities that have been recorded within 10 km of the study area, or which have suitable habitat within the wider area, and are subject to the same inherent inaccuracy issues as the State derived databases.

In order to address these limitations in respect to data accuracy, threatened species records have only been used to provide a guide to the types of species that occur within the locality of the study area. Consequently, habitat assessment and the results of surveys conducted within the study area and surrounds have been used to assess the likelihood of occurrence of threatened species, populations and ecological communities to occur therein.

Figure 2 Flora Survey



C:\Project Files\17050 - 71 Branxton Road, Greta\5. GISPDF Figure 2 Flora Survey 21-11-17

Figure 3 Fauna Survey



3 Results

3.1 Desktop Assessment

Using the NSW Wildlife Atlas database BioNet, and EPBC Act Protected Matters Search (18 October 2017), a list of potentially occurring threatened species, populations and ecological communities from the locality (10 km radius) has been compiled (**Table 2**). A total of 83 entities have been recorded of which 17 threatened flora species, 48 fauna species, 4 ecological communities and 14 migratory species have either been detected or have the potential to occur within the locality.

Note: Included in **Table 2** below are the numbers of records (not the number of individuals) for each species within the locality taken from the NSW Wildlife Atlas database. The EPBC Act Protected Matters Search does not provide number of records within the locality. Therefore, the record count related only to those TSC Act listed species that were detected within 10 km of the site. It is also noted that due to the terrestrial nature of the site, marine species were not considered under this ecological assessment and have not been included in the list.

Table 2 Threatened Flora & Fauna Database Search Results.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
Flora					
Heath Wrinklewort	<i>Rutidosis heterogama</i>	V	V	1	Recorded within 10km of the site ¹ Species or species habitat likely to occur within area ²
Bynoe's Wattle	<i>Acacia bynoeana</i>	E	V	6	Recorded within 10km of the site ¹ Species or species habitat known to occur within area ²
	<i>Asterolasia elegans</i>	E	E	-	Species of species habitat may occur within area ²
Netted Bottle Brush	<i>Callistemon linearifolius</i>	V		1	Recorded within 10km of the site ¹
Bluegrass	<i>Dichanthium setosum</i>	V	V	-	Species or species habitat likely to occur within area ²
<i>Eucalyptus camaldulensis</i> population in the Hunter Catchment	<i>Eucalyptus camaldulensis</i>	E		1	Recorded within 10km of the site ¹
Slaty Red Gum	<i>Eucalyptus glaucina</i>	V	V	58	Recorded within 10km of the site ¹ Species or species habitat likely to occur within area ²
Earp's Gum	<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	V	V	3	Recorded within 10km of the site ¹ Species or species habitat known to occur within area ²

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
Cymbidium canaliculatum population in the Hunter Catchment	<i>Cymbidium canaliculatum</i>	E		2	Recorded within 10km of the site ¹
Small-flower Grevillea	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	V	V	1	Recorded within 10km of the site ¹ Species or species habitat likely to occur within area ²
North Rothbury Persoonia	<i>Persoonia pauciflora</i>	E	CE	91	Recorded within 10km of the site ¹ Species or species habitat known to occur within area ²
Illawarra Greenhood	<i>Pterostylis gibbosa</i>	V	E	1	Recorded within 10km of the site ¹ Species of species habitat may occur within area ²
	<i>Euphrasia arguta</i>	CE	CE	-	Species or species habitat may occur within area ²
Austral Toadflax	<i>Thesium australe</i>	V	V	-	Species or species habitat may occur within area ²
Leek Orchid	<i>Prasophyllum</i> sp. Wybong		CE	-	Species or species habitat may occur within area ²
Heath Wrinklewort	<i>Rutidosis heterogama</i>	V	V	-	Species or species habitat likely to occur within area ²
Magenta Lilly Pilly	<i>Syzygium paniculatum</i>	E	V	1	Recorded within 10km of the site ¹ Species or species habitat may occur within area ²
Birds					
Regent Honeyeater	<i>Anthochaera phrygia</i>	CE	CE	1	Recorded within 10km of the site ¹ Species or species habitat known to occur within area ²
Australasian Bittern	<i>Botaurus poiciloptilus</i>	E	E	-	Species or species habitat known to occur within area ²
Curlew Sandpiper	<i>Calidris ferruginea</i>	E	CE, M	-	Species or species habitat may occur within area ²

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	V		3	Recorded within 10km of the site ¹
Speckled Warbler	<i>Chthonicola sagittata</i>	V		11	Recorded within 10km of the site ¹
Spotted Harrier	<i>Circus assimilis</i>	V		1	Recorded within 10km of the site ¹
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	V		2	Recorded within 10km of the site ¹
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V		8	Recorded within 10km of the site ¹
Eastern Bristlebird	<i>Dasyornis brachypterus</i>	E	E	-	Species or species habitat likely to occur within area ²
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E		1	Recorded within 10km of the site ¹
Red Goshawk	<i>Erythrotriorchis radiatus</i>	CE	V	-	Species or species habitat likely to occur within area ²
White-fronted Chat	<i>Epthianura albifrons</i>	V		1	Recorded within 10km of the site ¹
Black Falcon	<i>Falco subniger</i>	V		1	Recorded within 10km of the site ¹
Little Lorikeet	<i>Glossopsitta pusilla</i>	V		4	Recorded within 10km of the site ¹
Painted Honeyeater	<i>Grantiella picta</i>	V	V	1	Recorded within 10km of the site ¹ Species or species habitat likely to occur within area ²
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V	M	1	Recorded within 10km of the site ¹
Little Eagle	<i>Hieraetus morphnoides</i>	V		1	Recorded within 10km of the site ¹
Swift Parrot	<i>Lathamus discolor</i>	E	CE	50	Recorded within 10km of the site ¹ Species or species habitat known to occur within area ²
Square-tailed Kite	<i>Lophoictinia isura</i>	V		1	Recorded within 10km of the site ¹
Turquoise Parrot	<i>Neophema pulchella</i>	V		1	Recorded within 10km of the site ¹
Barking Owl	<i>Ninox connivens</i>	V		1	Recorded within 10km of the site ¹
Powerful Owl	<i>Ninox strenua</i>	V		1	Recorded within 10km of the site ¹
Far Eastern Curlew	<i>Numenius madagascariensis</i>		CE, M	-	Species or species habitat may occur within area ²
Scarlet Robin	<i>Petroica boodang</i>	V		2	Recorded within 10km of the site ¹

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	V		62	Recorded within 10km of the site ¹
Australian Painted Snipe	<i>Rostratula australis</i>	E	E	-	Recorded within 10km of the site ¹ Species or species habitat may occur within area ²
Masked Owl	<i>Tyto novaehollandiae</i>	V		1	Recorded within 10km of the site ¹
Mammals					
Spotted-tailed Quoll (SE mainland population)	<i>Dasyurus maculatus maculatus</i> (southeastern mainland population)	V	E	7	Recorded within 10km of the site ¹ Species or species habitat likely to occur within area ²
Koala	<i>Phascolarctos cinereus</i>	V	V	3	Recorded within 10km of the site ¹ Species or species habitat known to occur within area ²
Eastern Pygmy-possum	<i>Cercartetus nanus</i>	V		1	Recorded within 10km of the site ¹
Squirrel Glider	<i>Petaurus norfolcensis</i>	V		16	Recorded within 10km of the site ¹
Greater Glider	<i>Petauroides volans</i>		V	-	Species or species habitat may occur within area ²
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	E	V	-	Species or species habitat may occur within area ²
Long-nosed Potoroo (SE mainland)	<i>Potorous tridactylus tridactylus</i>	V	V	-	Species or species habitat may occur within area ²
New Holland Mouse	<i>Pseudomys novaehollandiae</i>		V	-	Species or species habitat likely to occur within area ²
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	11	Recorded within 10km of the site ¹ Foraging, feeding or related behaviour known to occur within area ²
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V		14	Recorded within 10km of the site ¹
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	1	Recorded within 10km of the site ¹ Species or species habitat

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
					likely to occur within area ²
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V		1	Recorded within 10km of the site ¹
Little Bentwing-bat	<i>Miniopterus australis</i>	V		10	Recorded within 10km of the site ¹
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V		26	Recorded within 10km of the site ¹
Southern Myotis	<i>Myotis macropus</i>	V		6	Recorded within 10km of the site ¹
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V		3	Recorded within 10km of the site ¹
Eastern Cave Bat	<i>Vespadelus troughtoni</i>	V		1	Recorded within 10km of the site ¹
Herpetofauna					
Giant Burrowing Frog	<i>Heleioporus australiacus</i>	V	V	1	Species or species habitat known to occur within area ²
Green and Golden Bell Frog	<i>Litoria aurea</i>	E	V	-	Species or species habitat likely to occur within area ²
Stuttering Frog	<i>Mixophyes balbus</i>	E	V	-	Species or species habitat likely to occur within area ²
Threatened Ecological Communities					
Central Hunter Valley Eucalypt Forest and Woodland Corresponds to Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregion (MU 18 – LHCCREMS)		E	CE	-	Community likely to occur in the area ²
Hunter Valley Weeping Myall (<i>Acacia Pendula</i>) Woodland		E	CE	-	Community may occur in the area ²
Lowland Rainforest of Subtropical Australia		E	CE	-	Community likely to occur in the area ²
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		E	CE	-	Community likely to occur in the area ²
Migratory Species					
Oriental Cuckoo	<i>Cuculus optatus</i>		M	-	Species or species habitat may occur within area ²
Spectacled Monarch	<i>Monarcha trivirgatus</i>		M	-	Species or species habitat may occur within area ²
Black-faced Monarch	<i>Monarcha melanopsis</i>		M	-	Species or species habitat known to occur within area ²
Fork-tailed Swift	<i>Apus pacificus</i>		M	-	Species or species habitat

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
					likely to occur within area ²
White-throated Needletail	<i>Hirundapus caudacutus</i>		M	-	Species or species habitat known to occur within area ²
Yellow Wagtail	<i>Motacilla flava</i>		M	-	Species or species habitat may occur within area ²
Satin Flycatcher	<i>Myiagra cyanoleuca</i>		M	-	Species or species habitat known to occur within area ²
Rufous Fantail	<i>Rhipidura rufifrons</i>		M	-	Species or species habitat known to occur within area ²
Common Sandpiper	<i>Actitis hypoleucos</i>		M	-	Species or species habitat may occur
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>		M	-	Species or species habitat may occur within area ²
Pectoral Sandpiper	<i>Calidris melanotos</i>		M	-	Species or species habitat may occur within area ²
Latham's Snipe	<i>Gallinago hardwickii</i>		M	-	Species or species habitat may occur within area ²
Osprey	<i>Pandion haliaetus</i>	V	M	-	Species or species habitat likely to occur within area ²
Common Greenshank	<i>Tringa nebularia</i>		M	-	Species or species habitat may occur within area ²

Key:

V = Vulnerable
E = Endangered

M = Migratory
CE = Critically Endangered

1 - *Atlas of NSW Wildlife*, Office of Environment and Heritage (Accessed 18-10-2017).

2 - Commonwealth Protected Matters Search Tool, Department of the Environment (Accessed 18-10-2017)

3.2 Flora Survey

3.2.1 Vegetation Mapping & Delineation

The vegetation communities within the study area were observed to be significantly modified as a result of previous clearing and grazing activities given the areas agricultural history. As such floristic complexity of the vegetation communities delineated within the study area was observed to be low. These communities were found to be largely devoid of a native canopy and the shrub layer often sparse. The groundcover included many exotic and/or pasture species with areas of native groundcovers.

Regional vegetation mapping identified the following two vegetation communities within the study area;

- MU17 Lower Hunter Spotted Gum-Ironbark Forest; and
- MU19 Hunter Lowlands Redgum Forest

The site assessment revealed that there is a low condition form of MU19 present around the dam and creekline in the north of the site. Whilst there was no evidence of MU17 on site.

A total of four vegetation communities have been delineated within the site these being:

- MU 19 Hunter Lowlands Redgum Forest (Low condition);
- Pasture with Scattered trees;
- Dam and degraded creekline; and
- Managed landscape.

Approximate areas of vegetation communities delineated on site have been provided in **Table 3** below. Refer to **Figure 4**.

MU19 – Hunter Lowlands Redgum Forest

The Hunter Lowlands Redgum Forest is found primarily within the top eastern corner of the site, with a very small occurrence as an isolated degraded patch adjacent to the western boundary. The areas in which this community has been identified are generally low in quality with the canopy and midstorey layers significantly altered and a groundcover layer either grazed and or competing with exotic groundcover species.

The patch in the north is found on the northern and eastern side of the dam/creekline. The vegetation on site is contiguous from adjacent vegetation on the neighbouring landholding. Native canopy is generally absent across the area with canopy species *Angophora floribunda* (Rough-barked Apple) found along the eastern margin of the dam, and *Eucalyptus tereticornis* (Forest Red Gum) scattered north of the dam. The Swamp Oak *Casuarina glauca* is found on the northern boundary at the point the creek enters the site. Other species found within the canopy layer are exotic species such as the *Grevillea robusta* (Silky Oak), *Pinus radiata* (Radiata Pine). The mid-storey is generally absent with only scattered native species present on the eastern side of the dam these species are *Pittosporum undulatum* (Sweet Pittosporum) *Ozothamnus diosmifolius* (White Dogwood) and *Breynia oblongifolia* (Coffee Bush). The remaining species in the midstorey are exotic species such as *Cinnamomum camphora* (Camphor Laurel), *Ligustrum sinense* (Small-leaf Privet), *Ligustrum lucidum* (Broad-leaf Privet), *Olea europaea* subsp *cuspidata* (African Olive) and *Lantana camara* (Lantana).

The Groundcover present within this vegetation is a mix of exotic and native species that have been routinely grazed. The groundcover often consists of grazed shrub species such as *Lissanthe strigosa* (Peach Heath), *B. oblongifolia*, and *Jacksonia scoparia* (Dogwood) and grassy and herbaceous species such as *Themeda triandra* (Kangaroo grass), *Cymbopogon refractus* (Barbed wire grass), *Rytidosperma bipartitum* (Wallaby Grass) *Eragrostis brownii* (Brown's Lovegrass) and *Imperata cylindrica* (Blady grass). The exotic weed presence in the groundcover layer is primarily grassy weeds such *Paspalum dilatatum* (Paspalum), *Andropogon virginicus* (Whisky grass), with herbs and vines

such as *Verbena bonariensis* (Purple Top), *Senecio madagascariensis* (Fireweed) and *Lonicera japonica* (Japanese Honeysuckle).

The small patch (430m² in area) adjacent to the western boundary has young *E. tereticornis* canopy with very sparse midstorey and groundlayer. The linear patch has been impacted by the surrounding exotic pastures with exotic species found throughout the groundcover layer. The Midstorey is primary scattered *B. oblongifolia*, *Acacia parvipinnula*, and *Denhamia silvestris*. The ground layer is often sparse with clusters of native and exotic species present these species include *Lomandra filiformis*, *Einadia hastata* (Berry Saltbush) and exotic species juvenile *Cestrum parqui* (Green Cestrum), *S. madagascariensis*, *Briza major* and *Verbena rigida* (Creeping Verbena).



Plate 1: Low condition Hunter Lowland Red Gum Forest

Pasture with Scattered Trees

The majority of the study area is a mix of exotic/native pasture with patches of scattered trees. The western section of the site has an established Pine plantation, with an exotic and native groundcover. The dominant grass species within this area and across the site is *Cynodon dactylon* (Couch Grass). The understory was often dead or showing signs of stress possibly due to dry spring conditions experience in the region. In areas that allowed midstorey growth a very limited occurrence of shrubs were present. Species such as *B. oblongifolia*, *A. parvipinnula*, with exotic species such as *G. robusta*, and *O. europaea* subsp. *cuspidata*.

Pasture found south of the central track and south west of the pine plantation is primarily exotic pasture with scattered occurrences of native grasses. The pasture is predominantly *C. dactylon*, with *Axonopus fissifolius* (Carpet Grass), *Pennisetum clandestine* (Kikuyu), *P. dilatatum* and a number of annual grass species. Whilst there are scattered native species such as *Aristida ramosa* (Three-awned grass), *E. brownii* and *T. triandra* at no point where the native species dominant or consistent to identify these areas as native pasture. In addition, the ground layer included many common exotic herbaceous species such as *Cirsium vulgare* (Spear Thistle), *Plantago lanceolata*, *Senecio madagascariensis* with scattered patches of *opuntia stricta* (Prickly pear).

The areas of pasture located between the Pine plantation and northern fenceline and the area between the plantation on the central vehicle track, the presences of native species is more prevalent and species richness does increase. These areas are still primarily Couch grass dominant, but also include previous mentioned native grass species at a higher density with the addition of the following species, *Lomandra filiformis*, *Cheilanthes sieberi* *Tricoryne elatior*, *Rytidosperma bipartitum*, *Pseudonaphthium luteo-album*.



Plate 2: Pasture with Scattered trees

Dam and Degraded Creekline

The creekline that enters the landholding from the northern boundary has been heavily modified due to past and present land uses. The water course is a second order stream with a constructed on line dam in the northern corner of the site. The location of the dam on line has resulted in the edges of surrounding vegetation (HLLRGF) progressively being eroded away creating a drop off around the edge of the creek line/dam in this area. At the edges of the drop off the establishment of wetland macrophytes has occurred. The creation of a wetland like environment has provide opportunity for *Typha orientalis* to establish in the channel and around the edges of the dam. This species is found in dense patches in the narrow channel as well as scattered in patches along all edges. The wetland environment also provides opportunity for other macrophytes such as *Persicaria decipiens*, *Ludwigia peploides*, *Juncus usitatus* and *Cypress polystachyos*.

The dam has a small number of juvenile canopy species present with *C. glauca* the main species and the exotic species *Salix babylonica* (Willow) and *P. radiata*.

The dam restricts movement of water further down stream. At the time of field surveys civil works associated with the neighbouring subdivision had occurred within the creekline just below the dam (within the study area) resulting in the removal of all vegetation to allow for the construction of a bridge and road alignment.

The creekline traverses the southern corner of the site. In this location the watercourse is highly degraded with high densities of the exotic sedge species *Junucs acutus* observed. The presence of other native species, similar to those observed around the dam are low in density amongst the *J. acutus*. The creekline vegetation is primarily devoid of other riparian vegetation with pasture vegetation growing to the creek edge.



Plate 3: Dam Vegetation

Managed landscape

Vegetation adjoining the residential dwelling and associated structures consists primarily of managed exotic lawns, and garden beds with ornamental shrubs. The southern side of the residential block has a small number of native Eucalypt species inter mixed with the ornamental shrub and tree species.

Table 3 Vegetation Community Areas

Vegetation Community	Status	Area Ha (approx.)
Hunter Lowlands Red Gum Forest	<i>Low condition</i>	0.397ha
Pasture with Scattered trees	<i>N/A</i>	4.09ha
Dam and degraded creekline (Inc. civil works)	<i>Low condition</i>	0.478ha
Managed Landscape	<i>N/A</i>	0.894ha

3.2.2 Significant Flora Survey

A total of 65 flora species have been positively identified within the site during current surveys (see **Appendix 2**).

An assessment of potential habitat was undertaken for possible threatened flora species whilst traversing the site. No significant flora or potential habitat for these species listed under the TSC Act or EPBC Act were identified within the site during this ecological assessment.

3.3 Fauna Survey

The following provides the fauna results from the site survey. A total of 46 fauna species were observed during the survey period. A full list of the fauna species recorded within the site is provided as **Appendix 2**.

3.3.1 Mammals

One native mammal species was recorded during diurnal surveys across the site, being Eastern Grey Kangaroo. Along with sightings of individuals foraging, scats were observed across the site. Additionally, the Grey-headed Flying Fox (*Pteropus poliocephalus*) was observed foraging on *Grevillea robusta* during nocturnal surveys

Goats were observed grazing in the lower paddocks on sites. One European Red Fox was recorded during nocturnal spotlighting surveys.

3.3.2 Avifauna

A total of 30 bird species were recorded during the survey. Species recorded were typical of agricultural and rural settings including Eastern Rosella, Australia Raven, and Masked Lapwings.

The dam and creek line in the north-east corner of the site was the location of most of the bird activity on site. There was a small number of wetland birds observed using the dam and associated vegetation. Species observed in this area included Australian Wood Ducks, White-necked Herons, Purple Moorhens and Reed warblers.

The minimum canopy and shrub species across the site has limited the species richness within the site. In addition to the common species mentioned above there were a small number of forest and woodland birds on site, these were Superb Fairy Wren, Australian Magpies, Black-faced Cuckoo-shrike, Red Brow Finches and a family of Blue-faced Honeyeaters within the Pine tree plantation.

Also noteworthy is the high number of exotic bird species recorded on site, including Common Starlings, Indian Mynas. This reflects the high level of disturbance currently existing in the wider region, with extensive urban areas located to the north east and south east of the site in the greater Greta -Branxton area.

While the potential for threatened avifauna to occur intermittently on site cannot be discounted (particularly due to neighbouring woodland vegetation), the site lacks habitat features that could support a local population of any threatened species occurring in the region.

3.3.3 Microchiropteran Bats

A total of six microbat species were detected via the use of the Anabat SD-1 echo-location call recorder. Of these species, two are listed as Vulnerable under the TSC Act, specifically the Little Bent-wing Bat (*Miniopterus australis*) and Eastern Bent-winged Bat (*Miniopterus schreibersii oceanensis*). The four remaining microbats positively identified were the Gould's Wattled Bat (*Chalinolobus gouldii*), White-striped Free-tailed Bat (*Austronomus australis*), Southern Freetail Bat (*Mormopterus planiceps*) and Inland Broad-nosed Bat (*Scotorepens balstoni*).

Additionally, the following bat species had potential to occur within the site, but could not be confidently identified:

- Chocolate Wattled Bat (*Chalinolobus morio*)
- Eastern Coastal Free-tailed Bat (*Mormopterus norfolkensis*)
- Ride's Free-tailed Bat (*Mormopterus ridei*)
- Eastern Falsistrelle (*Falsistrellus tasmaniensis*) (Vulnerable under the BC Act);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Eastern Broad-nosed Bat (*Scotorepens orion*)
- Large Forest Bat (*Vespadelus darlingtoni*);
- Eastern Forest Bat (*Vespadelus pumilus*);
- Southern Forest Bat (*Vespadelus regulus*);
- Eastern Cave Bat (*Vespadelus troughtoni*) (Vulnerable under the BC Act) and
- Little Forest Bat (*Vespadelus vulturnus*)

Refer to **Appendix 2** for a detailed list of recorded species and **Appendix 3** for the Anabat Call Recording reports.

3.3.4 Herpetofauna

Seven species of herpetofauna were recorded during the survey. Over two nights of listening surveys at three separate wetlands (one farm dam and two floodplain swamps), four frog species were heard calling, namely the Common Eastern Froglet (*Crinia signifera*), Stripped Marsh Frog (*Limnodynastes peronii*), Eastern Dwarf Tree frog (*Litoria fallax*), Peron's Tree frog (*Litoria peronii*) and the Broad-palmed frog (*Litoria latopalmata*). All species were heard calling at the dam and creek line in the north east of the site.

Only two reptiles were observed during field surveys. The Red bellied black snake (*Pseudechis porphyriacus*) was observed in the vicinity of the dam during diurnal field surveys while a long-necked turtle (*Chelodina longicollis*) was observed in the dam during nocturnal survey works.

3.4 Habitat Survey

The majority of the study area exists in a highly disturbed state that is devoid of a canopy and shrub layer and contains a groundcover that is predominantly pasture that is actively grazed. There are areas of canopy trees primarily adjacent to the existing dam on site and a patch of Pine trees that have been planted in a plantation like arrangement.

Only a small number of native paddock trees remain in pasture areas and native trees in the low conditions remnants are generally young in age with one to two age cohorts present. As a result, available habitat is considered to be limited to foraging habitat for fauna species. Habitat for flora species is also limited to low condition remnants that support low species richness and a simple structure for the associated vegetation community.

Terrestrial Habitat

Habitat within the study area for terrestrial fauna species is limited as a result of the sparse to absent canopy and shrub layer observed on site. Habitat for reptile species in the form of fallen logs and/or leaf litter is limited to scattered old fence posts, old farm structures, fallen logs and other detritus beneath the scattered pasture trees. The vegetated watercourse and dam at the northern and southern edge of the study area provide habitat for frog species, with tussocks of dense *Juncus usitatus* and *J. acutus* scattered along the creekline and dam edge as well as tall macrophytes such as Typha.

The highly disturbed nature of the cleared areas limits their potential to provide habitat for terrestrial species, but some common grassland/open woodland species, including the Eastern Rosella, Willy Wagtail, Welcome Swallow, and Australian Magpie, were identified. Eastern Grey Kangaroos were seen grazing on pasture grasses on several occasions.

Arboreal Habitats

The site has very limited native canopy vegetation. Only a small number of native tree and shrub species, remain scattered through the pasture and low condition Hunter Lowlands Red Gum Forest. The Red Gum and Angophora species remaining on site do not contain hollows which limits the opportunity to support some microbats or nesting birds that rely on this habitat feature to breed and roost. Seasonal flowering events of these Red Gums and Angophora species could intermittently bring nectivores such as honeyeaters or lorikeets to the site. The *Grevillea robusta* although not native to the area was observed to be providing significant foraging opportunities for honeyeaters, and of an evening Grey-headed Flying-fox where observed to be foraging on this species that where located adjacent to the dam.

The site has limited connectivity in the south and although is contiguous with adjacent vegetation to the north, that is part of a larger patch of vegetation, it is relatively isolated from other patches of vegetation limiting the usage potentially to highly mobile fauna species only. The distance between trees on site would allow for arboreal species such as gliders to move through the landscape but the site does not provide sufficient suitable nesting hollows and also limited foraging potential.

Aquatic Habitats

The study area contains a large dam and associated creekline, both of which are outside the development footprint. Despite the low-quality condition of the dam and creekline, they were found to support ducks (Australian Wood Duck, Pacific Black Duck), wading Pelicaniformes (White-faced Heron, Royal Spoonbill), Long necked Turtle, and five species of frogs (*Crinia signifera* and *Litoria falaxa* L. *latopalmata*). The vegetation within the dam particularly the Typha was observed to be providing habitat for a small number of Reed warblers, and Swamp Hens. A Red-bellied Black snake was also observed to be basking in the sun adjacent to macrophytes on the bank of the dam.

Connectivity

Habitat connectivity is generally poor within the site, as the vegetation in the north-eastern corner being the southern extent of the vegetation corridor in the locality. The Site does adjoin a larger patch of vegetation to the north, of which some is currently being removed with the neighbouring development. The substantial patch of vegetation provides connection from the site to the Hunter river, providing opportunity as a patchy corridor for fauna movement. The proposal will not reduce the connectivity in the area as native vegetation that makes up the southern extent of the corridor, albeit tenuous, will be retained.

Figure 4 Vegetation Map

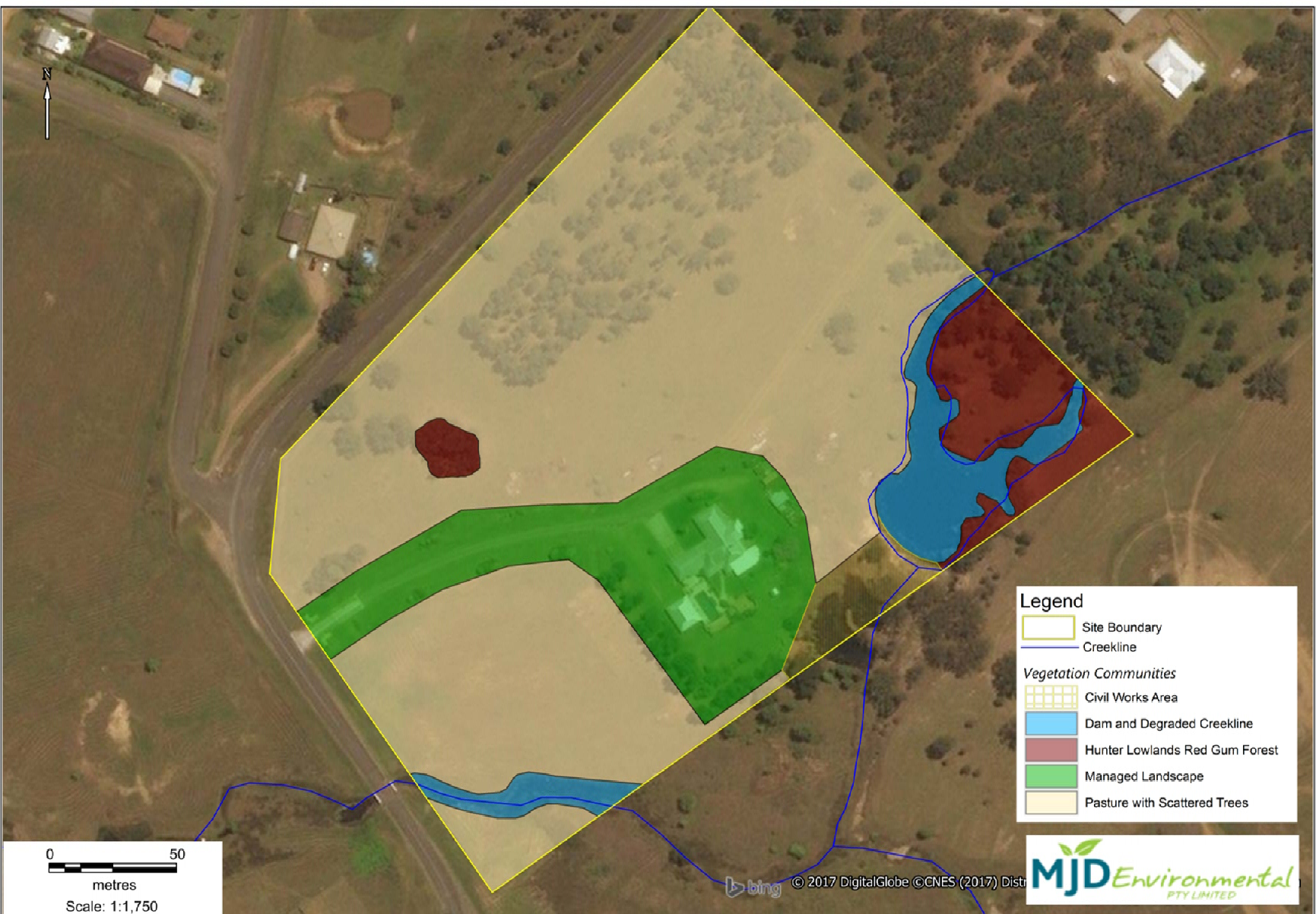
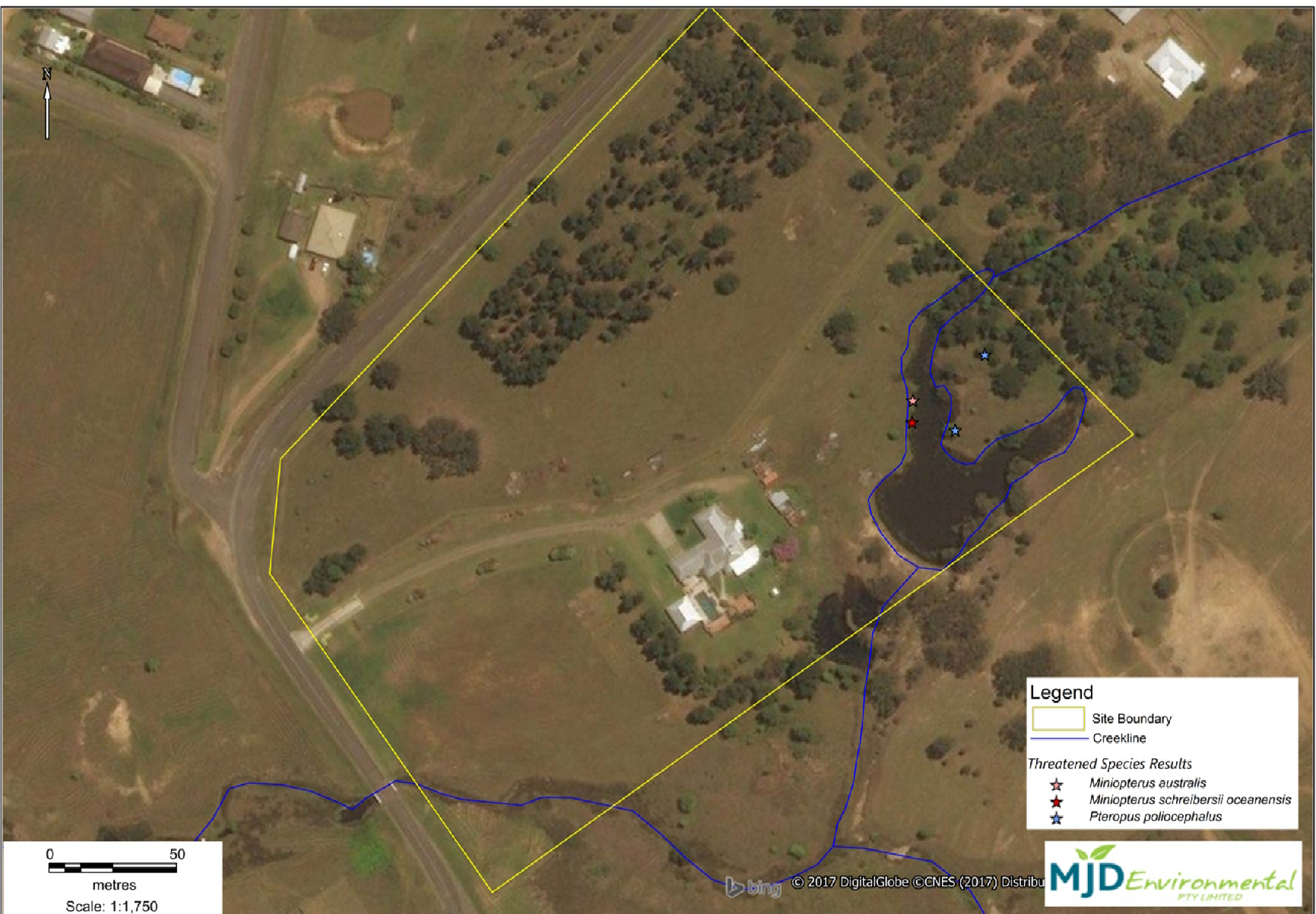


Figure 5 Threatened Fauna Results



C:\Project Files\17050 - 71 Branxton Road, Greta\5. GIS\PDF Figure 5 TS Fauna 21-11-17

4 Impact Assessment

The following section provides an overview of the potential direct, indirect impacts associated with the proposal. This overview has been used to inform a likelihood of occurrence and potential for impacts to occur to threatened species, populations and ecological communities. In such instances this has determined the need for further assessment of significance (7-part test).

4.1 Potential Impacts

The proposed development may result in the following ecological impacts:

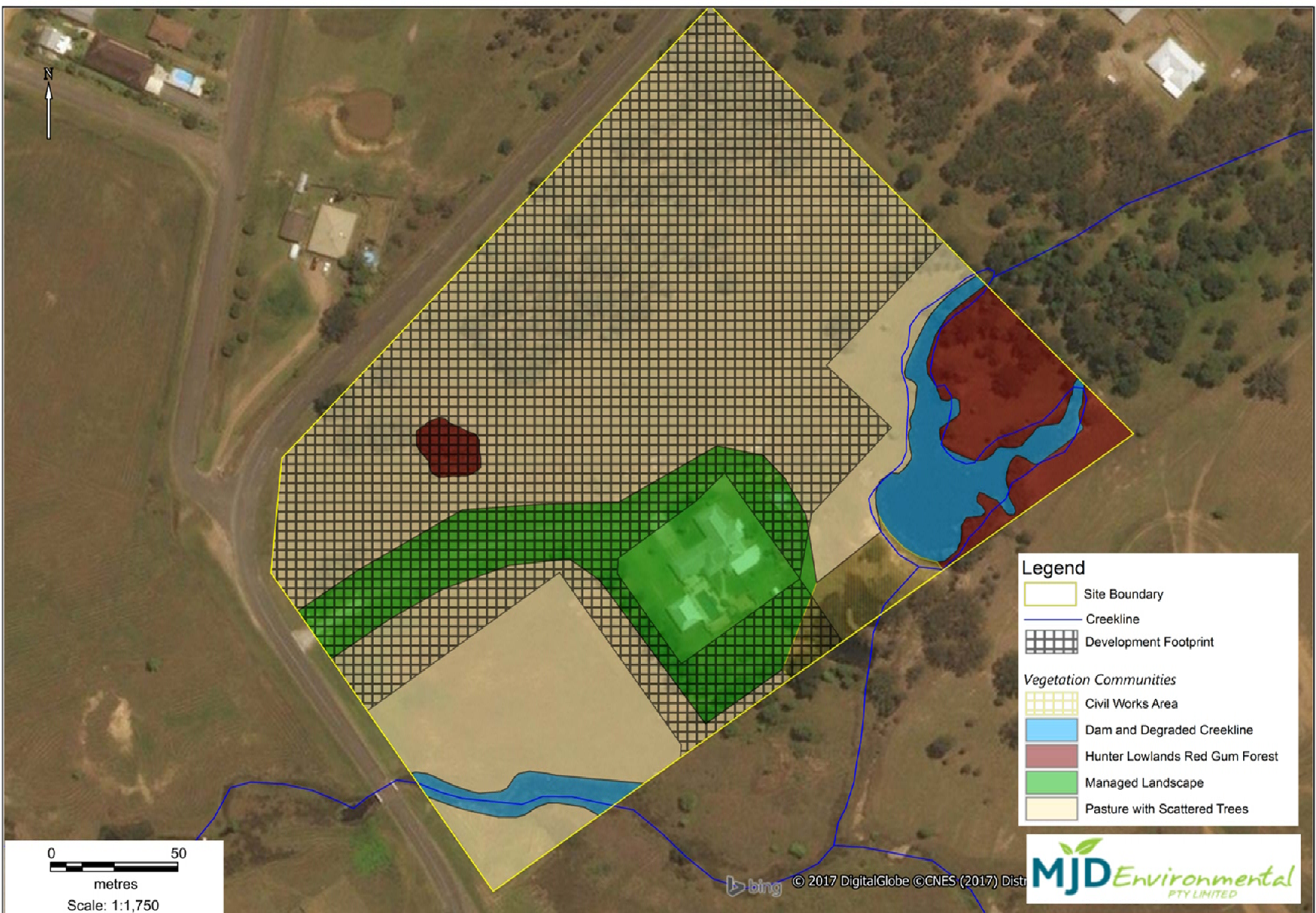
Direct Impacts

- Loss of 430m² of low condition Hunter Lowlands Red Gum Forest
- Loss of 3.14ha of disturbed pasture and scattered trees, and
- Loss of 614m² of managed landscapes;
- Loss of 330m² of Degraded creekline that is currently the location of civil works associated road construction in adjacent development
- Removal of *G. robusta*, potential foraging habitat for threatened Grey-headed Flying-fox.

Indirect Impacts

- Potential indirect impacts on adjacent wetland and floodplain vegetation from alterations to water regimes and runoff quality.

Table 4 Development Outcome



C:\Project Files\17050 - 71 Branxton Road, Greta\5. GIS\PDF Figure 6 Dev. Impact 21-11-17

4.2 Threatened Species & Communities Likelihood of Occurrence Assessment

Threatened flora and fauna species (listed under the TSC Act and/or EPBC Act) that have been gazetted and recorded within a 10 kilometres radius of the Site have been considered within the assessment contained in **Table 4**. Each species / community is considered for its likelihood to occur on the site and potential for impact arising from the proposal. Where a potential for impact is considered the entity has been nominated for further assessment under an Assessment of Significance (AoS) in **Appendix 3**.

'Species / Community' – Lists each threatened species / EEC known from the locality (10 km radius). The status and number of records along with source and notes for each threatened entity under the TSC Act and the EPBC Act are also provided.

'Habitat / Species Descriptions' – for up to date threatened species profiles including habitat descriptions and other key ecological information reference is made to the following online resources:

- NSW OEH Threatened Species Profile Search - <http://www.environment.nsw.gov.au/threatenedSpeciesApp/>
- Commonwealth Biodiversity: Species Profile and Threats Database (SPRAT) - <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

'Likelihood of Occurrence on Site' – Assesses the likelihood of each locally recorded species and EEC to occur within the Site, using knowledge of each species' habitat and lifecycle requirements and with regard the habitat types present within the Site, results of the literature review and database searches and field investigations. The location and number of records of the species (OEH Atlas of NSW Wildlife) were also considered in determining probability of occurrence.

'Potential for Impact' – Assesses the likelihood of impacts to each species / community that would result from the proposed development, taking into account direct and indirect short and long-term impacts.

Database searches were conducted of the NSW Wildlife Atlas (18-10-2017) and Commonwealth Protected Matters Tool (18-10-2017).

Note: marine species (bird, reptile, fish, mammal) recorded on the Protected Matters have not been listed or assessed herewith.

Table 5 Likelihood of Occurrence and Impact Assessment

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
Flora					
Heath Wrinklewort	<i>Rutidosia heterogama</i>	V	V	1	No targeted threatened species surveys were undertaken due to the extensive managed (grazed/ mowed) pastures present within the study area. Pastures on site are primarily dominated by exotic species. Past and current land uses, particularly grazing, have diminished the quality of any remaining habitat and reduced the likelihood that this species would persist on site. On this basis, coupled with the single recorded within a 10km search of the locality, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Bynoe's Wattle	<i>Acacia bynoeana</i>	E	V	6	No targeted threatened species surveys were undertaken due to the highly disturbed nature of the study area. Pastures and low quality remnants groundcover layers found on site are primarily dominated by exotic species. Past and current land uses, particularly grazing, have diminished the quality of any remaining habitat and reduced the likelihood that this species would persist on site. On this basis, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
	<i>Asterolasia elegans</i>	E	E	-	No targeted threatened species surveys were undertaken due to the highly disturbed nature of the study area. and the lack of records within a 10km search of the locality. No sandstone habitats which could support this species occur on site, and the site is well outside its known range. On this basis, it is very unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Netted Bottle Brush	<i>Callistemon linearifolius</i>	V		1	No targeted threatened species surveys were undertaken due to the highly disturbed nature of the study area. and the low number of records within a 10km search of the locality. The past and present land management practices have resulted in low quality remnant vegetation remaining on site and any habitat suitable being altered or completely removed. On this basis it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
bluegrass	<i>Dichanthium setosum</i>	V	V	-	This species has not been recorded within 10km of the site, and the site is outside its known range. Heavy basaltic black soils and red-brown loams with clay subsoil preferred by this species do not occur on site, and species commonly found in association with bluegrass were not recorded on site. On this basis, this species is unlikely to occur on site and unlikely to be impacted by the proposal. An AoS is not required for this species.
<i>Eucalyptus camaldulensis</i> population in the Hunter Catchment	<i>Eucalyptus camaldulensis</i>	E		1	Targeted threatened species surveys did not detect this species on site. The relatively low number of paddock trees particularly Red Gum species on site, provided sufficient opportunity to positively identify that <i>E. camaldulensis</i> was not present within the study area. This species prefers wetter, floodplain habitats that are found north and north-east of the study area adjacent to the Hunter River and associated floodplains. As such it is unlikely that species will be impacted by the proposal. An AoS is not required for this species.
Slaty Red Gum	<i>Eucalyptus glaucina</i>	V	V	58	Targeted threatened species surveys did not detect this species on site. The relatively low number of paddock trees particularly Red Gum species on site, provided sufficient opportunity to positively identify that <i>E. glaucina</i> was not present within the study area. As such it is unlikely that species will be impacted by the proposal. An AoS is not required for this species.
Earp's Gum	<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	V	V	3	Targeted threatened species surveys did not detect this species on site. The relatively low number of paddock trees particularly Red Gum species on site, provided sufficient opportunity to positively identify that <i>E. parramattensis</i> subsp. <i>decadens</i> was not present within the study area. Sandy soils preferred by this species also do not occur on site. As such it is unlikely that species will be impacted by the proposal. An AoS is not required for this species.
<i>Cymbidium canaliculatum</i> population in the Hunter Catchment	<i>Cymbidium canaliculatum</i>	E		2	Targeted threatened species surveys did not detect this species on site. The scattered native trees on site are may support this epiphytic species although no individuals were observed. As such it is unlikely that species will be impacted by the proposal. An AoS is not required for this species.
Small-flower Grevillea	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	V	V	1	No targeted threatened species surveys were undertaken due to the highly disturbed nature of the study area and the low number of records within a 10km search of the locality. Given the disturbance history over the site this species is unlikely to occur. On this basis, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
North Rothbury Persoonia	<i>Persoonia pauciflora</i>	E	CE	91	The known distribution of this species is limited to approximately 4.5km ² in the vicinity of North Rothbury. The site is not within the known range of this species, and the dispersal capability appears to be quite low, with known populations all within 1km of one another. This species was not recorded during targeted threatened species surveys on site. As such it is unlikely that species will be impacted by the proposal. An AoS is not required for this species.
Illawarra Greenhood	<i>Pterostylis gibbosa</i>	V	E	1	This species has not been recorded on site during the current survey. The site is not one of the five known locations for this species in the Hunter Valley and is outside the species' known range. Due to the long history of mowing and grazing on the site, this species is unlikely to persist on site. On this basis, it's considered unlikely to occur on site and therefore unlikely to be impacted by the proposal. An AoS is not required for this species.
	<i>Euphrasia arguta</i>	CE	CE	-	This species has not been recorded on site or within 10km of the site. This annual herb is unlikely to persist in the heavily grazed and mowed habitat on site. As such it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Austral Toadflax	<i>Thesium australe</i>	V	V	-	This species has not been recorded on site or within 10km of the site, and past and current practices (particularly mowing and grazing) have diminished the potential for the species to occur. Given a lack of records for the species within the locality and the poor quality of habitat, it is unlikely to occur on site and unlikely to be impacted by the proposal. An AoS is not required for this species.
A Leek orchid	<i>Prasophyllum sp. Wybong</i>		CE	-	No targeted threatened species surveys were undertaken due to the highly disturbed nature of the study area, and the lack of records within a 10km search of the locality. The sites location is distant from all known populations situated in the Upper Hunter Valley. As such it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Magenta Lilly Pilly	<i>Syzygium paniculatum</i>	E	V	1	This species was not recorded on site. No suitable rainforest habitat is present on site. It is highly unlikely to occur and unlikely to be impacted by the proposal. An AoS is not required for this species.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
Birds					
Regent Honeyeater	<i>Anthochaera phrygia</i>	CE	CE	1	This species was not recorded in the study area and there are very few records within a 10km search of the locality. Only a few scattered Red Gums and Rough-bark Apple on site offer any foraging potential for this species, and nesting in the stands non-native trees on site is very unlikely given the limited forage trees in the surrounding area. On this basis it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Australasian Bittern	<i>Botaurus poiciloptilus</i>	E	E	-	This species has not been recorded on site or within 10 km of the site. Marginal foraging habitat for this species occurs on site. The small farm dam which may be modified (though not removed) by the proposal represents only a small change to potential foraging habitat and contains some of the dense <i>Typha</i> fringing vegetation this species prefers. Higher quality wetland areas are widespread along the Hunter River and floodplains. On this basis, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Curlew Sandpiper	<i>Calidris ferruginea</i>	E	CE	-	Wetland habitats on site represent poor quality potential foraging habitat for this species, and would likely only be used intermittently by individuals migrating through the area. The modification of habitat around the dams on site represents only a small loss of low quality foraging habitat of a kind which is abundant in the surrounding floodplains of the Hunter River. On this basis, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	V		3	This species was not detected during the field survey period. Foraging habitat (<i>Casuarina</i> and <i>Allocasuarina</i> tree species) is present along the margins of the small farm dam on site. The potential forage trees are outside areas of impact and the mostly non-native trees to be cleared on site are unlikely to be visited by individuals foraging in the region. On this basis, it is unlikely this species will be impacted by the proposal. An AoS is not required for this species.
Speckled Warbler	<i>Chthonicola sagittata</i>	V		11	This species was not recorded during surveys. The site is almost entirely lacking shrubs, dense tall grasses, or any complex vegetation structure in which this species could nest or forage. Due to the lack of habitat and long history of disturbance, this species is unlikely to occur on site, and therefore unlikely to be impacted by the proposal. An AoS is not required for this species.
Spotted Harrier	<i>Circus assimilis</i>	V		1	This species was not detected within the study area. The wetland areas bordering the study area to the southwest may offer limited foraging potential for this species, however

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					these dams are not contiguous with any larger wetland complexes, and therefore represent fragmented, marginal foraging. These wetlands will be retained by the proposal, and as such the disturbance to any individuals foraging in the area is expected to be quite low. On this basis it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	V		2	This species was not recorded during survey, although there are a few records within 10km and some marginal foraging habitat. Brown Treecreepers typically forage in eucalypt woodlands dominated by stringybarks and rough barked species, often with abundant wood litter and stags. While suitable eucalypt woodland borders the site to the north, the stand of non-native trees within the study area offer only limited foraging potential. Exotic pines are unlikely to support large numbers of arthropods on which this species feeds, and hollows suitable for nesting do not occur within the site. Therefore, while this species may occur on site while moving through the landscape from suitable habitat adjacent to the study area, it is unlikely to utilize the study area for any part of its life cycle and therefore unlikely to be impacted by the proposal. An AoS is not required for this species.
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V		8	This species has been recorded within 10km of the study area and very limited suitable foraging habitat exists on site. While individuals traversing the site while moving through the wider region have potential to visit and forage in the patch of mostly non-native trees on site, these exotic trees are unlikely to support a significant number of small insects on which this species feeds, and unlikely to be important to the long-term survival of the species in the locality. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Eastern Bristlebird	<i>Dasyornis brachypterus</i>	E	E	-	This species has not been recorded on site or within 10km of the site. Suitable habitat for this species is not found on site, as the study area lacks woodlands with the dense understorey that this species requires. On this basis it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E		1	This species has potential to intermittently forage in wetlands in the study area. The dam and associated wetlands in the study area likely support fish and frogs on which this species could forage. These wetlands are currently in a disturbed state as a result of residential and pastoral activity. The proposal is not likely to modify this habitat such the

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					local population of this species will be affected. It is unlikely that the proposal will impact this species. An AoS is not required for this species.
Red Goshawk	<i>Erythrotriorchis radiatus</i>	CE	V	-	Riparian habitats preferred by this species do not occur on site and there are no records within 10km. This species is unlikely to utilize the site for foraging or nesting. As such, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
White-fronted Chat	<i>Epthianura albifrons</i>	V		1	This species was not recorded during the current survey and there are few local records. The wetlands on site do not represent suitable habitat for this species, as they lack the low open fringing wetland vegetation that this species prefers for foraging. Therefore, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Black Falcon	<i>Falco subniger</i>	V		1	This species has potential to traverse the site intermittently while foraging in the wider region, however the open, managed grassland with stands of non-native trees on site offers very limited foraging potential. The widespread distribution and wide variety of habitats within which this species occurs diminishes the importance of the disturbed habitat that occurs on site. As such, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Little Lorikeet	<i>Glossopsitta pusilla</i>	V		4	This species was not detected during the field survey period. The exotic stand of trees on site are unlikely to be visited by individuals foraging in the region. While this species may visit the study area, the scattered native trees within the site are unlikely to be important for individuals foraging in the region. On this basis, it is unlikely this species will be impacted by the proposal. An AoS is not required for this species.
Painted Honeyeater	<i>Grantiella picta</i>	V	V	1	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found on site and this species is unlikely to forage in the scattered native trees to be cleared by the proposal. Mistletoe species on which this species may feed were not observed on site. On this basis it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V	M	1	Suitable habitat for this species is not present on site. The aquatic habitats within the study area do not represent foraging habitat for this species, as large fish are highly

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					unlikely to persist in the small, turbid farm dams and shallow swamps. Large, robust trees suitable for nesting are not present on site. As such, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Little Eagle	<i>Hieraaetus morphnoides</i>	V		1	This species has potential to traverse the site intermittently while foraging in the wider region, however the open, managed grassland with stands of non-native trees on site offers very limited foraging potential. The widespread distribution and wide variety of habitats within which this species occurs diminishes the importance of the disturbed pasture habitat that occurs on site. As such, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Swift Parrot	<i>Lathamus discolor</i>	E	CE	50	This species was not detected during the field survey period. The stand of non-native trees on site are unlikely to be visited by individuals foraging in the region. While this species may visit woodlands adjacent to the study area to the northeast, the scattered native trees within the site are unlikely to be important for individuals foraging in the region. On this basis, it is unlikely this species will be impacted by the proposal. An AoS is not required for this species.
Square-tailed Kite	<i>Lophoictinia isura</i>	V		1	This species has potential to traverse the site intermittently while foraging in the wider region, however the stand of non-native trees and managed exotic grasslands on site offer very limited foraging potential. The widespread distribution and wide variety of habitats within which this species occurs diminishes the importance of the disturbed pasture habitat that occurs on site. As such, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Turquoise Parrot	<i>Neophema pulchella</i>	V		1	This species was not detected during the field survey period. The exotic stand of trees on site are unlikely to be visited by individuals foraging in the region. While this species may visit the study area, the managed grasslands within the site are unlikely to be important for individuals foraging in the region. On this basis, it is unlikely this species will be impacted by the proposal. An AoS is not required for this species.

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Barking Owl	<i>Ninox connivens</i>	V		1	This species was not detected during the field survey period and potential habitat is limited. However, due to the wide distribution of this species and the availability of marginal foraging habitat on site, this species has potential to occur. The proposal will clear stands of non-native trees with no hollows suitable for nesting, as well as a small area of poor quality foraging habitat in the cleared/managed grassland. However, extensive foraging habitat similar to the grasslands found on site exists in the surrounding area, and higher quality habitat remains in the broader region. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Powerful Owl	<i>Ninox strenua</i>	V		1	This species was not detected during the field survey period and potential habitat is limited. Native woodlands where this species would forage for small mammals do not occur on site. The stand of non-native trees is unlikely to support prey species and therefore unlikely to represent foraging habitat. The proposal will clear stands of non-native trees with no hollows suitable for nesting, as well as a small area of poor quality foraging habitat in the cleared/managed grassland. However, extensive foraging habitat similar to the grasslands found on site exists in the surrounding area, and higher quality habitat remains in the broader region. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Far Eastern Curlew	<i>Numenius madagascariensis</i>		CE, M	-	Wetlands on site do not constitute suitable habitat for this species and there are no records within 10km of the study area. This coastal species forages in intertidal zones, coastal lagoons, and bays which do not occur on or near the site. It is very unlikely to occur on site and as such unlikely to be impacted by the proposal. An AoS is not required for this species.
Scarlet Robin	<i>Petroica boodang</i>	V		2	This species was not detected during the field survey and there are few records within 10km of the study area. The site offers only very limited habitat to this woodland species and the non-native stand of trees is unlikely to be utilised. As such, it is highly unlikely to occur. The proposal is unlikely to impact this species. An AoS is not required for this species.
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	V		62	This species was not recorded during field surveys and suitable habitat does not occur. The site lacks woodlands or native regrowth vegetation, and the few managed shrubs and low trees forming part of rural landscaping are not likely to be significant to local individuals. This species prefers to forage in open country with a mosaic of woodland, shrubs, and regrowth, and with some complexity of groundcover such as woody debris

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					and litter in which to forage. Such habitat features do not occur on site, and therefore this species is unlikely to occur. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Australian Painted Snipe	<i>Rostratula australis</i>	E	E	-	This species has not been recorded on site and there are no local records. The small dams and disturbed grasslands that may be impacted by the proposal lack the vegetation cover that this secretive species prefers and as such represent only very poor quality potential foraging habitat. On this basis it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Masked Owl	<i>Tyto novaehollandiae</i>	V		1	This species was not detected within the study area and there are few local records. While this species is known to forage in open country, the site is lacking in native vegetation likely to support prey species for the Masked Owl and as such is unlikely to be visited by individuals foraging in the locality. The small stand of non-native trees is too small to support a local population of this species. Therefore, this species is unlikely to occur on site and unlikely to be impacted by the proposal.
Mammals					
Spotted-tailed Quoll (SE mainland population)	<i>Dasyurus maculatus maculatus</i> (southeastern mainland population)	V	E	7	This species was not opportunistically detected during the field survey period. The highly disturbed nature of the study area, lack of cover, lack of proximate woodland, and proximity to urban areas greatly diminishes the potential for this species to occur. On this basis it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Koala	<i>Phascolarctos cinereus</i>	V	V	3	This species was not detected during the field survey period and no recent records exist for the species in the surrounding region. No preferred feed tree species occur on site. Given the disturbed nature of the study area and the absence of the species from the region in the past decade, it is considered unlikely to occur. On this basis, it is unlikely the species will be impacted by the proposal. Additionally, an assessment under SEPP 44 (Section 4.3.2) determined the site does not constitute Koala habitat. An AoS is not required for this species.

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Eastern Pygmy-possum	<i>Cercartetus nanus</i>	V		1	This species has not been recorded on site and there are few records within 10km of the site. This species was not opportunistically detected during the field survey period. The site does not contain preferred habitat for this species. The sites isolation from proximate and interconnecting vegetation coupled with the small size of adjacent areas of suitable vegetation in the vicinity of existing residential blocks further reduces the likelihood of this species occurring on site. Therefore, this species is unlikely to be impacted by the proposal.
Squirrel Glider	<i>Petaurus norfolcensis</i>	V		16	This species was not recorded in the study area during surveys, however there are records within 10km of the study area. Despite the presence scattered remnant native trees and a stand of exotic pines, the isolation of the study area to proximate native canopy vegetation severely limits the potential for this species to utilize habitat on site. The tree plantings and remnant vegetation surrounding residential blocks within the site are unlikely to support a population of Squirrel Gliders due to their small size, disturbance, and isolation. On this basis, it is highly unlikely that this species occurs on site and unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Greater Glider	<i>Petauroides volans</i>		V	-	This species has not been recorded on site or within 10km of the site. This species was not opportunistically detected during the field survey period. The site does not contain preferred habitat for this species. The sites isolation from proximate and interconnecting vegetation coupled with the small size by way of comparison to the species requirements is likely to prohibit site occupation. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	E	V	-	This species was not opportunistically detected during the field survey period and there are no records within 10 km. The site does not contain suitable rocky habitat for this species. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Long-nosed Potoroo (SE mainland)	<i>Potorous tridactylus tridactylus</i>	V	V	-	This species has not been recorded on site or within 10km of the site. The site does not contain dense understorey vegetation or heaths preferred by this species. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
New Holland Mouse	<i>Pseudomys novaehollandiae</i>		V	-	This species has not been recorded on site or within 10km of the site. This species was not opportunistically detected during the field survey period. The site does not contain the

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					sandy heathland habitat preferred by this species and there is very little native groundcover vegetation. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	11	This species was detected foraging on site during the field survey. The site does not contain a permanent or temporary camp for this species. Foraging habitat is present on site in the form of seasonal blossom of scattered remnant native trees, as well as trees used for rural landscaping such as <i>Grevillea robusta</i> . While the proposal will remove some potential foraging trees, the species has a widespread distribution and is highly mobile. The few remnant feed trees present on site are not likely to represent important seasonal forage for the local population. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V		14	This species may have been recorded on site during the current surveys, however the call recordings could only be identified to a species complex level. Potential foraging habitat occurs within the study area. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish the likelihood that this species will continue to forage on site. As a result, it is unlikely this species will be significantly impacted by the proposal. An AoS is not required for this species.
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	1	This species was not recorded during surveys and there are few records within 10km of the study area. There is no roosting habitat (caves) on site. The site is highly degraded, and isolated from remnant woodlands or areas which may contain roost caves. Therefore, while some limited foraging potential exists, the site is unlikely to represent foraging habitat of any significance to individuals occurring in the locality. On this basis, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V		1	This species may have been recorded on site during the current surveys, however the call recordings could only be identified to a species complex level. Potential foraging habitat occurs within the study area. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish the likelihood that this species will continue to forage on site. As a result, it is unlikely this species will be significantly impacted by the proposal. An AoS is not required for this species.

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Little Bentwing-bat	<i>Miniopterus australis</i>	V		10	This species was recorded during surveys. There is no roosting habitat (caves, tree hollows, or similar man-made structures) on site. The site is highly degraded, and while some limited foraging potential exists, the site is unlikely to represent foraging habitat of any significance to individuals occurring in the locality. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish the likelihood that this species will continue to forage on site. On this basis, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V		26	This species was recorded during surveys. There is no roosting habitat (caves) on site. The site is highly degraded, and while some limited foraging potential exists, the site is unlikely to represent foraging habitat of any significance to individuals occurring in the locality. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish the likelihood that this species will continue to forage on site. On this basis, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Southern Myotis	<i>Myotis macropus</i>	V		6	This species has not been recorded within the study area and there are few records within 10km. Potential foraging habitat occurs in the open managed grassland and over the farm dam and freshwater wetland areas. No wetlands will be removed by the proposal, and the development of cleared/disturbed pasture into residential blocks is not likely to significantly diminish the foraging potential of what is currently poor quality foraging habitat. As such it is unlikely this species will be impacted by the proposal. An AoS is not required for this species.
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V		3	This species may have been recorded on site during the current surveys, however the call recordings could only be identified to a species complex level. Potential foraging habitat occurs within the study area. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish the likelihood that this species will continue to forage on site. As a result, it is unlikely this species will be significantly impacted by the proposal. An AoS is not required for this species.
Eastern Cave Bat	<i>Vespadelus troughtoni</i>	V		1	This species may have been recorded on site during the current surveys, however the call recordings could only be identified to a species complex level. The site does not contain roosting habitat for this species. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
					the likelihood that this species will continue to forage on site. As a result, it is unlikely this species will be significantly impacted by the proposal. An AoS is not required for this species.
Herpetofauna					
Giant Burrowing Frog	<i>Heleioporus australiacus</i>	V	V	1	This species has not been recorded on site or within 10km of the site. Preferred habitat for this species does not occur on site and as such it is unlikely to occur and unlikely to be impacted by the proposal. An AoS is not required for this species.
Green and Golden Bell Frog	<i>Litoria aurea</i>	E	V	-	This species has not been recorded on site and there are no records within 10km of the site. While this species is known to occur in highly degraded wetlands similar to the farm dams found on site, targeted surveys failed to identify this species within potential habitat on site. Due to the lack of records during the current survey and the isolation of the site from known populations in the locality, this species is unlikely to occur. Wetlands will not be removed as a result of the proposal, and wetlands in the study area will not be impacted such as to render them uninhabitable to this species. As such this species is unlikely to be impacted upon by the proposal. An AoS is not required for this species.
Stuttering Frog	<i>Mixophyes balbus</i>	E	V	-	This species has not been recorded on site or within 10km of the site. Preferred habitat of rainforest and wet sclerophyll forest does not occur on site and as such this species is highly unlikely to occur and unlikely to be impacted upon by the proposal. An AoS is not required for this species.
Threatened Ecological Communities					
Hunter Lowland Red Gum Forest in the Sydney Basin Bioregion					Floristic surveys have confirmed this community occurs on site. An AoS has been applied in Appendix 4
Central Hunter Valley Eucalypt Forest and Woodland Corresponds to Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregion (MU 18 – LHCCREMS)		E	CE	-	Floristic surveys have confirmed this community does not occur on site. An AoS is not required for this species.
Hunter Valley Weeping Myall (<i>Acacia Pendula</i>) Woodland		E	CE	-	Floristic surveys have confirmed this community does not occur on site. An AoS is not required for this species.

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Lowland Rainforest of Subtropical Australia		E	CE	-	Floristic surveys have confirmed this community does not occur on site. An AoS is not required for this species.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		E	CE	-	Floristic surveys have confirmed this community does not occur on site. An AoS is not required for this species.
Migratory Species					
Oriental Cuckoo	<i>Cuculus optatus</i>		M	-	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found on site and this species is unlikely to forage in the stand of non-native trees to be cleared by the proposal. On this basis it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Spectacled Monarch	<i>Monarcha trivirgatus</i>		M	-	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found on site and this species is unlikely to forage in the stand of non-native trees to be cleared by the proposal. On this basis it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Black-faced Monarch	<i>Monarcha melanopsis</i>		M	-	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found on site and this species is unlikely to forage in the stand of non-native trees to be cleared by the proposal. On this basis it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Fork-tailed Swift	<i>Apus pacificus</i>		M	-	This species has not been recorded on site or within 10km of the site. As this species is believed to be almost entirely aerial in this part of its range, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
White-throated Needletail	<i>Hirundapus caudacutus</i>		M	-	This species has not been recorded on site or within 10km of the site. As this species is believed to be almost entirely aerial in this part of its range, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Yellow Wagtail	<i>Motacilla flava</i>		M	-	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found around the dam and this species is unlikely to forage in the area to be cleared by the proposal. On this basis, it is unlikely the species will be impacted by the proposal.

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					An AoS is not required for this species.
Satin Flycatcher	<i>Myiagra cyanoleuca</i>		M	-	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found on site and this species is unlikely to forage in the stand of non-native trees to be cleared by the proposal. On this basis it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Rufous Fantail	<i>Rhipidura rufifrons</i>		M	-	This species has not been recorded on site or within 10km of the site. No suitable habitat (wet sclerophyll forests) is found on site and this species is unlikely to forage in the stand of non-native trees to be cleared by the proposal. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Common Sandpiper	<i>Actitis hypoleucos</i>		M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>		M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Curlew Sandpiper	<i>Calidris ferruginea</i>	E	CE, M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.

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Pectoral Sandpiper	<i>Calidris melanotos</i>		M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Latham's Snipe	<i>Gallinago hardwickii</i>		M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.
Osprey	<i>Pandion haliaetus</i>	V	M	-	Suitable habitat for this species is not present on site. The aquatic habitats within the study area do not represent foraging habitat for this species, as large fish are highly unlikely to persist in the small, turbid dam. As such, it is unlikely that this species will be impacted by the proposal. An AoS is not required for this species.
Common Greenshank	<i>Tringa nebularia</i>		M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is unlikely the species will be impacted by the proposal. An AoS is not required for this species.

Key:

V = Vulnerable
E = Endangered

M = Migratory
CE = Critically Endangered

The following species are being assessed in **Appendix 4** under the 7 Part Test of Significance (TSC Act) based on the likelihood of occurrence results contained in **Table 4**.

Vegetation community

Hunter Lowland Red Gum Forest in the Sydney Basin Bioregion

Based on the likelihood of occurrence results contained in **Table 4**, there is no requirement to undertake an Assessment of Significance for all other threatened entities under the 7-part test as the proposed rezoning in its current form is unlikely to have a significant impact on threatened species such that a local extinction would occur based on likelihood of occurrence.

4.3 Other Legislative Considerations

4.3.1 Key Threatening Processes

A Key Threatening Process (KTP) is defined in the TSC Act as a process that “threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities”. They are listed under Schedule 3 of the TSC Act and may adversely affect threatened species, populations or ecological communities or could cause species, populations or ecological communities that are not threatened to become threatened.

KTP’s that have the potential to operate on site and require consideration under the site proposal have been outlined below.

1. Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners (*Manorina melanocephala*)
2. Anthropogenic Climate Change
3. Clearing of native vegetation
4. Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*)
5. Invasion, establishment and spread of *Lantana camara* (Lantana)
6. Invasion and establishment of exotic vines and scramblers
7. Invasion of native plant communities by exotic perennial grasses
8. Infection of native plants by *Phytophthora cinnamomi*
9. Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae
10. Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata* (Wall. ex G. Don) Cif.
11. Predation by the European Red Fox *Vulpes vulpes*
12. Removal of dead wood and dead trees

Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners (Manorina melanocephala)

The proposal seeks to remove only scattered trees and the Pine plantation over pasture. The Noisy miner was observed in small numbers within the study area. As such it is considered this KTP currently operates within the site and study area. The proposal will result in the removal of scattered

trees that will not result in increased edge of woodlands or forest where this species is known to inhabit. Therefore, it is unlikely the proposal will contribute to an increase in abundance and activity of the Noisy Miner.

Anthropogenic Climate Change

Modification of the environment by humans is considered to contribute to Climate Change and as a result has been listed as a Key Threatening Process. Land use change and construction activities which are occurring as a result of the proposal are actions that can contribute to greenhouse gas emissions. This may indirectly impact upon known or potentially occurring threatened species as most species depend on climate for their distribution.

The proposal seeks to remove scattered trees, the pine plantation and pasture vegetation from the site. This is unlikely to make a significant contribution to local climate such that alterations resulting in impacts on locally occurring threatened species, populations or ecological communities would occur.

Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*)

The proposal seeks to remove primarily pasture vegetation from the site. It is acknowledged this KTP is likely to operate on site due to the small fragment patches of vegetation coupled with the expansive pasture areas. Furthermore, given the European Rabbit grazes on a wide range of foliage in the groundcover and herbaceous layer, it is also considered that any alteration to the extent and abundance of native or exotic species assemblage would not lead to an increase in activity or abundance of this species on site. The proposal may result in a reduction in the potential area of occupancy of this species.

Invasion, establishment and spread of *Lantana camara* (*Lantana*)

This species was observed on site during field surveys with minor to moderate infestations present within the Red gum forest and Pine plantation in the study area. Higher concentrations were found in association with the creekline and Dam that dissects the northern corner of the study area.

The proposal seeks to remove 2.04ha of pasture and Scattered trees. The proposal may result in an immediate reduction of this species within the study area during vegetation clearing works. Due to the higher occurrence of this species within vegetation proposed to be retained, this may increase the potential for *Lantana* to continue to colonise retained remnant vegetation. On this basis, it is considered that the proposal may increase the prevalence of this KTP which is currently operating within the study area, whilst reducing its effect within the development site.

The removal of this species is recommended throughout the study area via best practice bush regeneration techniques to further reduce and minimise this KTP operating within the study area.

Invasion and establishment of exotic vines and scramblers

The invasive vine species *Lonicera japonica* (Japanese Honeysuckle) was observed within the Lowlands Red Gum Forest in the northern corner of the study area. The location of this species is within vegetation proposed to be retained as part of the residential subdivision resulting in this KTP continuing to operate on site. Although limited to a small section of the vegetation the aggressive nature of this species will result in further invasion and an increase in this KTP operating on site.

The removal of this species is recommended throughout the study area via best practice bush regeneration techniques to further reduce and minimise this KTP operating within the study area.

Invasion of native plant communities by exotic perennial grasses

This KTP is considered to be operating on site based on the presence of exotic and perennial species which dominate much of the groundcover on site. The proposal seeks to remove areas of pasture containing perennial grasses, however it is not anticipated that the proposal will trigger an increase to the KTP beyond its current operation across the study area.

Infection of native plants by *Phytophthora cinnamomi*

The soil born pathogen *Phytophthora cinnamomi* spreads in plant roots and has been known to infect a number of native plants. There was no evidence observed of *P. cinnamomi* impact on site during the survey period. With due consideration of the recommendation and mitigation measures contained within this report, it is considered unlikely that the proposal will contribute to this KTP.

Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae

Plants of the family Myrtaceae were not recorded on site. Exotic Rust Fungi may be introduced into the study area by increased movement of plant, vehicles and workers across the study area. It is recommended that anti-contamination procedures be enacted for personnel and equipment to minimise the chance of infection. These mitigation measures will provide an opportunity to enact an anti-contamination program to ameliorate this KTP.

Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata* (Wall. ex G. Don) Cif.

This species was observed on the site, however it is not considered the proposal will increase the prevalence of this species and therefore it is unlikely to contribute significantly to this KTP.

The removal of this species is recommended throughout any retained vegetation on site, via best practice bush regeneration techniques to further reduce and minimise this KTP operating within the study area

Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758)

The proposal does not seek to remove or modify significant patches of vegetation that would offer key hunting habitat for the fox. One fox was observed during nocturnal surveys in the vicinity of the dam. Foraging habitat for foxes is likely to be reduced as pasture is replaced by residential development. As such it is considered the while this KTP is likely to operate on site, the proposal is unlikely to contribute to an increase in abundance and activity of the European Red Fox.

Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)

The proposal is for establishment of a residential subdivision. Notwithstanding the likely background levels of Cat predation in the locality, it is likely that the occupation of the residential subdivision will lead to a contribution to this KTP over time. The extent to which shall have a direct relationship to cat ownership levels and owner stewardship.

Removal of dead wood and dead trees

The proposal will require the removal of only scattered pasture trees and scattered woody debris from fallen tree limbs and old fence posts. As a result, the proposal is likely to make only a minor contribution to this KTP.

Clearing of native vegetation

The KTP final determination lists nine factors that have the potential to impact species distribution or result in extinction. These factors are:

- 1) destruction of habitat resulting in loss of local populations of individual species;
- 2) fragmentation;
- 3) expansion of dryland salinity;
- 4) riparian zone degradation;
- 5) increased greenhouse gas emissions;

- 6) increased habitat for invasive species;
- 7) loss of leaf litter layer;
- 8) loss or disruption of ecological function; and
- 9) changes to soil biota.

The proposal seeks to remove a small patch of low quality regrowth Lowlands Red Gum Forest. This loss of vegetation will represent a small amount of habitat loss for potential threatened species in the area.

A further 3,540m² of low quality Hunter Lowlands Red Gum Forest will be retained within the study area at the completion of works, reducing the likelihood of local extinctions on site of threatened entities as a result of the proposal.

The proposal will affect habitat connectivity on a very minor scale within the site, it will not further fragment or isolate areas of habitat in the surrounding region then currently experienced. Loss of connectivity within the site will be limited to the small island of regrowth to be cleared for the residential subdivision.

The proposal will have a minor impact on increasing greenhouse gas emissions and a very minor loss on leaf litter layer due the reduction of vegetation within the site.

The current proposal is to encroach on water front land (as defined under the Water Management Act) and current design will result in minor encroachment of riparian vegetation zones, therefore will have a minor impact on riparian areas. The proposal will not be affected by dry land salinity.

The proposal will have a minor impact on ecological function and soil biota. The sites ecological function and soil biota has been impacted prior to the proposal due to the previous land uses in the area, and this can be seen throughout the site with obvious soil disturbance areas such as roads, soil compaction and general landscape modification.

The proposed retained vegetation currently has moderate to high density cover of invasive weed species present, particularly *Pinus radiata* which is codominant in the canopy at some locations and at times creating a monoculture. Lantana, Large Leaf Privet, and Honeysuckle are all present, and have the potential form larger thickets on site.

On this basis, it is considered the KTP will be increased on a small scale in the locality, however it is unlikely that the level of impact will result in a decline and/ or extinction due to reduction in habitat availability from clearing.

4.3.2 SEPP 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 site area to be impacted; 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 area to be impacted. '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.

One species of tree listed in Schedule 2 of the SEPP as a 'Koala Feed Tree Species' occurs on the Study Area, being *Eucalyptus tereticornis* (Forest Red Gum). Only a small number of individuals of this species were found widely scattered over pasture, and nowhere on site does it persist in densities of >15% of a woodland and as such would not constitute 'Potential Koala Habitat' as defined under the SEPP.

At no point were Koala feed trees observed on Site at >15% or more of the total tree cover. Additionally, investigations did not detect Koalas or signs of Koalas within the Site. Therefore, the vegetation on the Site does not constitute Potential or Core Koala Habitat.

On this basis no further considerations of the SEPP apply.

4.3.3 Commonwealth EPBC Act

An EPBC Act Protected Matters Search (accessed 18-10-2017) was undertaken to generate a list of those Matters of National Environmental Significance (MNES) from within 10 km of the site. An assessment of those MNES relevant to biodiversity has been undertaken in accordance within EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance (DoE, 2013). The Matters of National Environmental Significance protected under national environment law include:

- Listed threatened species and communities;
- Listed migratory species;
- Ramsar wetlands of international importance;
- Commonwealth marine environment;
- World heritage properties;
- National heritage places;
- The Great Barrier Reef Marine Park;
- Nuclear actions; and
- A water resource, in relation to coal seam gas development and large coal mining development.

Listed Threatened and Communities

A total of 33 threatened species and 4 threatened ecological communities listed under the EPBC Act have been recorded on the protected matters search. A likelihood of occurrence assessment for these MNES has been completed in **Section 4.2**.

This assessment concluded that the proposal is unlikely to impact the listed threatened species.

No Threatened Ecological Communities listed under the EPBC Act have been recorded within the study area or have been identified within any areas that have potential to be affected by indirect impacts.

Listed Migratory Species

The protected matters search nominated 16 migratory species or species habitat may occur with the 10km site buffer search area. The assessment contained in **Section 4.2** concluded that although migratory species may occupy and utilise various habitats throughout the Site and locality as part of their life cycle, no habitat on site is critical to their survival. Therefore, it is unlikely that the proposal over the site will impact migratory species.

Wetlands of International Significance (declared Ramsar wetlands):

The site is not a wetland of international significance or declared Ramsar wetland. The protected matters search nominates the following wetlands of international importance:

- Hunter Estuary Wetlands

The site is identified as occurring approximately 20 - 30km upstream from this wetland. While surface runoff and flow regimes may be altered by residential development over the pastures on site, provided recommended sedimentation and runoff controls are in place, the proposal will not significantly impact downstream Ramsar wetlands.

Commonwealth Marine Areas:

The Site is not part of or within close proximity to any Commonwealth Marine Area.

World Heritage Properties:

The Site is not a World Heritage area, and is not in close proximity to any such area.

National Heritage Places:

The Site is not a National Heritage area, and is not in close proximity to any such area.

Great Barrier Reef Marine Parks:

The Site is not part of or within close proximity to any Great Barrier Reef Marine Park.

Nuclear Actions:

The proposal over the site is not and does not form part of a Nuclear action.

Water Resources in relation to Coal Mining and CSG:

The proposal over the site is related to land development and as such is not or does not form part of a coal mining and/or CSG proposal.

Summary

In summary the proposed action is unlikely to have an impact to MNES and as such Commonwealth referral under the EPBC Act is not required.

5 Recommendations & Mitigation Measures

Recommendations have been provided to mitigate potential impacts on biodiversity values within the Site and broader Study Area with particular focus on any species, population or ecological community listed under the TSC Act and/or EPBC Act.

- Appropriate Water Sensitive Urban Design (WSUD) principles should be implemented for the proposed subdivision to effectively capture and treat stormwater and runoff. Outputs from stormwater treatment infrastructure should be of a comparable quality and quantity to the existing water regime to maintain the health of the creekline within the study area;
- Appropriate measures should be employed to ensure that machinery working within the study areas do not bring materials (soils etc.) onto the site with the potential to infect surrounding vegetation with Exotic Rust Fungi; and
- Erosion and sediment controls will be implemented to prevent run-off or sediment flows from impacting upon downstream habitats during construction and maintained until such time that formal engineering is installed and operational.

6 Conclusion

MJD Environmental has been engaged by Karl Waeger C/O- HDB Town Planning & Design, to prepare an Ecological Assessment to accompany a rezoning application for a residential subdivision at Lot 1 DP873220, 71 Branxton Street, Greta.

NSW Biodiversity Reforms - This assessment has been prepared with due regard to the transitional arrangements set out under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (Transitional Regulations). Under Part 7 clause 27 of the Transitional Regulations, the proposal is categorised as a *pending or interim planning application* pursuant to subclause (e) as the development application has been lodged with the consent authority within 3 months of commencement of the NSW Biodiversity Reforms (25th August 2017), being before 25th November 2017. It is on this basis that the assessment aims to examine the likelihood of the proposal having a significant effect on any threatened species, populations or ecological communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act). This assessment recognises the relevant requirements of the EP&A Act 1979 (as amended by the *NSW Environmental Planning and Assessment Amendment Act 1997*). Preliminary assessment was also undertaken having regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report has been prepared with respect to the *Lower Hunter Central Coast Regional Fauna & Flora Survey Guidelines* (LHCCREMS 2002) and the *Threatened Biodiversity Survey and Assessment Guidelines* (DEC 2004). Due to the lack of native vegetation and fauna habitat on site the survey effort undertaken was modified to suit the current site conditions.

Based on a comprehensive desktop review of threatened species databases and vegetation mapping coupled with a field validation survey, the ecological assessment found:

Vegetation Communities have been delineated across the Site as follows:

A total of four vegetation communities have been delineated within the site being:

- MU 19 Hunter Lowlands Redgum Forest (Low condition);
- Pasture with Scattered trees
- Dam and degraded creekline
- Managed landscape

No threatened flora species were detected during field surveys

Two threatened species, specifically the Little Bent-wing Bat (*Miniopterus australis*) and Eastern Bent-winged Bat (*Miniopterus schreibersii oceanensis*) listed as Vulnerable under the TSC Act, were recorded on site during the field validation survey. No additional threatened species were confidently recorded within the study area.

Assessment under SEPP 44 found that no 'Potential Koala Habitat' occurs within the Site and no further assessment under SEPP 44 was required.

The ecological impact assessment considered whether the removal of vegetation and cleared areas on site would constitute a significant impact on known threatened species, populations and ecological communities from the locality such that a local extinction may occur. The assessment concluded that the proposal was unlikely to have an impact on the threatened entities assessed and therefore, from an ecological perspective, there would be no impediment to development consent being granted for subdivision of this land.

7 References & Bibliography

- ANZECC and ARMCANZ (2000), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality. National Water Quality Management Strategy*. Australian and New Zealand Environment and Conservation Council Agriculture and Resource Management Council of Australia and New Zealand, October 2000.
- Bell, S. (2001) Notes on population size and habitat of the vulnerable *Cryptostylis hunteriana* (Orchidaceae) from the Central Coast of New South Wales. *Cunninghamia* **7**: 195–204.
- Bell, S. and Driscoll, C. (2004) *Population Count and Assessment of Rutidosia heterogama* (Asteraceae), Lower Hunter & Central Coast. East Coast Flora Survey, Kotara Fair.
- Briggs, J. D. and Leigh, J. H. (1996) *Rare and Threatened Plants*. CSIRO Publishing, Sydney.
- Churchill, S. (2008) *Australian Bats*. 2nd Edition. Allen & Unwin, Australia.
- Cropper (1993) *Management of Endangered Plants*. CSIRO Publications, East Melbourne, Victoria.
- Debus, S.J.S. (1995) Surveys of large forest owls in Northern New South Wales; methodology, calling behaviour and owl responses. *Corella* **19**: 38–50.
- DEC (2006) *Recovery Plan for the Large Forest Owls: Powerful Owl (Ninox strenua), Sooty Owl (Tyto tenebricosa) and Masked Owl (Tyto novaehollandiae)*. Department of Environment and Conservation, Sydney.
- DECCW (2009) Draft National Recovery for the Grey-headed Flying-fox *Pteropus poliocephalus*. Prepared by Dr Peggy Eby. Department of Environment, Climate Change and Water NSW, Sydney.
- Department of the Environment (DoE) (2013) *EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance*. Australian Government Department of the Environment.
- Department of the Environment (DoE) (2016). *Protected Matters Search*. Accessed September 2017.
- Department of the Environment *Commonwealth Biodiversity: Species Profile and Threats Database (SPRAT)* - <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl> (accessed September 2017)
- Department of Environment and Resource Management (2011) *National Recovery Plan for the Large-eared Pied Bat Chalinolobus dwyeri*. Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra.
- DLWC (Department of Land and Water Conservation) (2002) *The NSW State Groundwater Dependiant Ecosystem Policy*. NSW Government.
- Fischer, J. and Lindenmayer, D. B. (2007) Landscape Modification and Habitat Fragmentation: A Synthesis. *Global Ecology and Biogeography* Vol. 19 (3) pp: 265-280.
- Fletcher, jr. R. J., Ries, L., Battin, J. and Chalfron, A. D. (2007) The Role of habitat area and edge in fragmented landscapes: definitively distinct of inevitable intertwined? *Canadian Journal of Zoology*. **85**:1017-1030.
- Harden, G.J. (Ed) (1992) *Flora of New South Wales. Volume 3*. Royal Botanical Gardens Sydney & New South Wales University Press, Sydney

- Harden, G.J. (Ed) (1993) *Flora of New South Wales. Volume 4.* Royal Botanical Gardens Sydney & New South Wales University Press, Sydney
- Harden, G.J. (Ed) (2000) *Flora of New South Wales. Volume 1.* Royal Botanical Gardens Sydney & New South Wales University Press, Sydney
- Harden, G.J. (Ed) (2002) *Flora of New South Wales. Volume 2.* Royal Botanical Gardens Sydney & New South Wales University Press, Sydney
- House, S (2003). *Lower Hunter & Central Coast Regional Biodiversity Conservation Strategy, Technical Report, Digital Aerial Photo Interpretation & Updated Extant Vegetation Community Map.* Report to Lower Hunter & Central Coast Regional Environmental Management Strategy, Callaghan, NSW, May 2003.
- Kavanagh, R.P. and Peake, P. (1993) Distribution and habitat of nocturnal forest birds in south eastern New South Wales. In: Olsen, P. (ed.). *Australian Raptor Studies.* Australasian Raptor Association, Royal Australasian Ornithologists Union, Melbourne pg. 101–125.
- Mehkhorst, P, Schedvin, N and Geering, D. (1999) *Regent Honeyeater Recovery Plan 1999-2003.* Department of Natural Resources and Environment, Victoria.
- Murray, M., Bell, S. and Hoye, G. (2002). *Flora and fauna survey Guidelines: Lower Hunter Central Coast Region 2002.* Lower Hunter & Central Coast Regional Environmental Management Strategy, Callaghan.
- NPWS (2003) Lower Hunter & Central Coast Regional Environmental Management Strategy (LHCCREMS),
- NSW OEH Threatened Species Profile Search - <http://www.environment.nsw.gov.au/threatenedSpeciesApp/> (accessed October 2017)
- Pizzey, G. and Knight, F. (2007) *The Field Guide to the Birds of Australia.* Harper Collins Publishers, Sydney.
- Richardson, E. G. (1977) The biology and evolution of the reproductive cycle of *Miniopterus schreibersii* and *M. australis* (Chiroptera: Vespertilionidae). *Journal of Zoology*, London: 183: 353-375.
- Robertson, O. J. and Radford, J. Q. (2009) Gap-crossing decisions of forest birds in a fragmented landscape. *Austral Ecology*, 34: 435–446. Saunders, D.L. and Tzaros, C.L. 2011. *National Recovery Plan for the Swift Parrot Lathamus discolor*, Birds Australia, Melbourne.
- Robinson, M. (1998) *A field Guide to Frogs of Australia.* Reed New Holland, Sydney.
- Rowley, L., Edwards, R. And Kelly, P. (1999) Edges- Their Effect on Vegetation and Wildlife. Land for Wildlife, Queensland. Accessed online from: <http://www.sustainablebluemountains.net.au/localliving/resources/files/Edges-LfW.pdf>
- Simpson, K, and Day, N. (2010) *Field Guide to the Birds of Australia.* Penguin Group, Australia.
- Strahan, R. (2004) *The Mammals of Australia.* New Holland Publishers, Australia.
- Tyler, M. J. And Knight, F. (2011) *Field Guide to the Frogs of Australia.* Revised Edition. CSIRO Publishing, Australia.
- Wilson, S, and Swan, G. (2003) *A Complete Guide to Reptiles of Australia.* Reed New Holland, Sydney.

Appendix 1 Plan of Proposal



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Appendix 2 Flora and Fauna Species List

Fauna	
Mammals	
<i>Macropus giganteus</i>	Eastern Grey Kangaroo
<i>Vulpes vulpes</i>	European Red Fox
<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox
<i>Auromotus australis</i>	White-striped Free-tailed Bat
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat
<i>Miniopterus australis</i>	Little Bent-winged Bat (V)
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent-winged Bat (V)
<i>Mormopterus planiceps</i>	Southern Free-tailed Bat
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat
Birds	
<i>Gymnorhina tibice</i>	Australian Magpie
<i>Corvus coronoides</i>	Australian Raven
<i>Chenonetta jubata</i>	Australian Wood Duck
<i>Acridotheres tristis</i>	Indian Myna
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater
<i>Acanthiza pusilla</i>	Brown Thornbill
<i>Scythrops novaehollandiae</i>	Channel-billed Cuckoo
<i>Ocyphaps lophotes</i>	Crested Pigeon
<i>Gallinula tenebrosa</i>	Dusky Moorhen
<i>Platyercus eximius</i>	Eastern Rosella
<i>Eopsaltria australis</i>	Eastern Yellow Robin
<i>Cacatua roseicapilla</i>	Galah
<i>Cracticus torquatus</i>	Grey Butcherbird
<i>Rhipidura fuliginosa</i>	Grey Fantail
<i>Ocyphaps lophotes</i>	Crested Pigeon
<i>Dacelo novaeguineae</i>	Laughing Kookaburra
<i>Grallina cyanoleuca</i>	Magpie-lark
<i>Vanellus miles</i>	Masked Lapwing
<i>Sturnus vulgaris</i>	Common Starling
<i>Manorina melanocephala</i>	Noisy Miner
<i>Porphyrio porphyrio</i>	Purple Swamphen
<i>Merops ornatus</i>	Rainbow Bee-eater (M)
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet
<i>Acrocephalus australis</i>	Australian Reed-warbler
<i>Platalea regia</i>	Royal Spoonbill
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo
<i>Malurus cyaneus</i>	Superb Fairy-wren
<i>Anthochaera carunculata</i>	Wattlebird
<i>Hirundo neoxena</i>	Welcome Swallow
<i>Sericornis frontalis</i>	White-browed Scrubwren
<i>Rhipidura leucophrys</i>	Willie Wagtail
<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater

Fauna	
Herpetofauna	
<i>Chelodina longicollis</i>	Long-necked Turtle
<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake
<i>Crinia signifera</i>	Common Eastern Froglet
<i>Litoria fallax</i>	Eastern Dwarf Tree Frog
<i>Litoria latopalmata</i>	Broad-palmed Frog
<i>Litoria peronii</i>	Peron's Tree Frog
<i>Limnodynastes peronii</i>	Striped Marsh Frog

Flora List

Scientific Name	Common Name
<i>Liquidamber sp.</i>	Liquid amber
<i>Tricoryne elatior</i>	Yellow Autumn Lilly
<i>Conyza sp*</i>	Fleabane
<i>Cirsium vulgare*</i>	Thistle
<i>Hypochaeris radicata*</i>	Cats Ears
<i>Ozothamnus diosmifolius</i>	Dogwood
<i>Pseudognaphalium luteo-album.</i>	Cudweed
<i>Senecio madagascariensis*</i>	Fireweed
<i>Opuntia stricta*</i>	Prickly Pear
<i>Wahlenbergia gracilis</i>	Bluebells
<i>Lonicera japonica*</i>	Japanese Honeysuckle
<i>Casuarina glauca</i>	Swamp Oak
<i>Enadia hastata</i>	Saltbush
<i>Carex appressa</i>	
<i>Cypress polystachyos</i>	
<i>Maytenus silvestris</i>	
<i>Breynia oblongifolia</i>	Coffee Bush
<i>Acacia parvipinnula</i>	
<i>Jacksonia scoparia</i>	Dogwood
<i>Romulea rosea*</i>	Onion grass
<i>Juncus acutus*</i>	Spiny Rush
<i>Juncus usitatus</i>	
<i>Cinnamomum camphora*</i>	Camphor Laurel
<i>Tricoryne elatior</i>	
<i>Lomandra confertifolia</i>	
<i>Lomandra filiformis</i>	
<i>Lomandra multiflora</i>	
<i>Parvonias hastata</i>	
<i>Sida rhombifolia*</i>	
<i>Angophora floribunda</i>	
<i>Eucalyptus tereticornis</i>	Forest Red Gum
<i>Ligustrum sinense*</i>	Small-Leaf Privet
<i>Ligustrum lucidum*</i>	Large-leaf Privet

Scientific Name	Common Name
<i>Olea europaeae</i> subsp. <i>cuspidata</i> *	African Olive
<i>Ludwigia peploides</i>	Water Primrose
<i>Phytolacca octandra</i> *	Ink weed
<i>Pinus radiata</i> *	Monterey Pine
<i>Pittosporum undulatum</i>	Sweet Pittosporum
<i>Plantago lanceolata</i> *	Lambs tongue
<i>Agrostis avenacea</i>	Blown Grass
<i>Andropogon virginicus</i> *	Whiskey Grass
<i>Axonopus fissifolius</i> *	Carpet grass
<i>Aristida ramosa</i>	Three-awn Spear grass
<i>Briza major</i>	
<i>Cynodon dactylon</i>	Couch grass
<i>Eragrostis brownii</i>	
<i>Eragrostis curvulea</i> *	African Love Grass
<i>Imperata cylindrica</i>	Bladey Grass
<i>Paspalum dilatatum</i> *	Dallas Grass
<i>Pennisetum clandestine</i>	Kikuyu
<i>Rytidoperma bipartitum</i>	Wallaby Grass
<i>Themeda triandra</i>	Kangaroo Grass
<i>Persicaria decipiens</i>	Slender Knotweed
<i>Lysimachia arvensis</i> *	Scarlet Pimpernel
<i>Hakea sericea</i>	Needle Bush
<i>Grevillea robusta</i>	Silky Oak
<i>Persoonia linearis</i>	
<i>Cheilanthes sieberi</i>	Poison Rock Fern
<i>Salix babylonica</i> *	Willow
<i>Cestrum parquai</i> *	Green Cestrum
<i>Typha orientalis</i>	Bullrush
<i>Lantana camara</i> *	Lantana
<i>Verbena bonariensis</i> *	Purple top
<i>Verbena rigida</i> *	Creeping Verbena
<i>Viola betonicifolia</i>	Violet

Appendix 3 Assessment of Significance (7-part Test)

Section 5A of the EP&A Act lists seven factors that must be taken into account in the determination of the significance of potential impacts of proposed activities on 'threatened species, populations or ecological communities or their habitats' (threatened biota) listed under the TSC Act. The '7-part test' is used to determine whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats and thus whether a Species Impact Statement (SIS) is required to be produced.

The significance of the impacts on those threatened species and EECs which have been recorded in the Site or are likely to occur and are likely to utilise habitat to be potentially impacted by the proposal (see **Table 3**) have been assessed. This assessment concluded that all species were unlikely to be impacted by the proposal. As such and for completeness the following broad 7-part test provides coverage for the following entities.

Flora	
Heath Wrinklewort	<i>Rutidosia heterogama</i>
Bynoe's Wattle	<i>Acacia bynoeana</i>
	<i>Asterolasia elegans</i>
Netted Bottle Brush	<i>Callistemon linearifolius</i>
bluegrass	<i>Dichanthium setosum</i>
<i>Eucalyptus camaldulensis</i> population in the Hunter Catchment	<i>Eucalyptus camaldulensis</i>
Slaty Red Gum	<i>Eucalyptus glaucina</i>
Earp's Gum	<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>
<i>Cymbidium canaliculatum</i> population in the Hunter Catchment	<i>Cymbidium canaliculatum</i>
Small-flower Grevillea	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>
North Rothbury Persoonia	<i>Persoonia pauciflora</i>
Illawarra Greenhood	<i>Pterostylis gibbosa</i>
	<i>Euphrasia arguta</i>
Austral Toadflax	<i>Thesium australe</i>
A Leek orchid	<i>Prasophyllum</i> sp. Wybong
Magenta Lilly Pilly	<i>Syzygium paniculatum</i>
Birds	
Regent Honeyeater	<i>Anthochaera phrygia</i>
Australasian Bittern	<i>Botaurus poiciloptilus</i>
Curlew Sandpiper	<i>Calidris ferruginea</i>
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>
Speckled Warbler	<i>Chthonicola sagittata</i>
Spotted Harrier	<i>Circus assimilis</i>
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>
Varied Sittella	<i>Daphoenositta chrysoptera</i>
Eastern Bristlebird	<i>Dasyornis brachypterus</i>
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>
Red Goshawk	<i>Erythrorhynchus radiatus</i>
White-fronted Chat	<i>Epthianura albifrons</i>
Black Falcon	<i>Falco subniger</i>
Little Lorikeet	<i>Glossopsitta pusilla</i>
Painted Honeyeater	<i>Grantiella picta</i>
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>
Little Eagle	<i>Hieraaetus morphnoides</i>
Swift Parrot	<i>Lathamus discolor</i>

Square-tailed Kite	<i>Lophoictinia isura</i>
Turquoise Parrot	<i>Neophema pulchella</i>
Barking Owl	<i>Ninox connivens</i>
Powerful Owl	<i>Ninox strenua</i>
Far Eastern Curlew	<i>Numenius madagascariensis</i>
Scarlet Robin	<i>Petroica boodang</i>
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>
Australian Painted Snipe	<i>Rostratula australis</i>
Masked Owl	<i>Tyto novaehollandiae</i>
Mammals	
Spotted-tailed Quoll (SE mainland population)	<i>Dasyurus maculatus maculatus</i> (southeastern mainland population)
Koala	<i>Phascolarctos cinereus</i>
Eastern Pygmy-possum	<i>Cercartetus nanus</i>
Squirrel Glider	<i>Petaurus norfolcensis</i>
Greater Glider	<i>Petauroides volans</i>
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>
Long-nosed Potoroo (SE mainland)	<i>Potorous tridactylus tridactylus</i>
New Holland Mouse	<i>Pseudomys novaehollandiae</i>
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>
Little Bentwing-bat	<i>Miniopterus australis</i>
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>
Southern Myotis	<i>Myotis macropus</i>
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>
Eastern Cave Bat	<i>Vespadelus troughtoni</i>
Herpetofauna	
Giant Burrowing Frog	<i>Heleioporus australiacus</i>
Green and Golden Bell Frog	<i>Litoria aurea</i>
Stuttering Frog	<i>Mixophyes balbus</i>
Threatened Ecological Communities	
Hunter Lowlands Red Gum	
Central Hunter Valley Eucalypt Forest and Woodland Corresponds to Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregion (MU 18 – LHCCREMS)	
Hunter Valley Weeping Myall (<i>Acacia Pendula</i>) Woodland	
Lowland Rainforest of Subtropical Australia	
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	

- a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.**

All threatened species have been addressed for likelihood of occurrence and potential for impact in under Table 4 of this report. This assessment concluded that all species were unlikely to occur on the site or the habitat conditions present on the site are of low quality such that the site would not represent core habitat for any species addressed.

On this basis, it is considered unlikely that the proposal will have an adverse effect on the life cycle of the entities such that a viable local population of the species is likely to be placed at risk of extinction.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations were considered as having potential to occur on site. Therefore, the action proposed is not likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

One Endangered Ecological Communities have been recorded on site being *Hunter Lowlands Red Gum Forest in the Sydney Basin Bioregion*

The proposal will remove approximately:

- 430m² of low condition regrowth Hunter Lowlands Red Gum Forest

In addition, the proposal intends to retain:

- 3,540m² low condition Hunter Lowlands Red Gum Forest);

The removal of 430m² of low condition regrowth Hunter Lowland Red Gum Forest is unlikely to have an adverse effect or adversely modify the extent of either of the Endangered Ecological Communities such that its local occurrence is likely to be placed at risk of extinction.

d) In relation to the habitat of a threatened species, population or ecological community:

- i. the extent to which habitat is likely to be removed or modified as a result of the action proposed,**

The proposal will remove habitat as follows:

- Loss of 430m² of low condition Hunter Lowlands Red Gum Forest
- Loss of 3.14ha of disturbed pasture and scattered trees, and
- Loss of 614m² of managed landscapes;
- Los of 330m² of Degraded creekline that is currently the location of civil works associated road construction in adjacent development

All vegetation to be removed as part of this proposal is considered to be low condition and has limited suitable habitat for threatened species in the locality.

- ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**

The proposal is not considered to increase fragmentation or isolation in the local landscape given the highly disturbed nature of the existing area.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

Generally the habitat has been determined as not being of significance to the viability and long term survival of the threatened entities assessed herewith.

The proposal will remove or modify low quality foraging habitat for hollow-dependent and cave-dwelling microbat species. However, the change in much of this foraging habitat from grazed pasture land to residential development is unlikely to affect the long-term survival of these microbats in the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No critical habitat for any threatened species or ecological communities occurs on site, therefore the proposal is unlikely to impact upon such habitat.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

- *Chalinolobus dwyeri* Large-eared Pied Bat

The modification of foraging habitat from cleared pasture with exotic pines to residential development as a result of the proposal is potentially and to a very limited degree inconsistent with objective 2.1 (Protection of known roosts and associated foraging habitats and management of threats) of the national recovery plan for the Large-eared Pied Bat.

Forest Owls

- *Ninox connivens* Barking Owl;
- *Ninox strenua*; and
- *Tyto novaehollandiae* Masked Owl.

The removal of scattered pasture trees as a result of the Project is, to a very limited degree, inconsistent with objective 5 (minimise loss and fragmentation of owl habitat areas) of the Large Forest Owl Recovery Plan (DEC 2006) as the proposal will remove areas that could represent low quality foraging habitat on as part of a wider home range.

- *Pteropus poliocephalus* Grey-headed Flying-fox

The removal of habitat as a result of the Proposal is inconsistent with objective 3.3.1 Habitat loss, in particular the loss of the single isolated *Ficus macrophylla* (Moreton Bay Fig) on site, of the Draft Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* (DoE 2017). The loss of this single tree, occurring within a large expanse of cleared pasture, constitutes a very limited contravention of this recover plan.

More broadly the NSW OEH are in the early phases of implementing the 'Saving our Species' program, that aims to secure species in their natural settings for the next 100 years. The intent is to manage threatened species one of six streams being:

- 1) Site managed species
- 2) Iconic species
- 3) Data-deficient species
- 4) Landscape-managed species
- 5) Partnership species
- 6) Keep watch species

Based on management allocation, each species will be prioritised by OEH. At the time of reporting, most fauna species assessed were nominated as 'Landscape-managed Species'.

With regard to the six management streams of the 'Saving our Species' program, the proposal does not constitute a significant contravention of objectives or actions outlined within these management streams:

- 7) Site managed species – the study area neither contains nor is adjacent to conservation management sites currently identified for threatened species assessed herewith, and does not interfere either directly or indirectly with conservation projects underway at these sites.
- 8) Iconic species – the study area does not currently support any iconic species and does not contain any suitable habitat for these species.
- 9) Data-deficient species – the proposal does not interfere with any research objectives related to these species.
- 10) Landscape-managed species – the proposal will occur within previously cleared land, and as such will not contribute to clearing or degradation of native vegetation such that these species could be affected by loss of habitat.
- 11) Partnership species – the study area does not contain key populations, breeding sites, or declining populations of these species.
- 12) Keep watch species – the proposal does not significantly contribute to any developing threats to these species.

The removal of habitat as a result of the Proposal is inconsistent at a minor level with the critical action associated with this management action:

- The key threats to the viability of landscape-managed species are loss, fragmentation and degradation of habitat, and widespread pervasive factors such as impacts of climate change and disease.

The status of known management actions for flora and fauna species is discussed below:

- *Anthochaera phrygia* Regent Honeyeater “Site Managed Species”

A strategy for the management of Regent Honeyeaters has been developed under the NSW Save Our Species program. Under the program the species has been assigned to the Site-managed species stream. In order to facilitate long term conservation of this species, five conservation management sites have been set up in NSW as follows:

- Bundarra – Gunnedah, Gwydir, Tamworth, Uralla LGA's
- Lower Hunter Valley – Cessnock, Singleton LGA
- Capertree Valley – Lithgow, Mid-Western Region
- Taronga Zoo
- Mudgee/Wollar

The site is not located in or adjacent to any of the above mentioned conservation management sites.

- *Eucalyptus glaucina* “Site Managed Species”

Saving Our Species program. Under the program the species has been assigned to the Site-managed species stream. In order to facilitate long term conservation of this species, two conservation management sites have been proposed in NSW as follows:

- Breamar Richmond Valley LGA; and
- Minimbah Singleton and Cessnock LGA.

The site is not located in or adjacent to either of the dedicated conservation management sites.

- Hunter Lowlands Red Gum Forest “Species Action Statement”

A strategy for the management of Hunter Lowlands Red Gum Forest is currently being developed under the NSW Save Our Species program. A set of broad interim management actions have been prepared for ecological communities.

Given the proposal will impact 430m² of low condition habitat associated with this community, it is unlikely to contravene any interim objectives.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act 1995. KTPs considered relevant to the proposal is described in **Section 4.3.1**. This assessment concluded that the proposal was unlikely to trigger KTPs currently not operating on site and/or not significantly contribute to or increase the activity of a KTP operating on the site.

Appendix 4 Anabat Report



**ECHO
ECOLOGY**

Bat Call Identification

Greta, NSW

Prepared for
MJD Environmental Pty Ltd
2/235 Maitland Rd,
Mayfield, NSW 2998

Job Reference BC_MJD8 - November 2017

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



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Contents

1.0	Introduction.....	1
2.0	Methods.....	1
2.1	Characteristics Used to Differentiate Species.....	2
3.0	Results.....	3
4.0	Sample Calls	6
5.0	References	7

List of Tables

Table 3-1: Results of bat call analysis (number of passes per site per night)	4
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List of Figures

Figure 4-1: <i>Austronomus australis</i> definite call.....	6
Figure 4-2: <i>Chalinolobus gouldii</i> definite call	6
Figure 4-3: <i>Miniopterus australis</i> definite call	6
Figure 4-4: <i>Miniopterus orianae oceanensis</i> probable call	6
Figure 4-5: <i>Mormopterus planiceps</i> definite call	7
Figure 4-6: <i>Scotorepens balstoni</i> probable call	7

1.0 INTRODUCTION

This report has been commissioned by MJD Environmental to analyse bat echolocation call data (Anabat, Titley Electronics) collected from Greta, 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 (Chris Corben, Version 4.2n) software. The calls appeared to have been recorded using Div Ratio 8. The identification of calls was undertaken with reference to Pennay et al. (2004) and through the comparison of recorded reference calls from 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. Activity levels should not be compared among species as different species have different detectability due to factors such as call loudness, foraging strategy and call identifying features. Activity comparisons among sites 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.

Nomenclature follows the Australian Chiroptera taxonomic list described by Reardon et al. (2015).

2.1 Characteristics Used to Differentiate Species

Miniopterus australis was differentiated from *Vespadelus pumilus*, by characteristic frequency or the presence of a down-sweeping tail on pulses.

Calls from *Miniopterus orianae oceanensis* were differentiated from *Vespadelus* spp. by a combination of uneven consecutive pulses and the presence of down-sweeping tails.

Calls from *Mormopterus* spp. were differentiated by the presence of mainly flat pulses. Calls from *Mormopterus planiceps* were distinguished from *Mormopterus ridei* only where they do not overlap in characteristic frequency.

Chalinobus gouldii was differentiated from other species by the presence of curved, alternating call pulses.

Scotorepens balstoni was differentiated in long call sequences at lower frequencies by lack of alternation.

Scotorepens orion, *Scoteanax rueppellii* and *Falsistrellus tasmaniensis* were unable to be differentiated from one another. *Falsistrellus tasmaniensis* is most frequently recorded from more elevated locations in the region and so its occurrence within the study area is unlikely. However, some records exist from coastal lowlands and so we have included it in our species groups as a precautionary measure.

Austronomus australis was differentiated from other bat species on the basis of characteristic frequency.

3.0 RESULTS

A total of 302 call sequences were recorded, of which 159 call sequences were able to be analysed (ie were not 'noise' files or bat calls of short length). Of the bat calls, 37 call sequences (23 %) 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:

- *Austronomus australis* (White-striped Free-tailed Bat)
- *Chalinolobus gouldii* (Gould's Wattled Bat)
- *Miniopterus australis* (Little Bent-winged Bat)
- *Miniopterus orianae oceanensis* (Eastern Bent-winged Bat)
- *Mormopterus planiceps* (Southern Free-tailed Bat)
- *Scotorepens balstoni* (Inland Broad-nosed Bat)

Additionally, the following bat species potentially occurred within the site, but could not be confidently identified (those calls classified as possible or as a species group):

- *Chalinolobus morio* (Chocolate Wattled Bat)
- *Falsistrellus tasmaniensis* (Eastern Falsistrelle)
- *Mormopterus norfolkensis* (Eastern coastal Free-tailed Bat)
- *Mormopterus ridei* (Ride's Free-tailed Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Scotorepens orion* (Eastern Broad-nosed Bat)
- *Vespadelus darlingtoni* (Large Forest Bat)
- *Vespadelus pumilus* (Eastern Forest Bat)
- *Vespadelus regulus* (Southern Forest Bat)
- *Vespadelus troughtoni* (Eastern cave bat)
- *Vespadelus vulturinus* (Little Forest Bat)

It should be noted that additional bat species may be present within the site but were not recorded by the detectors (or are difficult to identify by bat call) 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 30/10/2017	Anabat 31/10/2017	Anabat 1/11/2017	Anabat 2/11/2017
DEFINITE				
<i>Austronomus australis</i>	4	1	-	-
<i>Chalinolobus gouldii</i>	1	3	-	1
<i>Miniopterus australis</i>	-	1	1	-
<i>Mormopterus planiceps</i>	-	-	3	1
PROBABLE				
<i>Chalinolobus gouldii</i>	2	2	1	-
<i>Miniopterus oriana oceanensis</i>	5	2	6	1
<i>Mormopterus planiceps</i>	-	-	1	-
<i>Scotorepens balstoni</i>	-	-	-	1
POSSIBLE				
<i>Miniopterus oriana oceanensis</i>	-	-	-	1
SPECIES GROUPS				
<i>Chalinolobus gouldii</i> / <i>Mormopterus norfolkensis</i> / <i>Mormopterus ridei</i> / <i>Scotorepens balstoni</i>	2	-	1	-
<i>Chalinolobus gouldii</i> / <i>Mormopterus ridei</i> / <i>Mormopterus planiceps</i> / <i>Scotorepens balstoni</i>	2	-	-	2
<i>Chalinolobus gouldii</i> / <i>Scotorepens balstoni</i>	3	1	2	-
<i>Chalinolobus morio</i> / <i>Vespadelus pumilus</i> / <i>Vespadelus vulturnus</i> / <i>Vespadelus troughtoni</i>	2	-	-	-
<i>Falsistrellus tasmaniensis</i> / <i>Scotorepens orion</i> / <i>Scoteanax rueppellii</i>	1	-	1	-
<i>Miniopterus oriana oceanensis</i> / <i>Vespadelus darlingtoni</i> / <i>Vespadelus regulus</i>	36	16	20	15
<i>Mormopterus norfolkensis</i> / <i>Mormopterus ridei</i>	3	-	4	-
<i>Mormopterus ridei</i> / <i>Mormopterus planiceps</i>	2	1	4	3
UNKNOWN				

IDENTIFICATION	Anabat 30/10/2017	Anabat 31/10/2017	Anabat 1/11/2017	Anabat 2/11/2017
'Noise' files	63	1	2	2
Unknown	22	16	27	10
TOTAL	148	44	73	37

4.0 SAMPLE CALLS

A sample of the calls actually identified from the site for each species is given below.

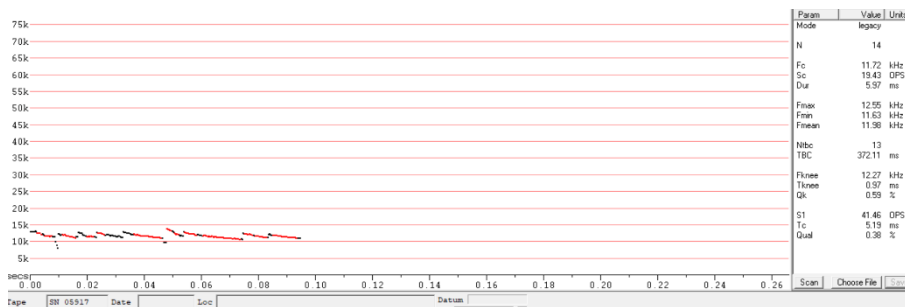


Figure 4-1: *Austronomus australis* definite call

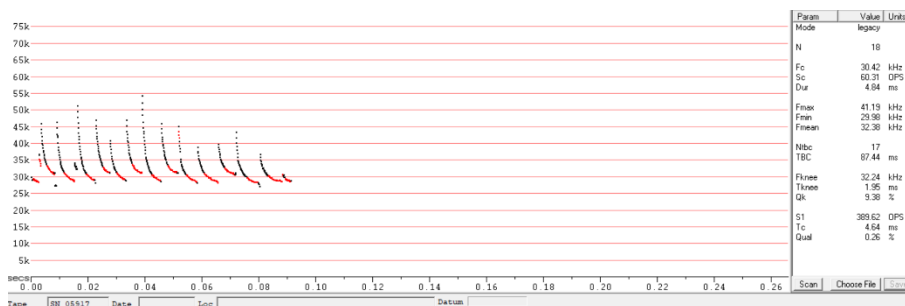


Figure 4-2: *Chalinolobus gouldii* definite call

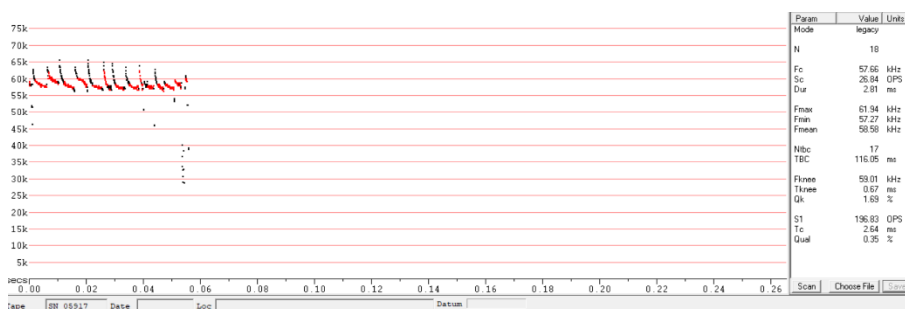


Figure 4-3: *Miniopterus australis* definite call

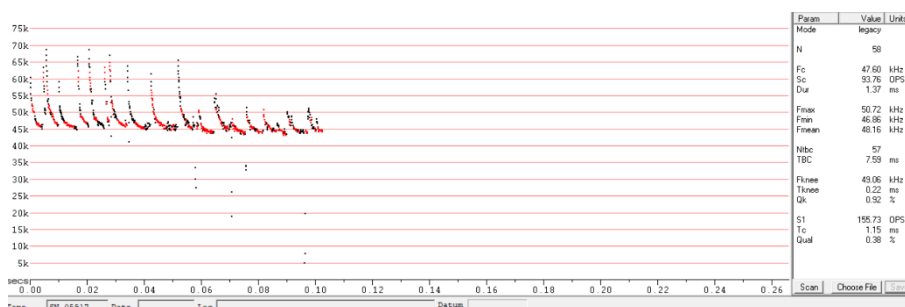


Figure 4-4: *Miniopterus orianae oceanensis* probable call

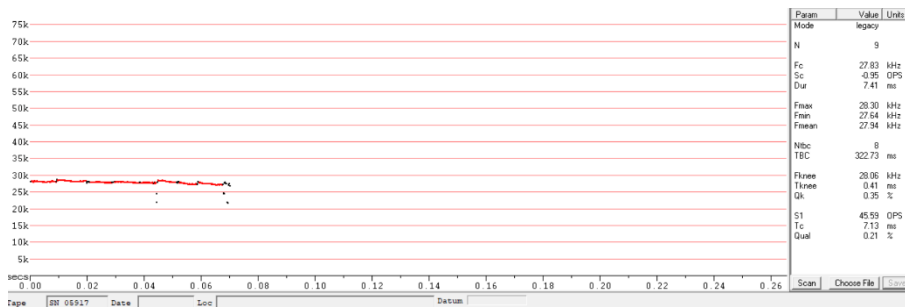


Figure 4-5: *Mormopterus planiceps* definite call

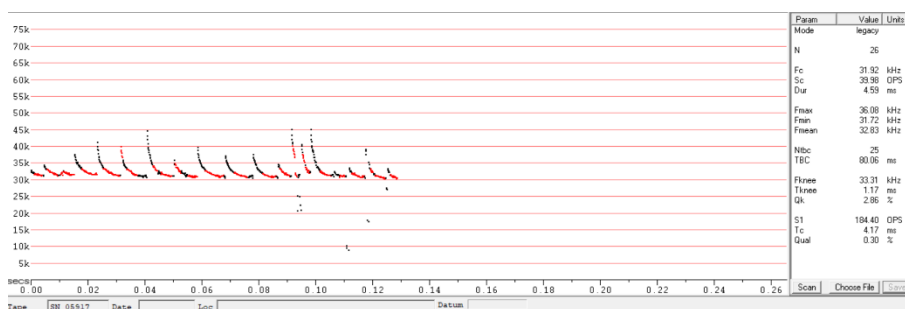


Figure 4-6: *Scotorepens balstoni* probable call

5.0 REFERENCES

Adams, M. D., Law, B.S., French, K.O. (2009). "Vegetation structure influences the vertical stratification of open- and edge-space aerial-foraging bats in harvested forests." *Forest Ecology and Management* 258(9): 2090-2100.

Adams, M. D., Law, B.S., French, K.O. (2010). Reliable automation of bat call identification for eastern New South Wales, Australia, using classification trees and AnaScheme software. *Acta Chiropterologica* 12(1): 231-245.

Australasian Bat Society Incorporated (undated) *Standards for reporting bat detector surveys*, http://batcall.csu.edu.au/abs/issues/ABS_Anabat_survey_standards.pdf

Churchill, S. (2008). *Australian Bats*. Second Edition Allen & Unwin; Crows Nest, NSW.

Law, B.S., Reinhold, L. and Pennay, M. (2002). Geographic variation in the echolocation calls of *Vespadelus* spp. (Vespertilionidae) from New South Wales and Queensland, Australia. *Acta Chiropterologica* 4: 201-215.

Pennay, M., Law, B. and Reinhold, L. (2004). *Bat calls of New South Wales: Region based guide to the echolocation calls of Microchiropteran bats*. NSW Department of Environment and Conservation, Hurstville.

Reardon, T., Armstrong, K., Jackson, S. (2015). *A current taxonomic list of Australian Chiroptera*, Australasian Bat Society, Inc. Version 2015-05-15.

Reinhold, L., Law, B., Ford, G. and Pennay, M. (2001a). *Key to the bat calls of south-east Queensland and north-east New South Wales*. Queensland Department of Natural Resources and Mines, State Forests of New South Wales, University of Southern Queensland, and New South Wales National Parks and Wildlife Service, Australia.

Reinhold, L., Herr, A., Lumsden, L., Reardon, T., Corben, C., Law, B., Prevet, P., Ford, G., Conole, L., Kutt, A., Milne, D. and Hoye, G. (2001b). Geographic variation in the echolocation calls of Gould's wattled bat *Chalinolobus gouldii*. *Australian Zoologist* 31: 618-624.

Van Dyck, S. and Strahan, R. (Eds.) (2008). *The Mammals of Australia: Third Edition*. New Holland; Sydney.

ATTACHMENT 4

STATE ENVIRONMENTAL PLANNING POLICY COMPLIANCE TABLE

State Environmental Planning Policy	Apply	Requirements	Comment
State Environmental Planning Policy No 1— Development Standards	YES	NO	Not applicable
State Environmental Planning Policy No 14— Coastal Wetlands	NO	NO	Not applicable
State Environmental Planning Policy No 15— Rural Landsharing Communities	YES	NO	Not applicable
State Environmental Planning Policy No 19— Bushland in Urban Areas	NO	NO	Not applicable
State Environmental Planning Policy No 21— Caravan Parks	YES	NO	Not applicable
State Environmental Planning Policy No 26— Littoral Rainforests	NO	NO	Not applicable
State Environmental Planning Policy No 29— Western Sydney Recreation Area	NO	NO	Not applicable
State Environmental Planning Policy No 30— Intensive Agriculture	NO	NO	Not applicable
State Environmental Planning Policy No 32— Urban Consolidation (Redevelopment of Urban Land)	NO	NO	Not applicable
State Environmental Planning Policy No 33— Hazardous and Offensive Development	NO	NO	Not applicable
State Environmental Planning Policy No 36— Manufactured Home Estates	NO	NO	Not applicable
State Environmental Planning Policy No 39—Spit Island Bird Habitat	NO	NO	Not applicable
State Environmental Planning Policy No 44— Koala Habitat Protection	YES	YES	The ecological assessment indicates that the vegetation on the property is not potential koala habitat. There this policy is not applicable to the proposal.
State Environmental Planning Policy No 47— Moore Park Showground	NO	NO	Not applicable
State Environmental Planning Policy No 50— Canal Estate Development	NO	NO	Not applicable
State Environmental Planning Policy No 52— Farm Dams and Other Works in Land and Water Management Plan Areas	NO	NO	Not applicable
State Environmental Planning Policy No 55— Remediation of Land	YES	YES	A contaminated land assessment is recommended post gateway determination prior to the making of the plan.
State Environmental Planning Policy No 59— Central Western Sydney Regional Open Space and Residential	NO	NO	Not applicable
State Environmental Planning Policy No 62— Sustainable Aquaculture	NO	NO	Not applicable
State Environmental Planning Policy No 64— Advertising and Signage	YES	NO	Not applicable
State Environmental Planning Policy No 65— Design Quality of Residential Flat Development	YES	NO	Not applicable
State Environmental Planning Policy No 70— Affordable Housing (Revised Schemes)	NO	NO	Not applicable
State Environmental Planning Policy No 71— Coastal Protection	NO	NO	Not applicable

State Environmental Planning Policy (Affordable Rental Housing) 2009	YES	NO	Not applicable
State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004	YES	NO	Not applicable
State Environmental Planning Policy (Exempt and Complying Development Codes) 2008	YES	NO	Not applicable
State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004	YES	NO	Not applicable
State Environmental Planning Policy (Infrastructure) 2007	YES	NO	Not applicable
State Environmental Planning Policy (Kosciuszko National Park—Alpine Resorts) 2007	NO	NO	Not applicable
State Environmental Planning Policy (Kurnell Peninsula) 1989	NO	NO	Not applicable
State Environmental Planning Policy (Major Development) 2005	NO	NO	Not applicable
State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007	YES	NO	No impact as the subject site is within 2km of an existing residential area as such it falls within the exclusion buffer area
State Environmental Planning Policy (Miscellaneous Consent Provisions) 2007	YES	NO	Not applicable
State Environmental Planning Policy (Penrith Lakes Scheme) 1989	NO	NO	Not applicable
State Environmental Planning Policy (Rural Lands) 2008	NO	NO	Not applicable
State Environmental Planning Policy (SEPP 53 Transitional Provisions) 2011	NO	NO	Not applicable
State Environmental Planning Policy (State and Regional Development) 2011	YES	NO	Not applicable
State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011	NO	NO	Not applicable
State Environmental Planning Policy (Sydney Region Growth Centres) 2006	NO	NO	Not applicable
State Environmental Planning Policy (Three Ports) 2013	NO	NO	Not applicable
State Environmental Planning Policy (Urban Renewal) 2010	NO	NO	Not applicable
State Environmental Planning Policy (Western Sydney Employment Area) 2009	NO	NO	Not applicable
State Environmental Planning Policy (Western Sydney Parklands) 2009	NO	NO	Not applicable

ATTACHMENT 5

S117 MINISTERIAL DIRECTIONS COMPLIANCE TABLE

	Applicable	Consistent	Comments
1.1 - Business and Industrial Zones	NO	-	
1.2 - Rural Zones	YES	NO	<p>This s117 direction refers to the need to protect the agricultural production value of rural land. Given the location and size of the subject site it is considered that the proposal is justifiably inconsistent.</p> <p>The subject site is less than 6ha in area and has not had any form of agricultural production value for the past several decades. The existing zoning does not reflect the use of the site. The current use of the property more closely represents a large lot residential zone than a rural production zone.</p> <p>As such it is considered that the proposal would be justifiably inconsistent due to lack of agricultural production capacity and its minor nature.</p>
1.3 - Mining, Petroleum Production and Extractive Industries	NO	-	
1.4 - Oyster Aquaculture	NO	-	
1.5 - Rural Lands	YES	NO	<p>This s117 direction refers to the need to protect the agricultural production value of rural land and facilitate the orderly and economic development of rural lands for rural and related purposes.</p> <p>Given the location and size of the subject site it is considered that the proposal is justifiably inconsistent due to lack of agricultural production capacity and its minor nature.</p>
2.1 - Environment Protection Zones	YES	YES	The site as a whole is classified <i>environmentally sensitive land</i> by Cessnock Council. The proposal has an ability to protect/offset any potential impacts. It is therefore considered that the proposal can be consistent with the s117 direction.
2.2 - Coastal Protection	NO	-	
2.3 - Heritage Conservation	NO	-	
2.4 - Recreation Vehicle Areas	NO	-	
3.1 - Residential Zones	YES	YES	Nil
3.2 - Caravan Parks and Manufactured Home Estates	NO	-	
3.3 - Home Occupations	YES	YES	Nil
3.4 - Integrating Land Use and Transport	YES	YES	Nil

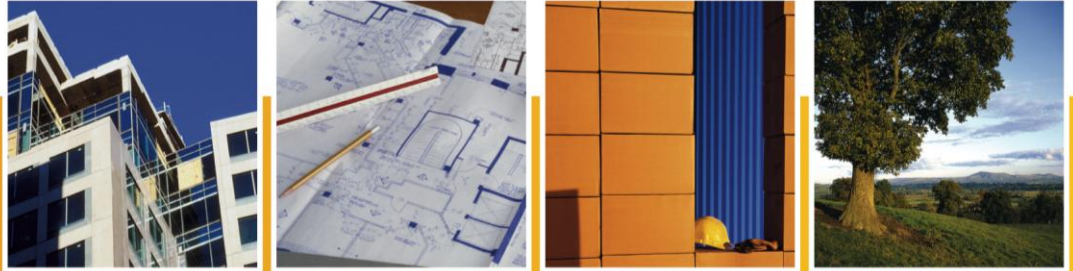
3.5 - Development Near Licensed Aerodromes	NO	-	
3.6 - Shooting Ranges	NO	-	
4.1 - Acid Sulfate Soils	NO	-	
4.2 - Mine Subsidence and Unstable Land	YES	NO	The subject site has not been identified as being located within a proclaimed Mine Subsidence District. However, the site has been identified as containing shallow mine workings. A full geotechnical investigation has been undertaken to determine areas of the site which would be at risk to future development. The assessment concludes that the site can be developed provided future investigations are undertaken as recommended in the report.
4.3 - Flood Prone Land	YES	NO	The subject site is subject to some flooding. The subdivision has been designed to mitigate this risk and as such is considered consistent.
4.4 - Planning for Bushfire Protection	YES	YES	Having regard to this direction the proposal put forward would have regard to <i>Planning for Bushfire Protection 2006</i> , introduce controls that avoid placing inappropriate developments in hazardous areas, and ensure that bushfire hazard reduction is not prohibited within the APZ. It is therefore considered that the proposal can be consistent with the s117 direction.
5.1 - Implementation of Regional Strategies	YES	YES	There is nothing in the proposal that is inconsistent with the directions for housing in the Hunter Regional Plan.
5.2 - Sydney Drinking Water Catchments	NO	-	
5.3 - Farmland of State and Regional Significance on the NSW Far North Coast	NO	-	
5.4 - Commercial and Retail Development along the Pacific Highway, North Coast	NO	-	
5.5 - Development in the vicinity of Ellalong, Paxton and Millfield (Cessnock LGA) (Revoked 18 June 2010)	N/A	-	
5.6 - Sydney to Canberra Corridor (Revoked 10 July 2008. See amended Direction 5.1)	N/A	-	
5.7 - Central Coast (Revoked 10 July 2008. See amended Direction 5.1)	N/A	-	

5.8 - Second Sydney Airport: Badgerys Creek	NO	-	
5.9 - North West Rail Link Corridor Strategy	NO	-	
6.1 - Approval and Referral Requirements	YES	YES	Nil
6.2 - Reserving Land for Public Purposes	YES	YES	Nil
6.3 - Site Specific Provisions	YES	YES	Nil
7.1 - Implementation of the Metropolitan Plan for Sydney 2036	NO	-	

ATTACHMENT 6

PRELIMINARY STORMWATER MANAGEMENT PLAN

STORMWATER MANAGEMENT PLAN



For
PROPOSED REZONING AND SUBDIVISION

At
LOT 1 DP873220
71 BRANXTON STREET, GRETA

Prepared for
KARL WAEGER

November 2017
Report No: 17/015/2 Rev2

Prepared by



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CONTENTS

1.0	Introduction	4
1.1	Purpose of this plan	4
1.2	Guiding documents	5
2.0	Existing surface water environment	6
3.0	Proposed subdivision	7
4.0	Surface water modelling assumptions and methodology	8
4.1	Water quantity - DRAINS	8
4.2	Water quality - MUSIC	10
5.0	Modelling results	11
5.1	Water quantity- DRAINS	11
5.2	Water quality - MUSIC	12
6.0	The proposed design	13
6.1	Proposed water management summary.....	14
7.0	Conclusions and recommendations	15

APPENDICES

Appendix A – Intensity-Frequency-Duration (IFD) Data

Appendix B – Storage-Elevation Relationships

Appendix C – Basin Inflow/Outflow Hydrographs

FIGURES

Figure 1 – Existing Catchments

Figure 2 – Developed Catchments

Figure 3 – Basin Details

TABLES

Table 1: Hydrological modelling parameters	8
Table 2: Load based targets.....	10
Table 3: Bio - retention basin	10
Table 4: Results of the post-development modelling with / without mitigation.....	11
Table 5: Basin properties	11
Table 6: Water quality pollutant reduction	12

1.0 INTRODUCTION

HDB Town Planning & Design have been engaged by Karl Waeger to prepare a Stormwater Management Plan (SMP) for the proposed subdivision and associated rezoning of Lot 1 DP 873220 located at 71 Branxton Street, Greta. The subdivision site is located less than 1km north of Greta's commercial centre. The site is approximately 5.8ha in area and is currently zoned RU2 - Rural Landscape. The rezoning is for the purpose of residential development.

1.1 PURPOSE OF THIS PLAN

The purpose of this document is to demonstrate that rezoning and subsequent subdivision of the site can effectively satisfy all applicable legislative requirements and best practice guidelines with regard to flood impact and stormwater management. Design has been undertaken with regard to flood impact and stormwater management, including appropriate control measures, in which the proposal will meet regulatory requirements. Where we require significantly greater data and detailed analysis in order to identify controls, the expected information has been broadly summarised for analysis within consequent stages of the application process, should that option be further pursued.

The site been designed in such a manner as to ensure:

- All proposed new lots have adequate flood free building envelopes for up to, and including, the 100yr ARI flood event (as identified by Peter Sullivan and Associates 1995 report) from the existing watercourse;
- Attenuation of peak stormwater runoff from the post-development catchment to be comparable to the pre-development (existing) catchment runoff for the 10yr and 100yr ARI design event; and
- Potential water quality issues are considered and recommended treatment measures to reduce urban water pollutants resulting from the increased hardstand areas.

It is intended that this document will provide guidance to both the developer and contractors as to their obligations to ensure that potential impacts regarding stormwater issues are minimised.

The design strategy is conceptual in nature and does not include detailed design or detailed stormwater modelling, however, for the purpose of recognising overall implications and management, the strategy provides broad quantities and recommendations.

1.2 GUIDING DOCUMENTS

The design strategy has been undertaken using recent best practice guidelines and documentation. The following documents have provided key inputs into this SMP:

- *National Water Quality Management Strategy* (ANZECC, 2000);
- *Australian Runoff Quality* (Engineers Australia, 2006);
- *Australian Rainfall and Runoff: A guide to flood estimation* (Engineers Australia, 2001);
- *NSW Floodplain Development Manual* (DIPNR, 2005);
- *Landcom's Water Sensitive Urban Design Guidelines*;
- *WSUD Technical Design Guidelines for South East Queensland* (Healthy Waterways, 2006); and
- *The City of Cessnock's Engineering Requirements for Development (1995)*.
- *Lake Macquarie City Council (LMCC) MUSIC Line Guideline*

While some details in the above documentation vary somewhat, the broad objectives of all of these documents have been used to guide this SMP. The strategy has prioritised the locally focussed documentation above national and regional.

2.0 EXISTING SURFACE WATER ENVIRONMENT

The site is bounded to the south-east, south-west and north-west by West Street, Branxton Street, and Hollingshed Street, respectively. West Street is currently unformed. North-east of the development is rural land zoned RU2. An unnamed 2nd Order (Strahler ordering) watercourse bisects the north-eastern corner of the land parcel, meanders south onto adjacent land, where a separate 1st Order tributary is collected, prior to bisecting the most southern corner of the land parcel and conveying flow under Branxton Street, eventually discharging in Anvil Creek. The watercourse also drains through an on-line farm dam in the north-eastern corner of the property.

The area has previously been the subject of flooding investigations in association with the Greta Drainage Study undertaken by Peter Sullivan and Associates (1995). Cessnock City Council have advised the 100yr ARI flood level resulting from these investigations varies from 51.2m AHD in the north-east corner and 47.1m AHD in the southern corner of the property. Council has identified these flood levels, in addition to the standard 500mm freeboard, as appropriate for flood planning restrictions relating to the site.

The site falls to the east draining to the watercourse with typical grades of between 4% and 8%. Detailed survey information has not been obtained for the purpose of this planning proposal, rather interpolation of LPI topographical mapping analysed in conjunction with known flood levels at the site and assumed bed levels. The typical bed grade in the creek was adopted and an assumed depth from bed to the 100yr flood level adopted at 1.2m in the downstream (south-western) boundary and 0.7m depth at the upstream (north-eastern) boundary. The LPI data indicated higher RL levels than what was in the Peter Sullivan and Associates 1995 report. As a result, the 100 yr ARI flood extents have been transferred to the plan; however the LPI RL height data has been used in the design.

Limited site specific geotechnical information has been made available for the purpose of this report, however, regional mapping information has been considered. Soil mapping information obtained from eSPADE (NSW Environment and Heritage) indicated topsoils of sandy loam to loams, and subsoils of light to medium clays, typically occur in the area. For the purpose of surfacewater infiltration characteristics, soils have been assumed to have slow infiltration rates and layer, which may impede the downward movement of water.

At present the site contains a residential dwelling, associated sheds and ancillary structures, along with an access drive.

Figure 1 demonstrates the existing land parcel.

3.0 PROPOSED SUBDIVISION

The planning proposal includes consists of 44 lots accessed by a circuit road, cul-de-sac and directly off West Street. Intersections with Hollingshed Street and West Street will be introduced. Of the 44 proposed lots, 3 lots are located on land affected by the 100yr ARI design flood (as identified by Peter Sullivan and Associates); however minor controlled filling in this area will lift these lots out of the flood zone. Vehicle access / egress would be maintained in the 100 yr ARI event.

The cumulative impact of development in the floodplain and potential increase in flood levels and velocities will require consideration; however these impacts are considered to be negligible for this study. Additional survey information would be necessary in order to carry out this analysis and the effect of the construction of West Street on the flood extents.

This proposal is shown in *Figure 2*.

4.0 SURFACE WATER MODELLING

ASSUMPTIONS AND METHODOLOGY

4.1 WATER QUANTITY - DRAINS

Investigation of the existing surfacewater flow across the proposed development site has occurred through the creation of a hydrological model using DRAINS modelling software. DRAINS is an event-base hydrologic and hydraulic software package which adopts ILSAX hydrological routing to derive catchment flow hydrographs. On-site detention requirements were estimated based upon the 10yr and 100yr ARI design events.

The pre-development and post-development hydrological parameters used within the DRAINS modelling are detailed in *Table 1*.

Hydrological DRAINS modelling parameter	Parameter description and value used
Antecedent Moisture Condition (Ranges 1-4 Dry to Saturated)	Rather Wet - 3
Soil type (Ranges 1-4, sand and gravels to clays with permanent high water table)	Between soil types with slow infiltration rates (may have layers that impeded downward movement of water) and soil types with high runoff potential and very slow infiltration rates – 3.5
Paved Depression Storage (mm)	1
Grassed Depression Storage (mm)	5
Manning's Pervious Overland Roughness *n	0.15
Manning's Impervious Overland Roughness *n	0.014

Table 1: Hydrological modelling parameters

Rainfall Intensity-Frequency-Duration (IFD) information was obtained using the Bureau of Meteorology's IFD program for co-ordinates identified at the site. The design rainfall hyetographs have then been identified by the software package using the temporal pattern appropriate to the area and in accordance with Book 2 of AR&R 1987. The IFD data used for the purpose of the surfacewater modelling is demonstrated in *Appendix A*.

The primary purpose of this report is to identify stormwater mitigation measures to ensure the development does not increase peak flow rates or impact upon existing surfacewater flow regimes. Therefore, the catchment area modelled has been limited to the site area that will be impacted by the proposed development. Diversion drains were assumed on the development boundaries, and runoff from Hollingshed Street was assumed to be conveyed by road side swales to the water

course below the site. Flow from the site currently discharges as sheet flow to the watercourse.

The existing site was modelled in two catchments draining to the existing watercourse and negating flow external to the site. The existing site was conservatively assumed to be completely pervious.

The proposed subdivision assumed each new lot would include 500m² of hardstand impervious area and a 6m road pavement within the proposed road reserve areas. Piped street drainage and inter-allotment drainage was assumed. Direct discharge from lots into the creek was stopped by introducing inter-allotment drainage in Catchment B, in order to address water quality. Instead all site water would be directed to the offline basin. Road grades and lot slopes were assumed to remain consistent with natural grades. The existing catchment and developed catchments are demonstrated in *Figure 1*, *Figure 2*.

The modelled basin as shown in *Figure 3*, used 1 (vertical) to 6 (horizontal) basin side slopes. Peak flow attenuation was dependent on a storage-elevation (or in a similar fashion, height-discharge) relationship which is demonstrated in *Appendix B* and the inflow / outflow hydrographs in *Appendix C*.

4.2 WATER QUALITY - MUSIC

Investigation of the effect of the development on water quality and the required level of mitigation was analysed in MUSIC modelling software. In the absence of water quality guidelines for Cessnock City Council, load based targets sourced from Lake Macquarie City Council (LMCC) MUSIC Guidelines have been used. These are shown below in *Table 2*.

Pollutant	Minimum Load Reduction Target (%)
Total Suspended Solids (TSS)	80
Total Phosphorus (TP)	45
Total Nitrogen (TN)	45
Gross Pollutants (GP)	70

Table 2: Load based targets

It was decided that the development would use an offline bio-retention basin integrated into the detention basin in order to improve water quality. The bio-retention basin has the properties shown in *Table 3*.

Bio-retention Basin	Value
Filtration Area	450m ²
Extended Detention Depth	300mm
Depth of filter material	400mm

Table 3: Bio - retention basin

5.0 MODELLING RESULTS

5.1 WATER QUANTITY- DRAINS

Hydrological modelling for the 10yr and 100yr ARI design event was conducted.

Table 4 demonstrates the resulting peak discharge rates with/without mitigation and the existing site at the downstream subdivision boundary.

Subdivision Option	10yr ARI Peak Catchment Discharge (m ³ /s)	100yr ARI Peak Catchment Discharge (m ³ /s)
Existing Site	0.59	1.15
Developed Site- No Mitigation	1.10	1.72
Developed Site- w/ Mitigation	0.50	1.19

Table 4: Results of the post-development modelling with / without mitigation

Using the previously discussed storage and discharge assumptions (refer to **Section 4**), the required basin storages to attenuate peak flow to be comparable for the 10yr and 100yr ARI design events, have been calculated. **Table 5** demonstrates the results of such, as well as the maximum water level, peak discharge, and elevation associated with each area. A low flow pipe of 450mm diameter was placed with its invert at RL49.8m (300mm above the basin base). A 5m weir with crest at RL50.5m was also modelled.

Subdivision Option	Basin Elevation (m AHD)	Basin Area (m ²)	Maximum Water Level	Peak Outflow (m ³ /s)
Developed Site- w/ Mitigation (450mm low flow pipe, 5m weir)	49.5	450	50.7	1.19
	51.2	1800		

Table 5: Basin properties

5.2 WATER QUALITY - MUSIC

In order to achieve the water quality targets, all developed lots were designed to discharge into the offline basin in order to limit direct discharge into the creek.

The results are shown below in *Table 6*.

Pollutant	Load Based Reduction Target (%)	Modelled Reduction (%)
Total Suspended Solids (TSS)	80	89.5
Total Phosphorus (TP)	45	46.3
Total Nitrogen (TN)	45	58.6
Gross Pollutants (GP)	70	100

Table 6: Water quality pollutant reduction

6.0 THE PROPOSED DESIGN

The proposed option has the following features:

- Low density residential development with minimal intrusion into the 100yr ARI design event for the watercourse (as identified by Peter Sullivan and Associates);
- Probable safe vehicular access to all lots (this however should be confirmed within further stages from site survey);
- Flood free lots up to the 100yr ARI design event from the watercourse, with minor filling in the flood zone;
- On-site detention to ensure the subdivision does not increase peak flow for the 10yr and 100yr design storm event;
- Design of the road drainage to ensure piped conveyance of the 5yr ARI is required at later stages in the development application process, in accordance with the City of Cessnock's *Engineering Requirements for Development*; and
- Minimal disturbance of the natural watercourse.

In order to attenuate post-development peak flow to be comparable to that of the pre-development site (running a multi-storm analysis); the detention basin design was found to require the following elements:

- A base area of 450m² at RL 49.5m AHD and a total footprint of 1,800m² (using 1 vertical to 6 horizontal embankment side slopes). This allowed for 500mm of freeboard and a maximum ponding depth of 1.2m in the 100 yr ARI design event;
- A low flow outlet pipe of 450mm diameter with invert at RL49.8m (300mm above the basin base); and
- A designed overflow weir modelled using a 5m base width set to an elevation of RL 50.5m AHD, to allow for safe discharge of flows up to the 100yr ARI design storm.

Scour protection and detailed outlet design will be required during the later stages of the development application process.

The primary aim of this Stormwater Management Plan is to ensure that stormwater can be effectively managed with the implementation of detention facilities and overland flow paths. In conjunction with the buffer zone to the creek, the detention basin will also provide water quality treatment in the form of a bio-retention basin. This bio-retention basin has the following elements:

- A filtration area of 450m²;
- An extended detention depth of 300mm (to the low flow pipe); and

- A filter material depth of 400mm.

The proposed low density residential subdivision utilises buffer zones which will assist in nutrient and pollutant removal. BASIX requirements for rainwater tanks will also provide additional treatment benefits.

In summary of the water quality treatment; pollutant and nutrient removal can effectively be provided for using:

- Rainwater tanks as per BASIX requirements for each lot;
- Buffer zones from impervious areas; and
- Discharge to an offline bio-retention basin.

6.1 PROPOSED WATER MANAGEMENT SUMMARY

The proposed water management system has been designed in such a manner that:

- Post-development flow rates are comparable to pre-development flows for up to and including the 100yr ARI design event at the downstream boundary of the site;
- Allocation of flood free new lots for up to and including the 100yr ARI flood event from the unnamed 2nd Order watercourse;
- Minimalistic development and minimal potential impact on natural flow regimes; and
- The provision of water quality treatment measures through the use of rainwater tanks, buffers, and a bio-retention basin.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The planning proposal has broadly identified the storage requirements in order to attenuate post-development peak flow to be comparable to pre-development flow. Allocation of basin location has been undertaken.

In the event that this proposal is pursued, consideration should be given to further investigation prior to issue of a subdivision certificate. It is recommended that the following further data be provided as a condition of consent, at the subdivision certificate stage:

- Site survey information that will demonstrate levels and flood depths detailed at critical locations; and
- Assurance that safe vehicular access can be provided without significant impacts upon flow regimes, for up to the 100yr ARI design event.

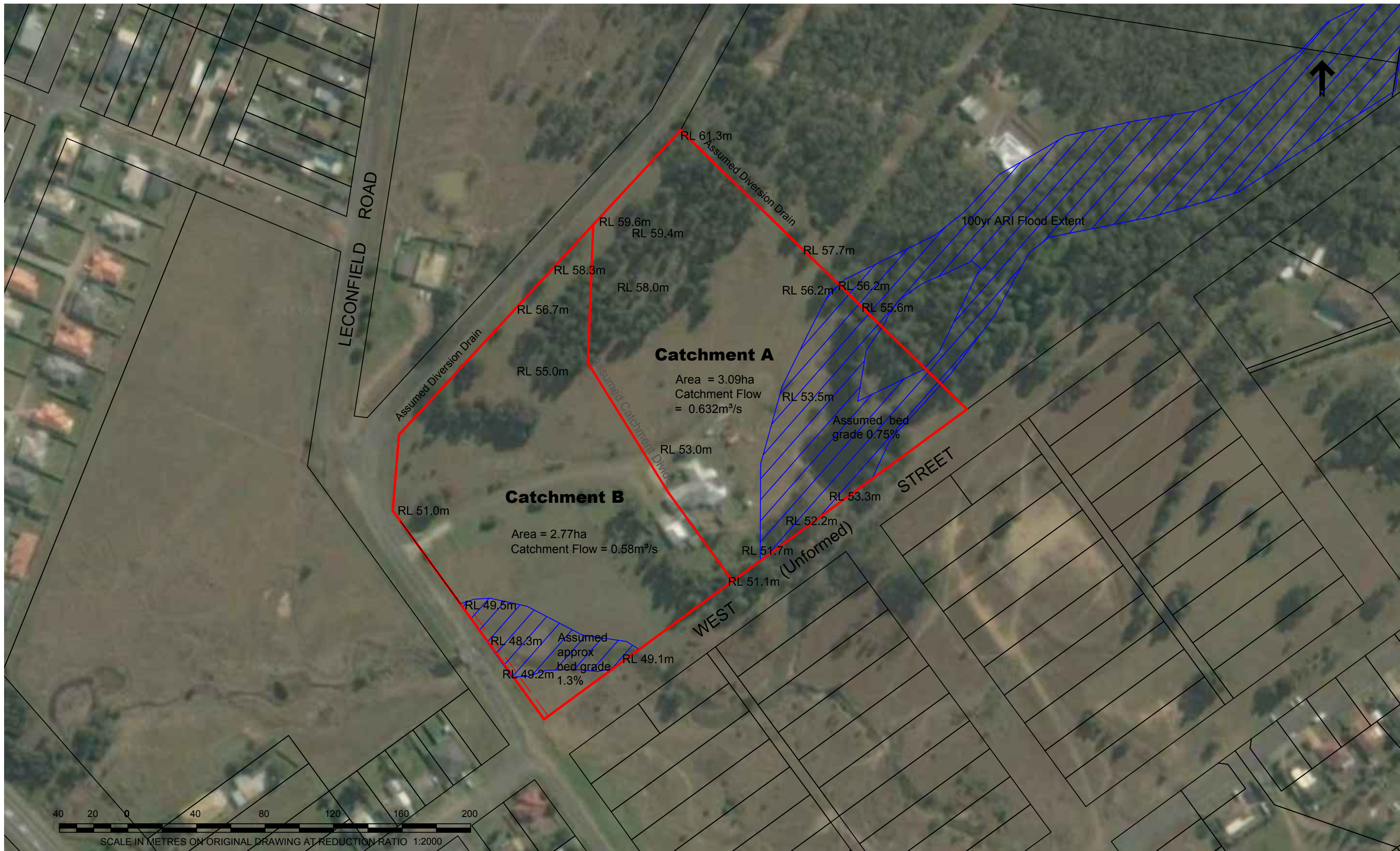
The detailed design would include the following elements:

- Design for conveyance of flow from the roadway for the 5yr ARI design event;
- Attenuation of post-development peak flow comparable to that of the pre-development peak flow for up to the 100yr design event; and
- Water quality treatment through a variety of measures using the treatment train approach.

While the design is conceptual in nature, it is adequate to satisfy the objectives of Council's requirements.

Figure 1

Existing Catchments



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Existing Catchments

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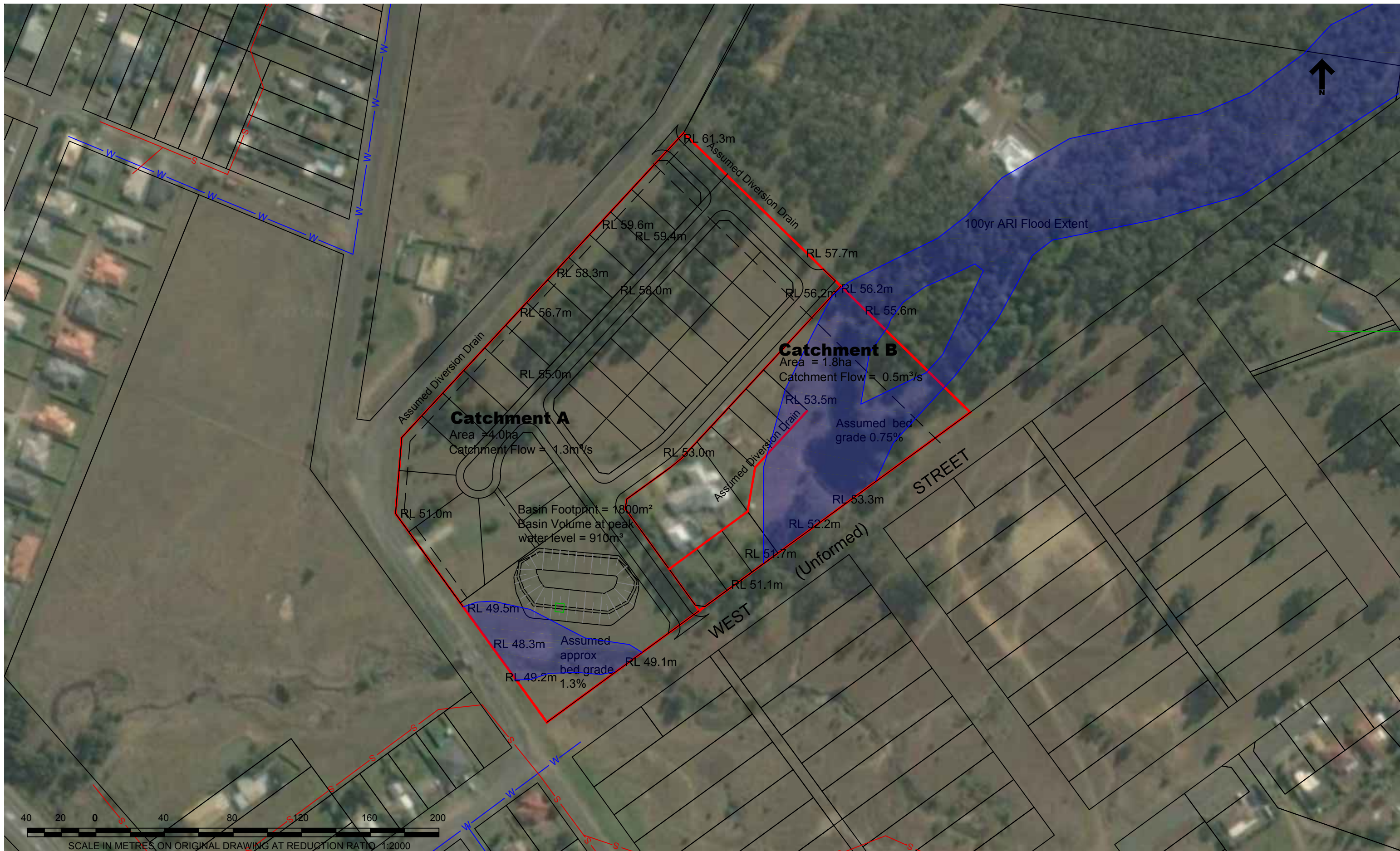
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Figure 2

Developed Catchments



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PROPOSED DEVELOPED CATCHMENTS

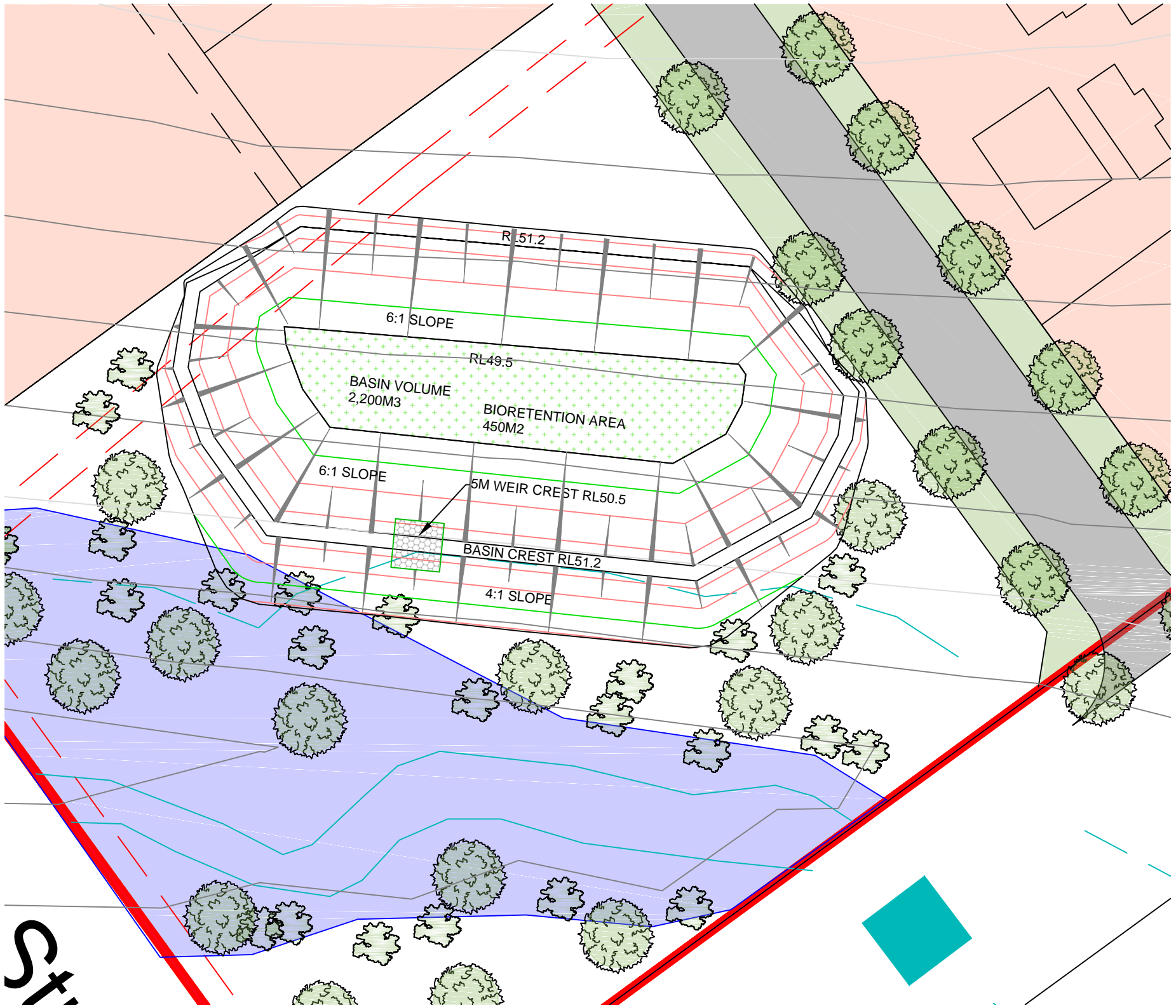
Lot 1 DP 873228
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Figure 3

Basin Details



St

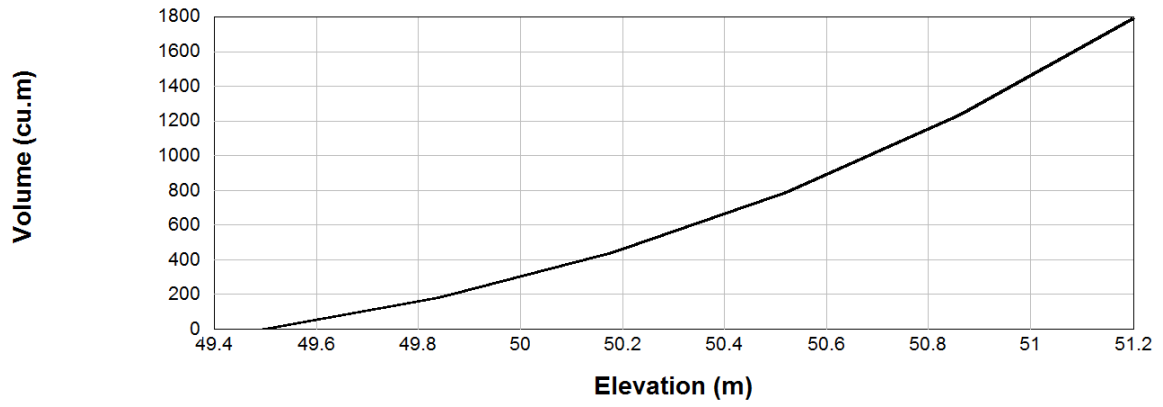
Appendix A

Intensity-Frequency-Duration (IFD) Data

Longitude	151.3904			Latitude	-32.6734		
Intensity-Frequency-Duration Table							
DURATION	1 Year	2 years	5 years	10 years	20 years	50 years	100 years
5 Mins	70.4	91.2	119	135	157	187	209
6 Mins	65.9	85.3	111	127	147	174	196
10 Mins	53.7	69.5	90.2	103	119	141	158
20 Mins	39.1	50.4	64.9	73.4	84.8	99.9	112
30 Mins	31.8	40.9	52.3	59.1	68.1	80	89.2
1 Hr	21.3	27.5	35.1	39.5	45.5	53.4	59.5
2 Hrs	13.7	17.7	22.7	25.7	29.6	34.9	38.9
3 Hrs	10.4	13.5	17.4	19.8	22.9	27.1	30.3
6 Hrs	6.52	8.47	11.1	12.7	14.8	17.6	19.7
12 Hrs	4.16	5.41	7.15	8.21	9.6	11.5	12.9
24 Hrs	2.73	3.56	4.69	5.38	6.3	7.51	8.46
48 Hrs	1.8	2.34	3.06	3.49	4.06	4.82	5.42
72 Hrs	1.36	1.76	2.3	2.62	3.05	3.62	4.06

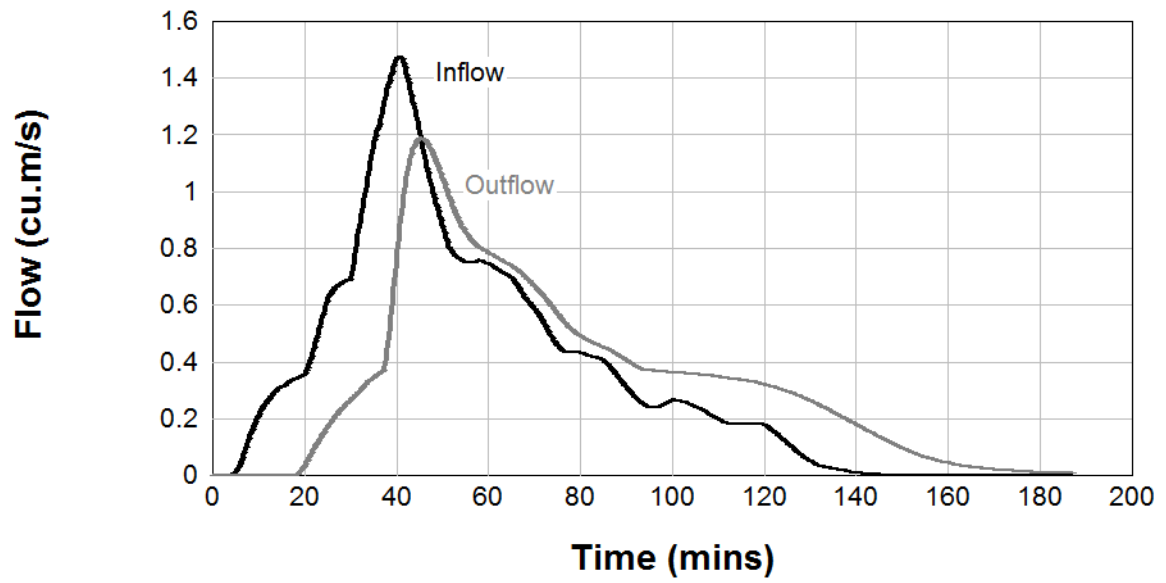
Appendix B

Storage-Elevation Relationships



Appendix C

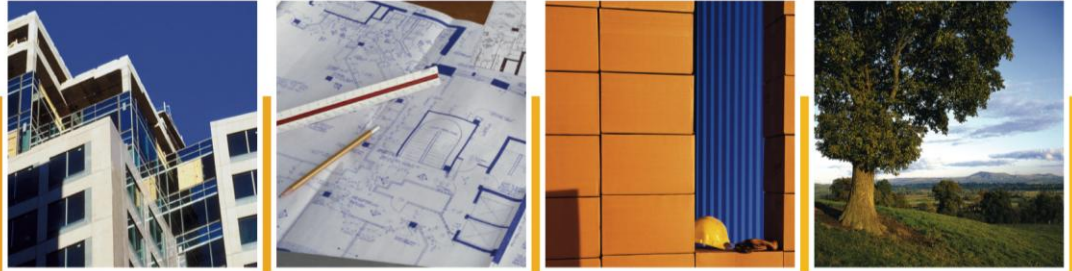
Basin Inflow / Outflow Hydrographs



ATTACHMENT 7

PRELIMINARY BUSHFIRE THREAT ASSESSMENT

BUSHFIRE THREAT ASSESSMENT



For

PROPOSED REZONING AND SUBDIVISION

At

LOT 1 DP873220
71 BRANXTON STREET, GRETA

Prepared for

KARL WAEGER

November 2017

Report No: 17/015/3

Prepared by



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Document History and Status

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Final	1	Council	1	17.11.17	LS	KN
Final	1	Client	1	17.11.17	LS	KN



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Printed: 20.11.17

File Reference: J:\2017\17015 - Karl Waeger - Planning Proposal, Branxton St, Greta\Publications - Deliverables\Working

Applicant: Karl Waeger

HDB Project Manager: Leena Sebastian

HDB Reference Number: 17/015

Project Manager

Date 17th November 2017

This document is for discussion purposes only, unless signed and dated by the person identified

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CONTENTS

1.0	Introduction	5
2.0	Site details	6
2.1	Site description and surrounding uses	6
2.2	Topography.....	7
2.3	Site constraints	8
2.3.1	Environmentally sensitive land.....	8
2.3.2	Flooding.....	9
2.3.3	Bushfire	9
2.3.4	Heritage.....	10
3.0	Proposed development.....	11
4.0	Bushfire threat assessment.....	12
4.1	Vegetation and slope assessment	12
4.2	Determination of the APZ.....	15
5.0	Bushfire management measures	16
5.1	APZ	16
5.2	Access.....	16
5.3	Services.....	16
5.4	Landscaping and maintenance	16
5.5	Construction requirements	17
5.6	Special considerations	17
	Ecological constraints: flora and fauna.....	17
	Flooding.....	17
5.7	Assessment of environmental impact.....	17
6.0	Conclusion and recommendations	18

APPENDICES

Appendix A – Concept Subdivision Plan

FIGURES

Figure 1: Location map	6
Figure 2: Existing access to the property.....	7
Figure 3: Site vegetation	8
Figure 4: Environmentally sensitive land map	8
Figure 5: Flood map.....	9
Figure 6: Bushfire prone land map	9
Figure 7: Vegetation within 140m of the subject site	13
Figure 8: Vegetation between the neighbouring dwellings within the 140m buffer	14
Figure 9: Vegetation adjoining the north-east part of the site.....	14

TABLES

Table 1: Summary of vegetation analysis within 140m of the site.....	15
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1.0 INTRODUCTION

HDB Town Planning & Design (HDB) has been engaged by Mr Karl Waeger to undertake a Bushfire Threat Assessment to support a Planning Proposal for the property at Lot 1 DP 873228, 71 Branxton Street, Greta.

The site is currently zoned RU2 - Rural Landscape under Cessnock LEP 2011. The Cessnock Citywide Settlement Strategy 2010 identifies Greta and neighbouring settlements as being subject to significant change over the next 25 years due to their strategic location at the fringe of residential areas, alongside main infrastructure corridors providing easy access to full reticulated systems. The Strategy recommends an upgrade in the village status of Greta to 'Low Density Residential'. The site also meets the criteria for housing development in the recently adopted Branxton Subregion Land Use Strategy. Consequently a rezoning to R2 - Low Density Residential Zone is required to facilitate rezoning and development.

The property is identified as being bushfire prone in Council's Bushfire mapping; any future residential development on the site will therefore be subject to consideration under Section 100B of the Rural Fires Act and *Planning for Bush Fire Protection 2006*.

This Bushfire Threat Assessment identifies the bushfire hazards associated with the site and examines the ability of the future subdivision to accommodate bushfire protection measures in accordance with *Planning for Bushfire Protection 2006* (henceforth referred to as PBP 2006).

The following legislative requirements and guidelines have been the basis of this Bushfire Threat Assessment:

- Section 100B of the Rural Fires Act;
- Planning for Bushfire Protection 2006 (PBP 2006); and
- AS 3959 – 2009 Construction of buildings in bushfire prone areas.

2.0 SITE DETAILS

Address:	71 Branxton Street
Local Government:	Cessnock City Council
Locality:	Greta
Area:	5.84ha
Zone:	RU2 - Rural Landscape

Figure 1 is the aerial photo of the site’s location.

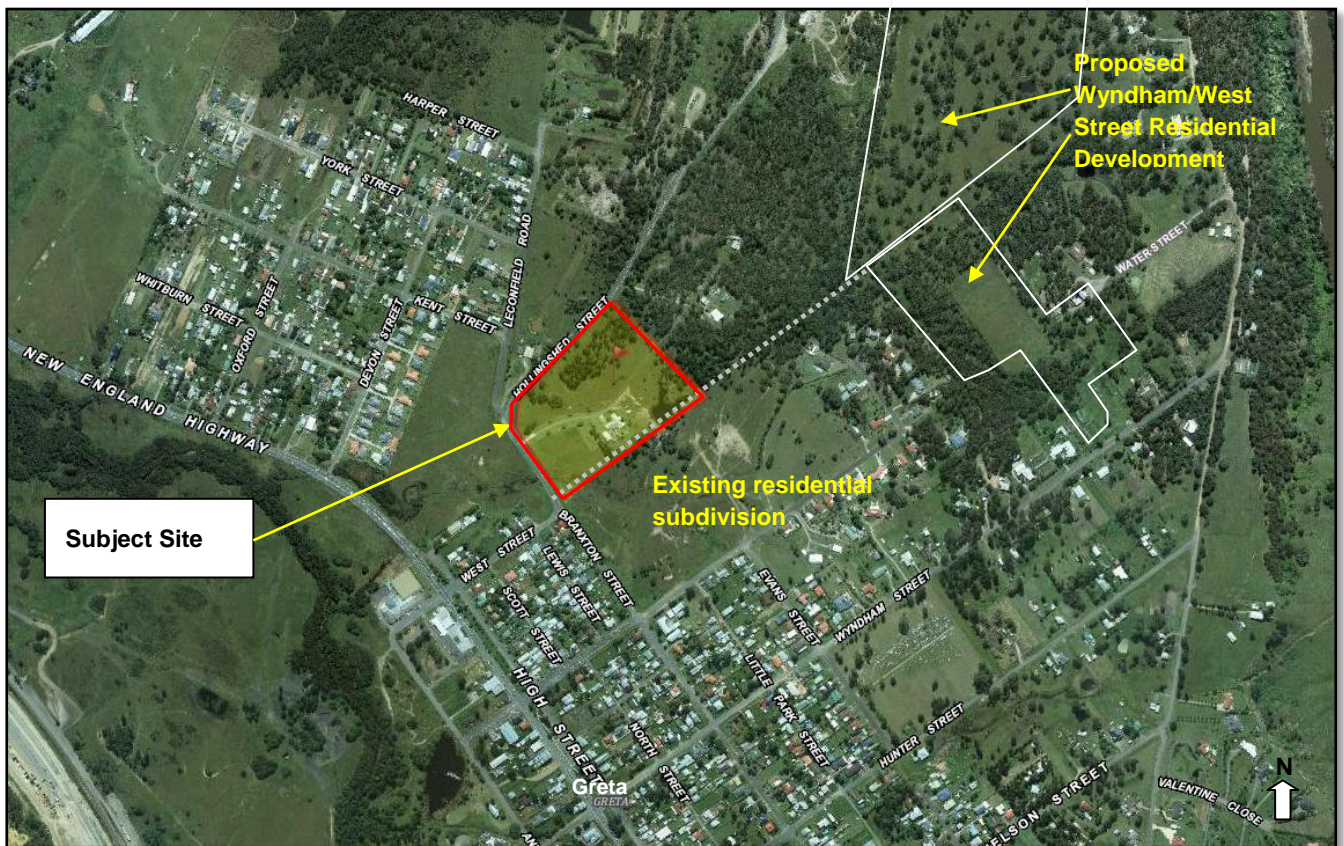


Figure 1: Location map
 Source - Six Maps, Accessed August 2014

2.1 SITE DESCRIPTION AND SURROUNDING USES

The site is located approximately 550m to the north of Greta Town Centre at the intersection of Branxton Street and Hollingshed Street. The current site improvements include a dwelling with a detached carport, and ancillary sheds which are accessed through a driveway off Branxton Street (refer to *Figure 2*).

The site is situated on the fringe of the rural landscape zone and is largely surrounded by established residential developments to the east, west and south. The proposed Wyndham Ridge Estate development and the associated extension of West Street

(along the eastern boundary of the site) will provide a third access option for the subject property (refer to **Figure 1**). The surrounding residential developments are characterised by single dwelling units on 800m² to 1,000m² lots.

Easement for electricity transmission lines and water supply ranging from 3m to 15m in width exist on the site.

The following services were identified in Branxton Street and / or Hollingshed Street:

- Telecommunications - Telstra NSW, Central
- Electricity - Ausgrid (formally Energy Australia)

Gas services and water / sewer services are located within the Greta area and have the potential to be extended to the site.



Figure 2: Existing access to the property

Source - HDB Town Planning & Design

2.2 TOPOGRAPHY

A dam and a 2nd order drainage line are located in the north-east corner of the site, which drains in a westerly direction into Anvil Creek. The topography of the site is gently undulating towards the drainage line at slopes less than 5°.

The site vegetation largely consists of pine trees and a small cluster (approximately 500m²) of potential Ecologically Endangered Communities (EECs) as shown in **Figure 3**.

The “Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project” identifies vegetation types located within the area to include; Red Ironbark / paperbark shrubby open forest; and Parramatta Red Gum / *Melaleuca Nodosa*

shrubby woodland in the Cessnock / Kurri Kurri area. These areas are considered *Endangered Ecological Communities* within the Kurri Sand Swamp Woodland in the Sydney Basin Bioregion. This will need to be confirmed by a Flora and Fauna Assessment as part of the preparation of the Development Application (DA).

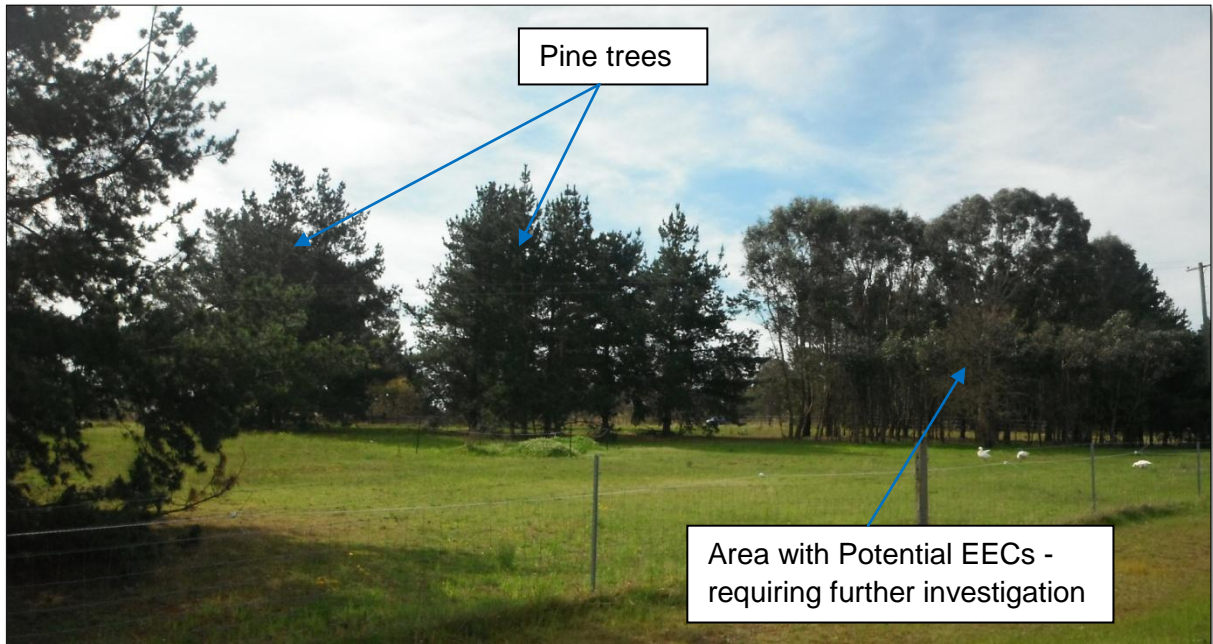


Figure 3: Site vegetation
 Source - HDB Town Planning & Design

2.3 SITE CONSTRAINTS

2.3.1 ENVIRONMENTALLY SENSITIVE LAND

The subject site and surrounding areas have been identified as environmentally sensitive lands in Council's mapping, as shown in *Figure 4*.



Figure 4: Environmentally sensitive land map
 Source: Cessnock City Council

2.3.2 FLOODING

Council's flood mapping indicates that the north-east and south-east sections of the site are affected by the 1 in 100 year Average Recurrence Interval (ARI) flood event.



Figure 5: Flood map
Source: Cessnock City Council

2.3.3 BUSHFIRE

The Council's bushfire mapping identifies areas of category 1 bushfire vegetation and bushfire buffer areas on the site as shown in **Figure 6**.

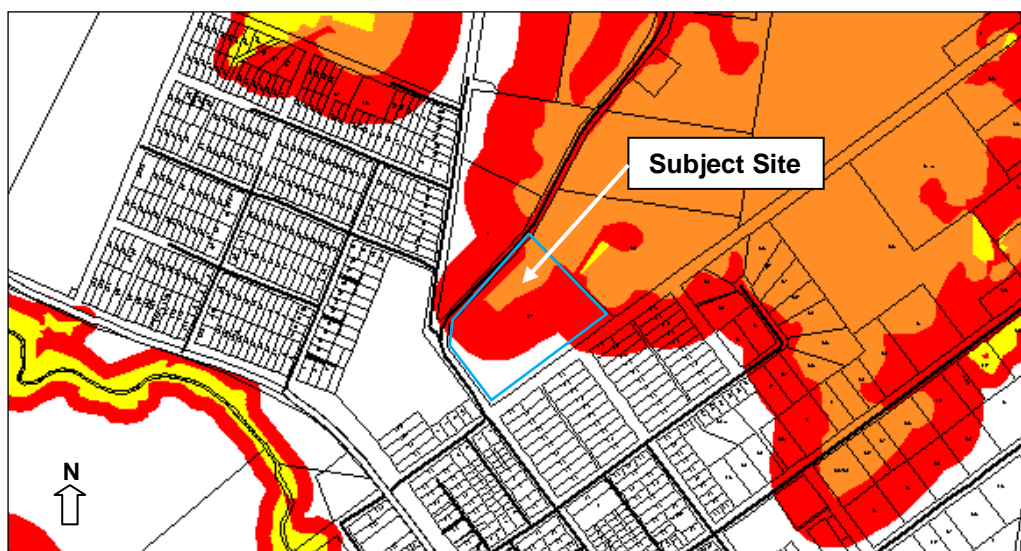


Figure 6: Bushfire prone land map
Source: Cessnock City Council

2.3.4 HERITAGE

The site does not contain, nor is it located in the vicinity of, any items of heritage significance. A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that there are no aboriginal sites, or places, recorded on the subject property.

3.0 PROPOSED DEVELOPMENT

The proposed rezoning from RU2 - Rural Landscape Zone to R2 - Low Density Residential Development aims to facilitate future residential subdivision on the property.

The proposal will require some vegetation removal on the development site. A Flora and Fauna Assessment undertaken for the site has concluded that the clearing is insignificant to have any adverse impacts.

The subdivision proposes a range of lot sizes between 520m² and 2,722m². The internal road system will connect to Hollingshed Street along the western boundary and West Street extension along the south-east, which is currently underway.

A copy of the concept plan is attached as *Appendix A*.

4.0 BUSHFIRE THREAT ASSESSMENT

The methodology outlined in Appendix 3 of PBP 2006 forms the basis of this Bushfire Threat Assessment, which involves the following steps:

- Step 1 – Identify all vegetation assemblages within 140m of the site;
- Step 2 – Determine the effective slope under the vegetation;
- Step 3 – Determine the Fire Danger Index (FDI) for the area;
- Step 4 – Match the relevant FDI, appropriate vegetation, distance, and effective slope classes to determine the level of bushfire attack.

4.1 VEGETATION AND SLOPE ASSESSMENT

A site inspection was carried out to identify the type and extent of vegetation. Aerial photographs of the site were also used to determine the coverage. The results of the vegetation analysis are presented in *Figure 7*.

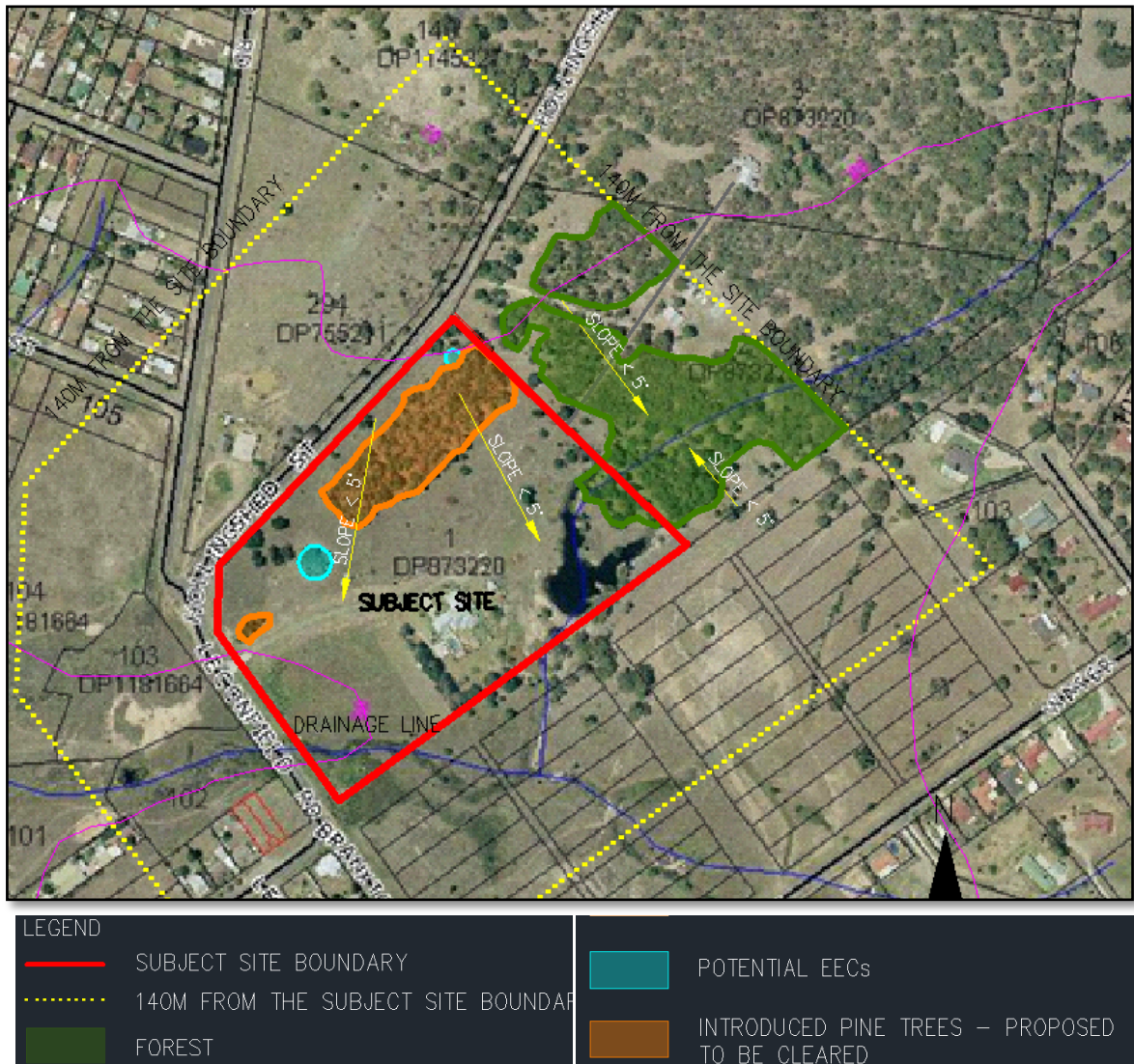


Figure 7: Vegetation within 140m of the subject site
 Source - HDB Town Planning & Design



Figure 8: Vegetation between the neighbouring dwellings within the 140m buffer
Source - HDB Town Planning & Design



Figure 9: Vegetation adjoining the north-east part of the site
Source - HDB Town Planning & Design

The assessment has excluded the existing pine trees on the site, as the proposed residential development will require their removal with Council's consent.

Owing to its small size (less than 1hectare), and the distance from the bushfire prone vegetation (more than 100m), the area with potential EECs is not considered a bushfire threat; nevertheless it is noted that they will be removed for development purpose.

A mix of vegetation assemblages were identified in the 140m buffer along the sites north-east boundary. Areas of cleared and managed landscape were observed within the curtilage of the neighbouring dwellings and their access ways. In unmanaged areas, away from the dwellings and closer to the drainage line; open forests formed the main vegetation assemblage.

The slope under the vegetation (for a distance of 100m) was determined from electronic contour maps (10m contour interval) and from site inspection.

A summary of the vegetation type and their respective slopes are given in **Table 1**.

Direction	Distance to the vegetation from the site boundary	Vegetation assemblage	Effective slope
North-east	Adjoins the boundary	Predominantly open forest with small areas of cleared and managed vegetation. Refer to Figures 7, 8 & 9.	Cross slope (considered to be level with respect to subject site)
South-east	N/A	N/A - Adjoined by a recently approved subdivision with a potential future road along the boundary.	N/A
South-east	N/A	N/A - Adjoined by road and cleared land.	N/A
North-west	N/A	N/A - adjoined by road and private residential property.	N/A

Table 1: Summary of vegetation analysis within 140m of the site

Source - HDB Town Planning & Design

4.2 DETERMINATION OF THE APZ

The FDI for Cessnock LGA is 100. Appendix 2 of PBP 2006 specifies the minimum requirement for Asset Protection Zones (m) for Residential and Rural Residential subdivision purposes to correspond to a radiant heat exposure less than or equal to 29kW/m². Based on the setback distances given in Table 4 of AS3959-2009 it is recommended that an APZ of 25m is maintained along the north-eastern boundary of the subject site to achieve a minimum Bushfire Attack Level (BAL) rating of 29 for the future residential subdivision.

5.0 BUSHFIRE MANAGEMENT MEASURES

The ability of the future subdivision to support bushfire management measures was assessed based on the performance criteria specified in chapter 4 of *Planning for Bushfire Protection 2006* as provided below:

5.1 APZ

As mentioned in **Section 4.2** of this report, the subdivision will require an APZ of 25m along the north-eastern boundary. This is largely absorbed within the 18m wide road reserve at the interface of the bushland. The remaining APZ can be easily accommodated in the front setback of the lots as indicated in the subdivision layout in **Appendix A**. Therefore all the lots in the proposed subdivision comply with the APZ requirements.

5.2 ACCESS

The subject site is currently bounded by two sealed roads (Branxton Street and Hollingshed Street) and a third access option will be available along its south-eastern boundary upon completion of the West Street extension.

An access road off Hollingshead Street and another one via the newly extended West Street will provide access to the proposed lots. With regard to access requirements for fire fighting and evacuation purposes, the subdivision meets the specifications of PBP.

In general, there are no topographical constraints preventing the construction of the proposed roads to the requirements in 4.1.3 (1) of PBP and the subdivision is capable of meeting the performance criteria for access.

5.3 SERVICES

The subdivision site will be serviced with reticulated water. The fire hydrant spacing, sizing, and pressures are able to comply with AS 2419.1-2005, to ensure adequate water supply for fire fighting.

All new electrical and telecommunications cable can be provided underground to meet the requirements of PBP 2006.

5.4 LANDSCAPING AND MAINTENANCE

Maintenance of the property, with particular attention to the APZ's, will be required. All landscaping and management of vegetation are able to comply with the requirements of Appendix 5 of PBP 2006.

5.5 CONSTRUCTION REQUIREMENTS

The construction of future dwellings should be in accordance with the requirements of AS 3959-2009 depending on the BAL rating.

5.6 SPECIAL CONSIDERATIONS

ECOLOGICAL CONSTRAINTS: FLORA AND FAUNA

The Flora and Fauna Assessment undertaken by MJD Environmental does not identify any significant impact from the vegetation clearing associated with the development.

FLOODING

The flood affected parts in the southern and eastern corners of the site have been excluded from the development site. All access roads and services are proposed on flood free areas to ensure smooth functioning and evacuation during a bushfire emergency.

5.7 ASSESSMENT OF ENVIRONMENTAL IMPACT

The proposed development does not involve removal of any significant flora, or any other measures that would have a significant impact on the environment.

6.0 CONCLUSION AND RECOMMENDATIONS

This assessment demonstrates that the proposed subdivision is able to satisfy the performance criteria for bushfire management as stipulated in PBP and AS 3959-2009. It is therefore considered that having regard to the Bushfire Threat Assessment, the subject site is suitable for subdivision.

The following recommendations are made for the compliance of the proposal with the relevant legislative requirements:

- An APZ of 25m is to be provided along the north-eastern boundary of the site. Ongoing maintenance of the APZ will be required to reduce fuel loads.
- The landscaping of the site is to comply with the requirements of Appendix 5 of PBP 2006.
- This assessment does not deal with the level of construction or specifications for dwellings on individual lots. Separate assessments are to be undertaken for infill development at the DA stage.
- The road network and utilities / services shall meet the fire fighting and management requirements as outlined in PBP 2006.

APPENDIX A

SUBDIVISION LAYOUT



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Option 1
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ATTACHMENT 8

GEOTECHNICAL ASSESSMENT REPORT

Proposed
Subdivision - Urban
Capability
Assessment

71 Branxton Street,
GRETA, NSW

NEW17P-0193-AA
20 November 2017



20 November 2017

Mr Karl Waeger
c/- Hunter Development Brokerage Pty Ltd
1st Floor, 44 Church Street,
MAITLAND NSW 2320

Attention: Karl Waeger

Dear Karl,

**RE: PROPOSED RESIDENTIAL SUBDIVISION
71 BRANXTON STREET, GRETA NSW
URBAN CAPABILITY ASSESSMENT**

Please find enclosed our Preliminary Geotechnical Assessment in the form of an Urban Capability Assessment for the proposed residential subdivision to be located at 71 Branxton Street, Greta.

The purpose of the Preliminary Geotechnical Assessment is to support an application to Cessnock City Council for rezoning of the site for residential subdivision. The report includes preliminary recommendations for suitability of the site for development from a geotechnical perspective.

The subject site has been identified as being located within a Mine Subsidence area. A separate mine subsidence assessment report has been prepared by Regional Geotechnical Solutions, ref: RGS31387.1-AA.

Additional detailed geotechnical investigation work will be required for design purposes at a later stage, including site classification for footings and pavement design for subdivision roads.

If you have any questions regarding this report, please do not hesitate to contact Shannon Kelly or the undersigned.

For and on behalf of Qualtest Laboratory (NSW) Pty Ltd



Emma Coleman
Senior Environmental Scientist

Table of Contents:

1.0	Introduction	1
2.0	Scope of Work.....	1
3.0	Desktop study.....	2
3.1	Geology Map.....	2
3.2	Acid Sulfate Soil Risk Maps.....	2
4.0	Field Work	2
5.0	Site Description	2
5.1	Surface Conditions	2
5.2	Subsurface Conditions.....	5
6.0	Laboratory Testing	7
7.0	Discussion and Recommendations.....	8
7.1	General	8
7.2	Slope Stability and Recommended Geotechnical Constraints	9
7.2.1	Basis of Assessment	9
7.2.2	Principal Site Features and Evidence of Instability	9
7.2.3	Hazard Identification.....	10
7.2.4	Risk Evaluation for the Proposed Development	10
7.2.5	Recommended Geotechnical Constraints for Residential Development	10
7.3	Acid Sulfate Soils.....	12
7.4	Salinity Assessment.....	13
7.4.1	Background Information.....	13
7.4.2	Significance of Urban Salinity	13
7.4.3	Salinity of Soil Profiles	13
7.4.4	Management of Salinity.....	14
7.5	Site Classification to AS2870-2011	14
7.6	Road Pavements.....	15
8.0	Limitations.....	16

Attachments:

Figures: Figure AA1: Site Location & Approximate test Locations

Appendix A: Results of Field Investigations

Appendix B: Results of Laboratory Testing

Appendix C: AGS 2007 Excerpts

1.0 Introduction

Qualtest Laboratory NSW Pty Ltd (Qualtest) is pleased to present this report to Hunter Development Brokerage Pty Ltd (HDB) on behalf of Mr Karl Waeger for the proposed residential subdivision to be located at 71 Branxton Street, Greta.

Based on the brief and plans provided in an email from HDB dated 28 September 2017, the proposed development is understood to comprise subdivision into about 41 residential allotments, associated road pavements and subdivision infrastructure.

The objectives of the work were to provide recommendations on the following:

- Preliminary Contamination Assessment;
- Preliminary Geotechnical Assessment in the form of an Urban Capability Assessment to assess suitability of the site for rezoning for residential subdivision including:
 - Acid Sulfate Soil and Salinity Assessment;
 - Risk of slope instability and associated geotechnical constraints;
 - Suitability of the site for development from a geotechnical perspective.
- Mine Subsidence Desktop Assessment.

This report presents the results of the preliminary geotechnical assessment, including field work investigations, laboratory testing, and recommendations.

The preliminary contamination assessment and mine subsidence assessment are presented in reports NEW17P-0197-AB, and RGS31387.1-AA, respectively.

2.0 Scope of Work

In order to meet the objective, the following scope of work was carried out:

- Desktop study, including review of:
 - Regional geological maps;
 - Department of Soil Conservation Soil Landscape Maps and Publications; and,
 - Acid Sulfate Soils Risk Maps;
- Field and laboratory investigations, including:
 - Site walkover and field mapping of surface features;
 - Site observations for visible evidence of Acid Sulfate Soils or Salinity;
 - Drilling of five hand auger boreholes;
 - Laboratory testing of three samples for Emerson Dispersion tests, three samples for Salinity tests (including electrical conductivity and pH), and three samples for Particle Size Distribution tests;
- Engineering analysis and reporting.

3.0 Desktop study

3.1 Geology Map

Reference to the 1:100,000 Cessnock Regional Geology Series Sheet 9132 indicates the site to be underlain by the Greta Coal Measures, which is characterised by lenticular conglomerates, sandstone, shale, and splitting coal seams.

3.2 Acid Sulfate Soil Risk Maps

The 1:25,000 Greta Acid Sulfate Soil Risk Map (9132S1) shows the site is located in an area of no known occurrence of Acid Sulfate Soils.

4.0 Field Work

The field investigations were carried out on 24 October 2017 and comprised drilling of five boreholes (HA01 to HA05) using hand auger methods. The boreholes were drilled to depths of between 0.45m and 1.0m, where refusal was reached on weathered conglomerate or sandstone. Disturbed samples were collected from each borehole for subsequent laboratory testing.

Two Dynamic Cone Penetrometer (DCP) tests were carried out adjacent to boreholes HA01 and HA02.

Investigations were carried out by an experienced Geotechnical Engineer from Qualtest who located the hand auger boreholes, carried out the testing and sampling, produced field logs, and made observations of the site conditions. Boreholes were located in the field relative to existing site features including topographic features, lot boundaries, existing developments and trees.

Engineering logs of the boreholes are presented in Appendix A.

Approximate borehole locations are shown on the attached Figure AA1.

5.0 Site Description

5.1 Surface Conditions

The subject site is located at the corner of Hollingshed and Branxton Streets, Greta, and comprises Lot 1 DP 873220, (No. 71 Branxton Street, Greta). The site comprises an approximately rectangular area of about 5.85 hectares, with the site location and area shown in Figure AA1 attached.

The site is bounded to the north by Hollingshed Street, to the west by Branxton Street, to the south by undeveloped lots within a residential zoning area, and by low density residential lots and bushland to the east.

The site is located within a region of gently undulating topography, on the lower slopes of a broadly sloping east-west oriented spur formation.

The site contains multiple tributaries and natural easements, with drainage and surface runoff assessed to generally flow towards the southeast and southwest parts of the site, where a tributary to Anvil Creek crosses the site. Anvil Creek, located about 500m west of the site, flows south to south-east.

Survey plans were not provided to Qualtest at the time of preparing this report, however, from survey data contained on Six Maps, ground levels at the site are assessed to range from approximately RL 50m (AHD) to approximately RL 60m (AHD).

The site generally slopes in an approximately southern direction, towards the Anvil Creek tributary at the south-eastern and south-western boundaries of the site. Surface slopes are typically in the order of between 5° and 6°, with localised slopes in the order of about 15-20°.

The majority of the site is undeveloped, with a single storey dwelling with attached garage, a short concrete driveway, and swimming pool located near the centre of the western boundary. The site also contained some shipping containers and piles of construction materials (such as concrete, timber, metal sheeting and wire) primarily to the east of the dwelling. There was also noted to be a small derelict brick and concrete structure near the centre of the eastern-most boundary.

An unsealed driveway connects the dwelling to Branxton Street to the west. The site is divided into several paddocks by timber post and barbed wire fencing.

There were several areas of surface settlement and open potholes which were judged to be likely due to mine subsidence in the north-western areas of the site. Reference should be made to the Mine Subsidence report prepared by Regional Geotechnical Solutions (ref: RGS31387.1-AA) in regards to mine subsidence.

Vegetation generally comprised grass cover and a few scattered trees, with sparse bushland present in the north-western area of the site, as shown on Figure AA1.

The site was judged to have good trafficability by way of 4WD vehicle on the day of the field investigation. The site was generally judged to be moderately drained mostly by way of surface runoff and infiltration into the near surface soils. There was no seepage or ponded water observed during the site visit.

Photographs of the site taken on the day of the site investigations are shown below.



Photograph 1: View northern portion of site facing southeast.



Photograph 2: Southeast portion of site, showing Anvil Creek tributary.



Photograph 3: View from south-eastern portion of site facing north-northwest.



Photograph 4: View from north-western portion of the site facing south, looking at residence.



Photograph 5: Waste materials on eastern side of residence.



Photograph 6: View from northern corner of site facing west showing trees in north-western portion of site.



Photograph 7: View from southwestern portion of site facing north-northeast.



Photograph 8: View from south-south-western part of the site facing south, showing site entrance from Branxton Street.



Photograph 9: Showing a mine subsidence pothole in north-western portion of site.



Photograph 10: Showing a pothole in west-south-western portion of site, probably related to mine subsidence.

5.2 Subsurface Conditions

The typical soil types encountered at the borehole locations during the field investigation have been divided into geotechnical units as summarised in Table 1.

Table 2 contains a summary of the distribution of the geotechnical units at borehole locations.

TABLE 1 – SUMMARY OF GEOTECHNICAL UNITS AND SOIL TYPES

Unit	Soil Type	Description
1	TOPSOIL	Silty SAND – fine to medium grained, dark grey-brown, fines of low plasticity, root affected.
2	Slopewash	Silty SAND / Clayey SAND – fine to coarse grained, dark grey to grey / pale brown to brown, fines of low to medium plasticity, trace to some fine to medium grained sub-angular to sub-rounded gravel. Trace cobbles up to ~63mm as Highly Weathered SANDSTONE at HA05. Silty Gravelly SAND / Silty Sandy GRAVEL – fine to coarse grained sub-rounded, pale grey-brown, fine to coarse grained sand, fines of low plasticity, with trace cobbles up to ~63mm as Highly Weathered SANDSTONE.
3	Colluvium / Alluvium	Gravelly Clayey SAND – fine to coarse grained, pale grey to grey, fines of low to medium plasticity, fine to medium grained sub-rounded gravel. Sandy CLAY – medium to high plasticity, brown, fine to coarse grained sand, some fine to medium grained sub-angular gravel.
4	Residual	Gravelly Clayey SAND – fine to coarse grained, pale orange-brown, fines of low to medium plasticity, fine to medium grained sub-rounded gravel. Sandy CLAY – medium to high plasticity, brown with pale grey and pale orange-brown / pale grey and pale orange-brown, fine to medium grained sand, trace fine grained sub-rounded gravel.

TABLE 2 – SUMMARY OF GEOTECHNICAL UNITS ENCOUNTERED AT EACH BOREHOLE LOCATION

Location	Unit 1 Topsoil	Unit 2 Slopewash	Unit 3 Colluvium / Alluvium	Unit 4 Residual Soil
	Depth (metres)			
HA01	0.00 – 0.20	0.20 – 0.45	0.45 – 0.65	0.65 – 0.85^
HA02	0.00 – 0.25	0.25 – 0.60	-	0.60 – 0.65*
HA03	0.00 – 0.25	0.25 – 0.40	0.40 – 0.65	0.65 – 1.00
HA04	0.00 – 0.25	0.25 – 0.45	-	0.45 – 0.65*
HA05	0.00 – 0.20	0.20 – 0.40	-	0.40 – 0.45*
Note: * Borehole terminated due to very slow progress or refusal of the hand auger.				

No groundwater was observed in the hand auger boreholes during the limited time that they remained open on the day of the investigation.

It should be noted that groundwater conditions can vary due to rainfall and other influences including regional groundwater flow, temperature, permeability, recharge areas, surface condition, and subsoil drainage.

6.0 Laboratory Testing

Samples collected during the field investigations were returned to our NATA accredited Warabrook Laboratory for testing. The testing comprised three Emerson Crumb tests, three Particle Size Distributions (Gradings).

In addition, three samples were despatched to Eurofins mgt, a NATA accredited laboratory for chemical testing. The three samples were tested for pH and Electrical Conductivity (EC) as part of the salinity assessment.

Results of the testing are presented in Appendix B, with a summary of the results presented in Tables 3 and 4.

TABLE 3 – SUMMARY OF PARTICLE SIZE DISTRIBUTION AND EMERSON TEST RESULTS

Location and Depth (m)	Material Description	Grading		Emerson Class
		Sieve (mm)	% Pass	
HA01 0.05 – 0.20	Sandy CLAY	37.5	100	Not tested
		19.0	100	
		2.36	96	
		0.075	50	
HA03 0.30 – 0.40	Silty Sandy GRAVEL	Not tested		2
HA04 0.05 – 0.20	Sandy SILT	37.5	100	5
		19.0	100	
		2.36	99	
		0.075	46	
HA04 0.25 – 0.45	Sandy SILT	37.5	100	2
		19.0	100	
		2.36	99	
		0.075	51	

Results of the laboratory testing indicate the site sub soils have an Emerson Class 2, which can generally be described as having the following properties:

- Is susceptible to slaking (breaking up upon absorbing water from oven-dried condition); and,
- Is susceptible to minor dispersion (allowing the clay fraction of the soil to dissolve) when submerged in water.

The surface soil sample that was tested revealed an Emerson Class 5, which can generally be described as having the following properties:

- Is susceptible to slaking (breaking up upon absorbing water from oven-dried condition); and,
- Will not disperse (allow the clay fraction of the soil to dissolve) when submerged in water.

Based on the results of fieldwork and laboratory testing, it is assessed that soil erosion should be able to be maintained within normally acceptable levels by adopting good soil erosion and sedimentation control practices, including:

- Minimise the area and duration of soil exposure by staged development and controlled clearing;
- Stockpile stripped soil for reuse and protect from erosion;
- Control storm water run-off by diverting clean run-off from denuded areas, minimising slope gradient, length and run-off velocities;
- Trap soil and water pollutants using silt traps, sediment basins, perimeter banks, silt fences and nutrient traps as appropriate;
- Re-vegetate as soon as is practicable.

7.0 Discussion and Recommendations

7.1 General

The site is considered suitable for the proposed development from a geotechnical viewpoint provided that development is carried out in accordance with sound engineering principles and good hillside practice, and with respect to the constraints and recommendations of this report.

Consideration should be given to proposed residential lots which are located in or immediately adjacent to the areas observed to be affected by mine subsidence. The RGS report on mine subsidence (ref: RGS31387.1-AA) must be referred to for further information and recommendations for these areas.

Further geotechnical investigation and advice should be carried out during detailed design phase including site classification to AS2870-2011 and pavement design as required.

7.2 Slope Stability and Recommended Geotechnical Constraints

7.2.1 Basis of Assessment

The risk of slope instability has been assessed from the observed site conditions using methods consistent with those presented in the Australian Geomechanics Society (AGS) publication "*Practice Note Guidelines for Landslide Risk Management, 2007*". Based on those methods, the risks to property associated with slope instability on the subject area have been assessed using the terms presented in AGS 2007, *Landslide Risk Assessment Qualitative Terminology for Use in Assessing Risk to Property*, extracts of which are attached in Appendix B.

The report provides an assessment of the risk of slope instability on the proposed development area. The report also recommends some geotechnical constraints for the site development in light of the slope instability assessment. The assessed risk to the proposed development is based on the geotechnical constraints and recommendations provided in this report being implemented. The onus is on the owner, potential owner, or interested party to decide whether the assessed level of risk is acceptable taking into account the likely consequences of the risk and the recommended geotechnical constraints.

7.2.2 Principal Site Features and Evidence of Instability

The assessment of the risk of slope instability has been based on the site observations recorded in Section 3 and the principal site features summarised below:

- Site situated in an area of gently undulating topography with moderate relief;
- Ground surface slopes are generally in the order of about 5° to 6° across the majority of the site, with localised steeper slopes up to about 15° to 20° near the banks of gullies;
- Soil depths encountered were generally in the range of about 0.5m to 1.5m;
- Soil profile generally comprising topsoil to depths in the order of 0.25m, overlying slopewash, colluvium, and residual clay soils typically of very stiff to hard consistency;
- The site drains primarily to the southeast and southwest to the tributary located on site, which drains to Anvil Creek;
- No evidence of seepage was observed and the site generally appeared moderately to well drained, mostly by way of downhill surface runoff. No water was observed to be ponded on the site;
- No evidence of deep soil erosion was observed at the site at the time of the field work;
- No obvious evidence of overall slope instability or significant damage attributable to mass ground movement (excluding mine subsidence) was observed on or in the vicinity of the site during the field work,

7.2.3 Hazard Identification

Elements at risk for the identified hazards are the proposed subdivision developments, which may include proposed residences, sheds, swimming pools, driveways and / or other site infrastructure.

The following hazards that could potentially impact on this site are assessed as follows:

- H1.** Potential broad deep-seated instability;
- H2.** Potential shallow instability such as overloading of slopes by excessive loads, unsuitable batters/support or unsuitable founding depths, or failure of fill not placed in a proper manner or subject to erosion by concentrated surface flows.
- H3.** Potential shallow ground 'creep' movements.

7.2.4 Risk Evaluation for the Proposed Development

The matrix below evaluates the hazards outlined above and their likelihood of occurring based on the proposed development of the site, and assuming the geotechnical constraints and recommendations of this report are implemented. If these recommendations are not followed, the likelihood of hazards occurring may increase and the level of risk may change. Further advice should be sought where necessary.

Hazard	Location	Consequence	Likelihood	Risk
H1	Overall Site	Major	Rare	Low
H2	Overall Site	Major	Rare	Low
H3	Overall Site	Minor	Unlikely	Low

Based on the above, the proposed development is assessed as having a "**Low**" risk of slope instability.

It would be normal practice in the Cessnock City Council local government area for development to proceed on a site with a risk level classification of Low.

Development should be carried out in accordance with sound engineering principles and good hillside practice (as set out in Appendix B), and the geotechnical constraints outlined in this report.

7.2.5 Recommended Geotechnical Constraints for Residential Development

Type of Structure:

There are no particular geotechnical constraints on the type of structures provided they are founded on footings designed and constructed in accordance with AS2870, 'Residential Slabs and Footings'.

Area for Development:

All of the site is considered feasible for development from a slope stability viewpoint.

Development of the site should be undertaken in accordance with good hillside construction practice and sound engineering principles as presented in the excerpts from AGS 2007 provided in Appendix B.

Care should be taken in the design of any developments in the vicinity of any existing excavations, fill platforms, embankments, retaining walls and dams, particularly if they involve surcharge loads or excavations.

Foundation Type:

Strip / pad footings, pier and beam systems or split-level raft slabs would be feasible from a slope stability viewpoint (broad raft slabs may not be suited to sloping areas of the site due to the slope modifications required).

Footings should not be founded within any existing uncontrolled fill. If uncontrolled fill is encountered, this will require piered foundations founded beneath the fill, removal of the fill, or removal and replacement of the fill to engineering specification.

Foundations should be designed and constructed in accordance with the recommendations and advice of AS2870, '*Residential Slabs and Footings*'.

Foundations near the crest of excavations should be taken to rock or founded behind or below a 1V:2H projection from the toe of the excavation.

Footings are to be founded outside of or below all zones of influence resulting from existing or future service trenches.

Excavations:

Excavations should be supported by properly designed and constructed retaining walls or else battered at 1V:2H or flatter and protected from erosion.

Excavations in competent bedrock (below the level of backhoe / excavator refusal) may be battered at 1V:1H.

Temporary excavations to depths of up to 1.2m in competent compact material with sufficient cohesion, such as clay of stiff consistency or better may be battered steeper than 1V:1H, subject to inspection during excavation by the geotechnical authority.

The safe working procedures of Work Cover NSW Excavation work code of practice, dated July 2014 should be followed.

Excavations should be designed for surcharge loading from slopes, retaining walls, structures and other improvements in the vicinity of the excavation.

Care should be taken not to disturb or destabilise existing underground services or structures. Excavations should remain outside a 1V:2H projection from the base of any structural footings.

Drainage measures should be implemented above and behind all temporary and permanent excavations to avoid concentrated water flows on the face of the cut or infiltration into the soil/rock profile behind the cut. Surface water flows from upslope areas should be diverted away from the cut face.

Filling:

The depth of unsupported fill on the site should preferably not exceed 1.5m and should be battered at 1V:2H or flatter and protected against erosion. All fill greater than 1.5m deep should preferably be supported by engineer designed retaining walls.

Where fill is to be placed on slopes in excess of 1V:8H (7°), a prepared surface should be benched or stepped into the slope.

Care should be taken during backfilling of any dams, gully areas or drainage depressions to reduce the risk of leaving a preferential underground drainage path which could result in softening of the surrounding area, piping erosion and/or localised seepage.

Earthworks should be carried out in accordance with the recommendations outlined in AS3798-2007 'Guidelines for Earthworks for Commercial and Residential Developments'.

Geotechnical advice should be sought with regards to site preparation and fill construction procedures at the time of detailed geotechnical investigations and design.

Retaining Walls

All structural retaining walls and all landscaping walls in excess of 1.0m should be designed by an experienced engineer familiar with the site conditions. All retaining walls should be designed for surcharge loading from slopes, structures and other existing/future improvements in the vicinity of the wall. Adequate subsurface and surface drainage should be provided behind all retaining walls.

Excavations for the construction of retaining walls result in a temporary reduction in the stability of the adjacent area particularly during wet weather until the wall is complete. This increased risk can be managed or reduced by appropriate construction planning, using temporary support, staged excavation and control of drainage.

Drainage and Sewage Disposal:

Adequate surface and storm water drainage should be installed and maintained on the site in accordance with local government requirements.

All collected stormwater run-off should be piped into the street / inter-allotment drainage system or discharged into existing storm water drains or watercourses in a controlled manner that limits erosion. Surface and sub-soil drains may be required to improve drainage. Septic wastes should be connected to the reticulated disposal system.

Other:

Inspection should be carried out by a geotechnical authority during construction to confirm the conditions assumed in this report and in the design.

Additional recommendations may be provided during further stages of the project.

7.3 Acid Sulfate Soils

Acid Sulfate Soils (ASS) are soils which contain significant amounts of pyrite which, when exposed to oxygen, in the presence of sufficient moisture, oxidises, resulting in the generation of sulphuric acid. Unoxidised pyritic soils are referred to as potential ASS. When the soils are exposed, the oxidation of pyrite occurs and sulphuric acids are generated, and the soils are said to be actual ASS.

Pyritic soils typically form in waterlogged, saline sediments rich in iron and sulfate. Typical environments for the formation of these soils include tidal flats, salt marshes and mangrove swamps below about RL 5m AHD. They can also form as bottom sediments in coastal rivers and creeks. Key points with regards to the likelihood of ASS being present on site are:

- Reference to the relevant Acid Sulfate Soil Risk Map (Greta, 1:25,000 scale, 1997 edition supplied by the NSW Government Office of Environment and Heritage) indicates that the site and surrounding area in the vicinity of the site is within an area of "no known occurrence" of acid sulfate soil conditions.
- Surface levels typically within the range of about RL 50m AHD to RL 60m AHD across the site, (i.e. significantly greater than RL 5m AHD).
- Subsurface soil materials encountered are of residual origin, (i.e. not estuarine).

It is considered unlikely that acid sulfate soils would be present at the site, and it is assessed that the proposed development presents a low risk of disturbance of acid sulfate soils.

Therefore Potential or Actual ASS are not likely to be encountered at the site as part of proposed site developments, and on this basis there is no requirement for an ASS Management Plan.

7.4 Salinity Assessment

7.4.1 Background Information

Soils in Australia contain variable quantities of salts, generally in the lower soil profile or weathered region. Most of the salts are in relatively deep sinks and aquifers and out of reach to cause damage to most plants or infrastructure.

Urban salinity is caused by the mobilisation of salts in the soil profile by surface water or groundwater. Salts naturally occur in soil from sources such as weathering of rock and soil, soils formed on old sea beds, salt lakes or other saline soils, or from the ocean via wind and rain.

When the water table rises close to the surface, it carries dissolved salts that are normally locked in the soil and rock profile to the surface.

7.4.2 Significance of Urban Salinity

Development of agricultural land for urban use can change the movement of surface and groundwater resulting in a change in the way salts and other minerals interact.

High salinity soils can reduce or altogether preclude vegetation growth and can produce aggressive soil conditions which may be detrimental to concrete and steel components of structures, foundations, pipelines and other engineering works. Thus, the management, design and construction of urban developments must take into consideration the impacts of salinity.

The impact of salts is not only related to the amount of salt and water present, but is also associated with the types of salts or cations (positively charged ions) present in the soil, the chemical and physical reactions with building materials and the amount of wetting and drying occurring (ref: Department of Land and Water Conservation (2002) Site Investigations for Urban Salinity (DLWC, 2002)).

7.4.3 Salinity of Soil Profiles

Salinity is determined by the electrical conductivity (EC) of a soil water extract corrected for texture. As the concentration of salt increases, the EC increases because salt separates into positively and negatively charged ions when dissolved in water.

The laboratory test results used to assess the salinity of the soil profile are presented in Table 4.

TABLE 4 – SUMMARY OF SALINITY TEST RESULTS

Location and Depth (m)	Textural Class	pH	EC (ds/m)	ECe (dS/m)	Soil Salinity Class
HA01 0.05 – 0.20	Medium CLAY	7.7	0.072	0.504	Non-saline
HA04 0.05 – 0.20	Clay LOAM	8.1	0.053	0.477	Non-saline

Location and Depth (m)	Textural Class	pH	EC (ds/m)	ECe (dS/m)	Soil Salinity Class
HA01 0.05 – 0.20	Medium CLAY	7.7	0.072	0.504	Non-saline
HA04 0.25 – 0.45	Clay LOAM	7.4	0.011	0.099	Non-saline

A saline soil is defined as a soil that contains sufficient soluble salt to adversely affect plant growth and / or land use. Reference to DLWC (2002) indicates that a soil with an ECe equal to or greater than 4 dS/m is considered saline, as it is the level at which many crops are affected.

As shown by the results in Table 4, urban salinity is unlikely to be an issue within the proposed allotments on this site. The samples tested were characterised by an ECe of <2 dS/m, which DLWC (2002) indicates is non-saline.

It is noted that in the close vicinity of creeks and waterways, there may be some areas of saline soils.

7.4.4 Management of Salinity

It is assessed that the soil salinity on this site, if present, would be limited to low lying areas along the existing waterway. It is understood that the proposed residential development has been setback from these areas. Therefore, salinity should not be an issue for the proposed development in its current layout given the setback from existing waterways and non-saline results from the samples tested. It is anticipated that the proposed building envelopes will not be affected by soil salinity.

7.5 Site Classification to AS2870-2011

Site classification in accordance with the classification system presented in AS2870-2011 'Residential Slabs and Footings' should be undertaken following further detailed geotechnical investigation of the site once site layout and site regrade designs are known.

Site classification will depend on a number of factors including depth of topsoil, depth of fill and residual soil, depth to rock, and reactivity of the natural soil and any fill material placed. A preliminary indication is that lots may potentially be classified Class 'M' or 'H1'.

All structural elements should be supported on footings founded beneath all uncontrolled fill, layers of inadequate bearing capacity, soft/loose, or other potentially deleterious material.

If any areas of uncontrolled fill of depths greater than 0.4m are encountered during construction, footings should be designed in accordance with engineering principles for Class 'P' sites.

Consideration should be given to proposed residential lots which are located in or immediately adjacent to the areas observed to be affected by mine subsidence. The RGS report on mine subsidence (ref: RGS31387.1-AA) must be referred to for further information and recommendations for these areas.

7.6 Road Pavements

Pavement design should be carried out following further detailed geotechnical investigation of the site. The existing residual clay soils are generally expected to be suitable for subgrade support subject to moisture conditions at the time of construction.

Due to the gently to moderately sloping nature of the site, road construction is generally anticipated to be on grade or within about 1m of existing surface levels, with only minor cut into soil or weathered rock, on-grade construction, and/or minor filling.

Consideration should be given to proposed pavements located in or immediately adjacent to the areas observed to be affected by mine subsidence. The RGS report on mine subsidence (ref: RGS31387.1-AA) must be referred to for further information and recommendations for these areas.

8.0 Limitations

The findings presented in the report and used as the basis for recommendations presented herein were obtained using normal, industry accepted geotechnical design practices and standards. To our knowledge, they represent a reasonable interpretation of the general conditions of the site.

The extent of testing associated with this assessment is limited to discrete test locations. It should be noted that subsurface conditions between and away from the test locations may be different to those observed during the field work and used as the basis of the recommendations contained in this report.

If subsurface conditions encountered during construction differ from those given in this report, further advice should be sought without delay.

Data and opinions contained within the report may not be used in other contexts or for any other purposes without prior review and agreement by Qualtest. If this report is reproduced, it must be in full.

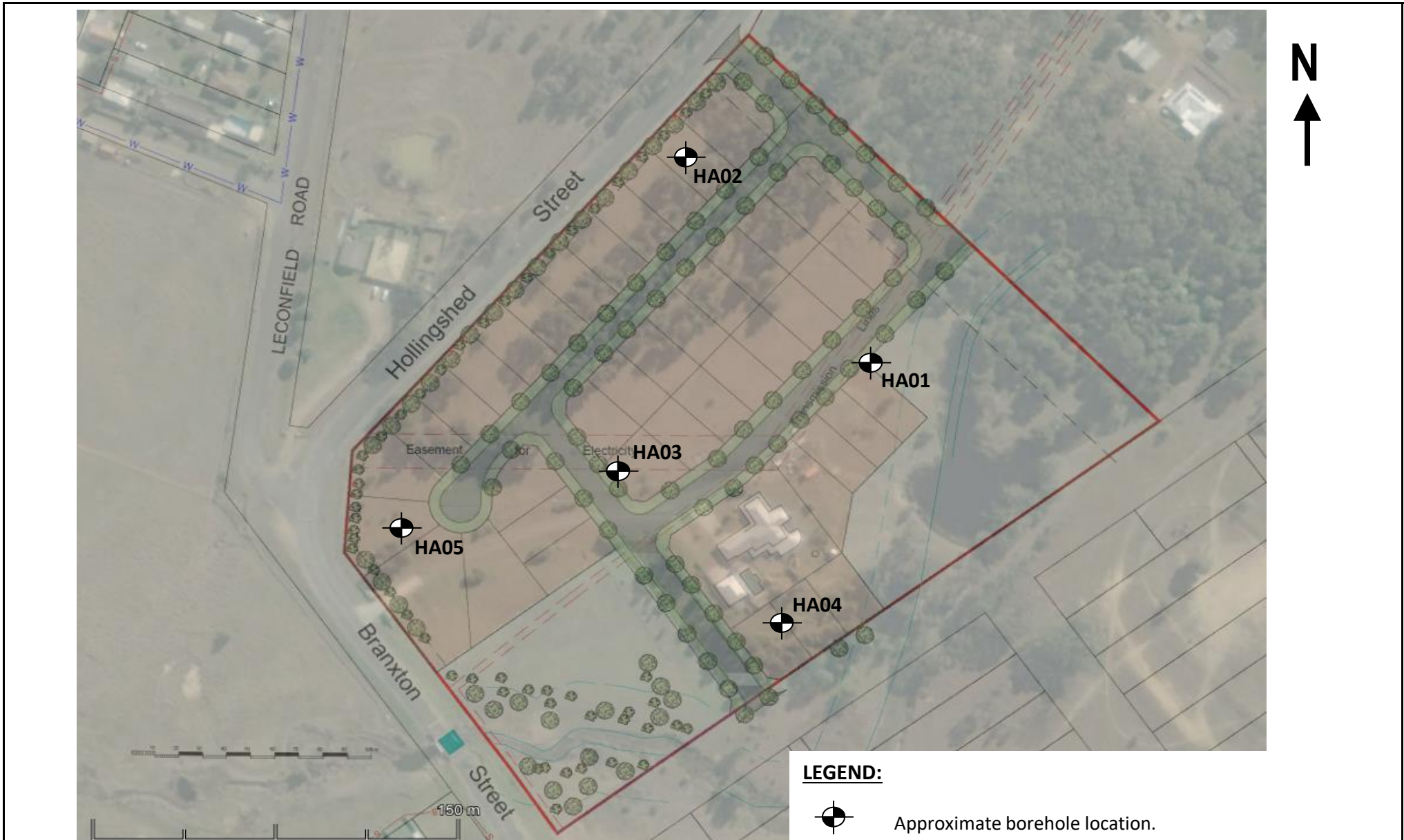
If you have any further questions regarding this report, please do not hesitate to contact Jason Lee or the undersigned.

For and on behalf of Qualtest Laboratory (NSW) Pty Ltd.


A handwritten signature in black ink, appearing to read 'Emma Coleman', is positioned above the printed name.

Emma Coleman
Senior Environmental Scientist

FIGURES:



Based on proposed site plan provided by HDB ("Option 1, Lot 1 DP 873228, 71 Branxton Street, Greta", Rev. A, dated 24/07/2017) overlain on Google Earth image.

	Client:	KARL WAEGER C/- HDB	Drawing No:	FIGURE AA1
	Project:	PROPOSED RESIDENTIAL SUBDIVISION	Project No:	NEW17P-0193
	Location:	71 BRANXTON STREET, GRETA	Scale:	AS SHOWN
	Title:	SITE PLAN AND APPROXIMATE TEST LOCATIONS	Date:	20/11/2017

APPENDIX A:

Results of Field Investigations



ENGINEERING LOG - HAND AUGER

CLIENT: HUNTER DEVELOPMENT BROKERAGE PTY LTD
PROJECT: URBAN CAPABILITY ASSESSMENT
LOCATION: 71 BRANXTON STREET, GRETA

HAND AUGER NO: HA01
PAGE: 1 OF 1
JOB NO: NEW17P-0193
LOGGED BY: BB
DATE: 24/10/17

DRILL TYPE: HAND AUGER
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM:

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations			
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result		
HA	Not Encountered	0.05m				SC	TOPSOIL: Sandy CLAY / Clayey SAND - fine to medium grained, dark grey-brown, fines of low plasticity, root affected.					TOPSOIL		
		D				0.20m	SC	Clayey SAND - fine to coarse grained, dark grey to grey, fines of low to medium plasticity, some fine to medium grained sub-angular to sub-rounded gravel.	M				SLOPE WASH	
		0.20m					0.45m	SC	Gravelly Clayey SAND - fine to coarse grained, pale grey to grey, fines of low to medium plasticity, fine to medium grained sub-rounded gravel.					COLLUVIUM / RESIDUAL SOIL
		D					0.65m	SC	Gravelly Clayey SAND - fine to coarse grained, pale orange-brown, fines of low to medium plasticity, fine to medium grained sub-rounded gravel.	D - M D - VD				RESIDUAL SOIL
		0.30m					0.85m	SC	Hole Terminated at 0.85 m Very slow progress					
		0.60m												
		0.70m												

LEGEND:

Water

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes

- Gradational or transitional strata
- Definitive or distinct strata change

Notes, Samples and Tests

- U₅₀ 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

Field Tests

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

Consistency	UCS (kPa)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W _p Plastic Limit
VSt Very Stiff	200 - 400	W _L Liquid Limit
H Hard	>400	
Fb Friable		

Density	UCS (kPa)	Density Index
V Very Loose		Density Index <15%
L Loose		Density Index 15 - 35%
MD Medium Dense		Density Index 35 - 65%
D Dense		Density Index 65 - 85%
VD Very Dense		Density Index 85 - 100%

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ENGINEERING LOG - HAND AUGER

CLIENT: HUNTER DEVELOPMENT BROKERAGE PTY LTD
PROJECT: URBAN CAPABILITY ASSESSMENT
LOCATION: 71 BRANXTON STREET, GRETA

HAND AUGER NO: HA02
PAGE: 1 OF 1
JOB NO: NEW17P-0193
LOGGED BY: BB
DATE: 24/10/17

DRILL TYPE: HAND AUGER
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM:

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result	
HA	Not Encountered	0.10m				SM	TOPSOIL: Silty SAND - fine to medium grained, dark brown, fines of low plasticity, root affected.	D - M				TOPSOIL	
		0.20m					0.25m						Silty Gravelly SAND - fine to coarse grained, pale grey-brown, fine to coarse grained angular to sub-angular gravel, fines of low to medium plasticity, trace cobbles up to ~63mm, as Highly Weathered SANDSTONE - fine to medium grained, red-brown to orange-brown.
		0.30m				0.60m	CI	Sandy CLAY - medium to high plasticity, pale grey and pale orange-brown, fine to medium grained sand.	M < Wp	H			RESIDUAL SOIL
		0.40m				0.65m		Hole Terminated at 0.65 m Practical Refusal					

OT.LIB.11.GLB.Log.NON-CORED BOREHOLE - TEST PIT NEW17P-0193 LOGS.GPJ <<DrawingFile>> 25/10/2017 11:39 10.0.0.000 Daigel Lab and In Situ Tool

LEGEND: Water Water Level (Date and time shown) Water Inflow Water Outflow Strata Changes Gradational or transitional strata Definitive or distinct strata change	Notes, Samples and Tests U ₅₀ 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample	Consistency VS Very Soft <25 S Soft 25 - 50 F Firm 50 - 100 St Stiff 100 - 200 VSt Very Stiff 200 - 400 H Hard >400 Fb Friable	UCS (kPa) <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	Moisture Condition D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit
	Field Tests PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	Density V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



ENGINEERING LOG - HAND AUGER

CLIENT: HUNTER DEVELOPMENT BROKERAGE PTY LTD
PROJECT: URBAN CAPABILITY ASSESSMENT
LOCATION: 71 BRANXTON STREET, GRETA

HAND AUGER NO: HA03
PAGE: 1 OF 1
JOB NO: NEW17P-0193
LOGGED BY: BB
DATE: 24/10/17

DRILL TYPE: HAND AUGER
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM:

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations			
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result		
HA	Not Encountered	0.10m				SM	TOPSOIL: Silty SAND - fine to medium grained, dark brown, fines of low plasticity, root affected.	M				TOPSOIL		
		0.20m	D											
		0.30m					GM	Silty Sandy GRAVEL - fine to coarse grained sub-rounded, pale grey-brown, fine to coarse grained sand, fines of low plasticity.	D - M	D			SLOPE WASH / ALLUVIUM	
		0.40m	D											
		0.50m					CH	Sandy CLAY - medium to high plasticity, brown, fine to coarse grained sand, some fine to medium grained sub-angular gravel.	M ~ w _p	H / Fb				COLLUVIUM
		0.70m												
		0.80m	D			CH	Sandy CLAY - high plasticity, brown with pale orange-brown and pale grey mottling, fine to medium grained sand.	M > w _p	VSt - H	HP	340 - 420	RESIDUAL SOIL		
				1.0			Hole Terminated at 1.00 m							

LEGEND:
Water
 Water Level (Date and time shown)
 Water Inflow
 Water Outflow
Strata Changes
 Gradational or transitional strata
 Definitive or distinct strata change

Notes, Samples and Tests
U₅₀ 50mm Diameter tube sample
CBR Bulk sample for CBR testing
E Environmental sample (Glass jar, sealed and chilled on site)
ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B Bulk Sample
Field Tests
PID Photoionisation detector reading (ppm)
DCP(x-y) Dynamic penetrometer test (test depth interval shown)
HP Hand Penetrometer test (UCS kPa)

Consistency	UCS (kPa)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W _p Plastic Limit
VSt Very Stiff	200 - 400	W _L Liquid Limit
H Hard	>400	
Fb Friable		
Density	V Very Loose	Density Index <15%
L Loose	MD Medium Dense	Density Index 15 - 35%
D Dense		Density Index 35 - 65%
VD Very Dense		Density Index 65 - 85%
		Density Index 85 - 100%



ENGINEERING LOG - HAND AUGER

CLIENT: HUNTER DEVELOPMENT BROKERAGE PTY LTD
PROJECT: URBAN CAPABILITY ASSESSMENT
LOCATION: 71 BRANXTON STREET, GRETA

HAND AUGER NO: HA04
PAGE: 1 OF 1
JOB NO: NEW17P-0193
LOGGED BY: BB
DATE: 24/10/17

DRILL TYPE: HAND AUGER
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM:

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result	
HA	Not Encountered	0.05m				SM	TOPSOIL: Silty SAND - fine to medium grained, brown to dark brown, fines of low plasticity, root affected.	D - M				TOPSOIL	
		D					0.25m						
		0.20m				SM	Silty SAND - fine to medium grained, pale brown to brown, fines of low plasticity, trace fine grained sub-rounded to sub-angular gravel.	MD					SLOPE WASH
		D					0.45m						
		0.30m				CH	Sandy CLAY - medium to high plasticity, pale orange-brown with pale grey, fine to medium grained sand, trace fine grained sub-rounded gravel.	M < W _p H / Fb					RESIDUAL SOIL
		D					0.65m						
0.40m													
0.50m													
0.60m													
							Hole Terminated at 0.65 m Practical Refusal						

OT.LIB.11.GLB.Log.NON-CORED BOREHOLE - TEST PIT NEW17P-0193 LOGS.GPJ <<DrawingFile>> 25/10/2017 11:39 10.0.0.000 Daigel Lab and In Situ Tool

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)		Moisture Condition	
Water		U ₅₀	50mm Diameter tube sample	VS	Very Soft	<25		D	Dry
	Water Level (Date and time shown)	CBR	Bulk sample for CBR testing	S	Soft	25 - 50		M	Moist
	Water Inflow	E	Environmental sample (Glass jar, sealed and chilled on site)	F	Firm	50 - 100		W	Wet
	Water Outflow	ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)	St	Stiff	100 - 200		W _p	Plastic Limit
Strata Changes		B	Bulk Sample	VSt	Very Stiff	200 - 400		W _L	Liquid Limit
	Gradational or transitional strata			H	Hard	>400			
	Definitive or distinct strata change			Fb	Friable				
		Field Tests		Density					
		PID	Photoionisation detector reading (ppm)	V	Very Loose				Density Index <15%
		DCP(x-y)	Dynamic penetrometer test (test depth interval shown)	L	Loose				Density Index 15 - 35%
		HP	Hand Penetrometer test (UCS kPa)	MD	Medium Dense				Density Index 35 - 65%
				D	Dense				Density Index 65 - 85%
				VD	Very Dense				Density Index 85 - 100%



ENGINEERING LOG - HAND AUGER

CLIENT: HUNTER DEVELOPMENT BROKERAGE PTY LTD
PROJECT: URBAN CAPABILITY ASSESSMENT
LOCATION: 71 BRANXTON STREET, GRETA

HAND AUGER NO: HA05
PAGE: 1 OF 1
JOB NO: NEW17P-0193
LOGGED BY: BB
DATE: 24/10/17

DRILL TYPE: HAND AUGER
BOREHOLE DIAMETER: 100 mm

SURFACE RL:
DATUM:

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
HA	Not Encountered	0.05m				SM	TOPSOIL: Silty SAND - fine to medium grained, dark brown, fines of low plasticity, root affected.					TOPSOIL
		0.20m				SM	Silty SAND - fine to medium grained, brown to grey-brown, fines of low plasticity, some fine to medium grained sub-rounded to sub-angular gravel, trace cobbles up to ~63mm as Highly Weathered SANDSTONE - fine to medium grained, red-brown to orange-brown with some pale grey.	D - M	D			SLOPE WASH
						CH	Sandy CLAY - medium to high plasticity, orange-brown to brown, fine to medium grained sand, trace fine to medium grained sub-angular gravel, trace cobbles up to ~63mm as Highly Weathered SANDSTONE - fine to medium grained, red-brown to orange-brown. Hole Terminated at 0.45 m Very slow progress	M < Wp	H / Fb			RESIDUAL SOIL
				0.5								
				1.0								

OT.LIB.11.GLB.Log.NON-CORED.BOREHOLE.-TEST.PIT.NEW17P-0193.LOGS.GPJ.<<DrawingFile>>25/10/2017.11:39.10.0.000.Daigel.Lab.and.In.Situ.Tool

LEGEND:

Water

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes

- Gradational or transitional strata
- Definitive or distinct strata change

Notes, Samples and Tests

- U₅₀ 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

Field Tests

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

Consistency	UCS (kPa)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W _p Plastic Limit
VSt Very Stiff	200 - 400	W _L Liquid Limit
H Hard	>400	
Fb Friable		

Density		Density Index
V Very Loose		<15%
L Loose		15 - 35%
MD Medium Dense		35 - 65%
D Dense		65 - 85%
VD Very Dense		85 - 100%

APPENDIX B:

Results of Laboratory Testing

Report No: MAT:NEW17W-4913--S01

Issue No: 1

Material Test Report

Client: Karl Waeger
38/48 Zaara Street
Newcastle NSW 2300

Principal:

Project No.: NEW17P-0193
Project Name: Proposed Residential Subdivision



Accredited for compliance with ISO/IEC 17025 - Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards



Approved Signatory: Dane Cullen
(Senior Geotechnician)
NATA Accredited Laboratory Number: 18686
Date of Issue: 1/11/2017

Sample Details

Sample ID: NEW17W-4913--S01
Sampling Method: AS1289.1.2.1 cl 6.5
Date Sampled: 24/10/2017
Source: On-Site
Material: Silty Sandy Gravel
Specification: No Specification
Project Location: 71 Branxton Street, Greta, NSW
Sample Location: HA03 - (0.3 - 0.4m)

Test Results

Description	Method	Result	Limits
Emerson Class Number	AS 1289.3.8.1	2	
Soil Description		Grey Silt	
Type of Water		Distilled Water	
Temperature of Water (°C)		23.0	

Comments

N/A

Report No: MAT:NEW17W-4913--S02
Issue No: 1

Material Test Report

Client: Karl Waeger
 38/48 Zaara Street
 Newcastle NSW 2300

Principal:

Project No.: NEW17P-0193
Project Name: Proposed Residential Subdivision



Accredited for compliance with ISO/IEC 17025 - Testing
 The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards

Dane Cullen
 Approved Signatory: Dane Cullen
 (Senior Geotechnician)
 NATA Accredited Laboratory Number: 18686
 Date of Issue: 1/11/2017

Sample Details

Sample ID: NEW17W-4913--S02
Sampling Method: AS1289.1.2.1 cl 6.5
Date Sampled: 24/10/2017
Source: On-Site
Material: Silty Sand
Specification: No Specification
Project Location: 71 Branxton Street, Greta, NSW
Sample Location: HA04 - (0.05 - 0.2m)

Particle Size Distribution

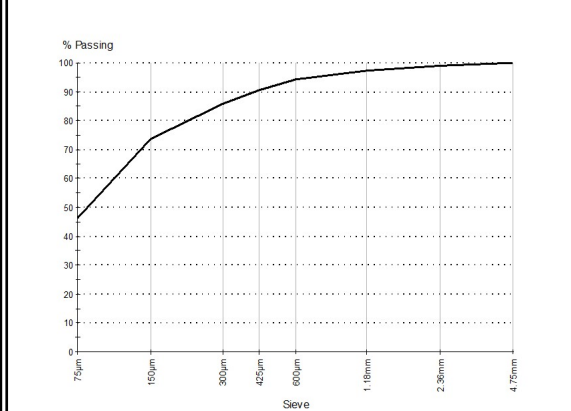
Method: AS 1289.3.6.1
Drying by: Oven
Note: Sample Washed

Sieve Size	% Passing	Limits
4.75mm	100	
2.36mm	99	
1.18mm	97	
600µm	94	
425µm	90	
300µm	86	
150µm	74	
75µm	46	

Other Test Results

Description	Method	Result	Limits
Emerson Class Number	AS 1289.3.8.1	5	
Soil Description		Grey Sandy Silt	
Type of Water		Distilled Water	
Temperature of Water (°C)		23.0	

Chart



Comments

N/A


Report No: MAT:NEW17W-4913--S03
Issue No: 1

Material Test Report

Client: Karl Waeger
 38/48 Zaara Street
 Newcastle NSW 2300

Principal:

Project No.: NEW17P-0193
Project Name: Proposed Residential Subdivision



Accredited for compliance with ISO/IEC 17025 - Testing
 The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards

Dane Cullen
 Approved Signatory: Dane Cullen
 (Senior Geotechnician)
 NATA Accredited Laboratory Number: 18686
 Date of Issue: 1/11/2017

Sample Details

Sample ID: NEW17W-4913--S03
Sampling Method: AS1289.1.2.1 cl 6.5
Date Sampled: 24/10/2017
Source: On-Site
Material: Silty Sand
Specification: No Specification
Project Location: 71 Branxton Street, Greta, NSW
Sample Location: HA04 - (0.25 - 0.45m)

Particle Size Distribution

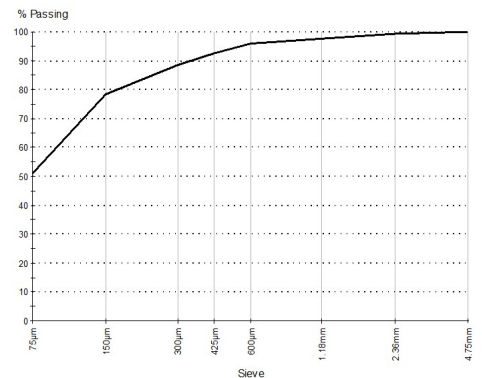
Method: AS 1289.3.6.1
Drying by: Oven
Note: Sample Washed

Sieve Size	% Passing	Limits
4.75mm	100	
2.36mm	99	
1.18mm	98	
600µm	96	
425µm	92	
300µm	89	
150µm	79	
75µm	51	

Other Test Results

Description	Method	Result	Limits
Emerson Class Number	AS 1289.3.8.1	2	
Soil Description		Grey Sandy Silt	
Type of Water		Distilled Water	
Temperature of Water (°C)		23.0	

Chart



Comments


N/A

Report No: MAT:NEW17W-4913--S04
 Issue No: 1

Material Test Report

Client: Karl Waeger
 38/48 Zaara Street
 Newcastle NSW 2300

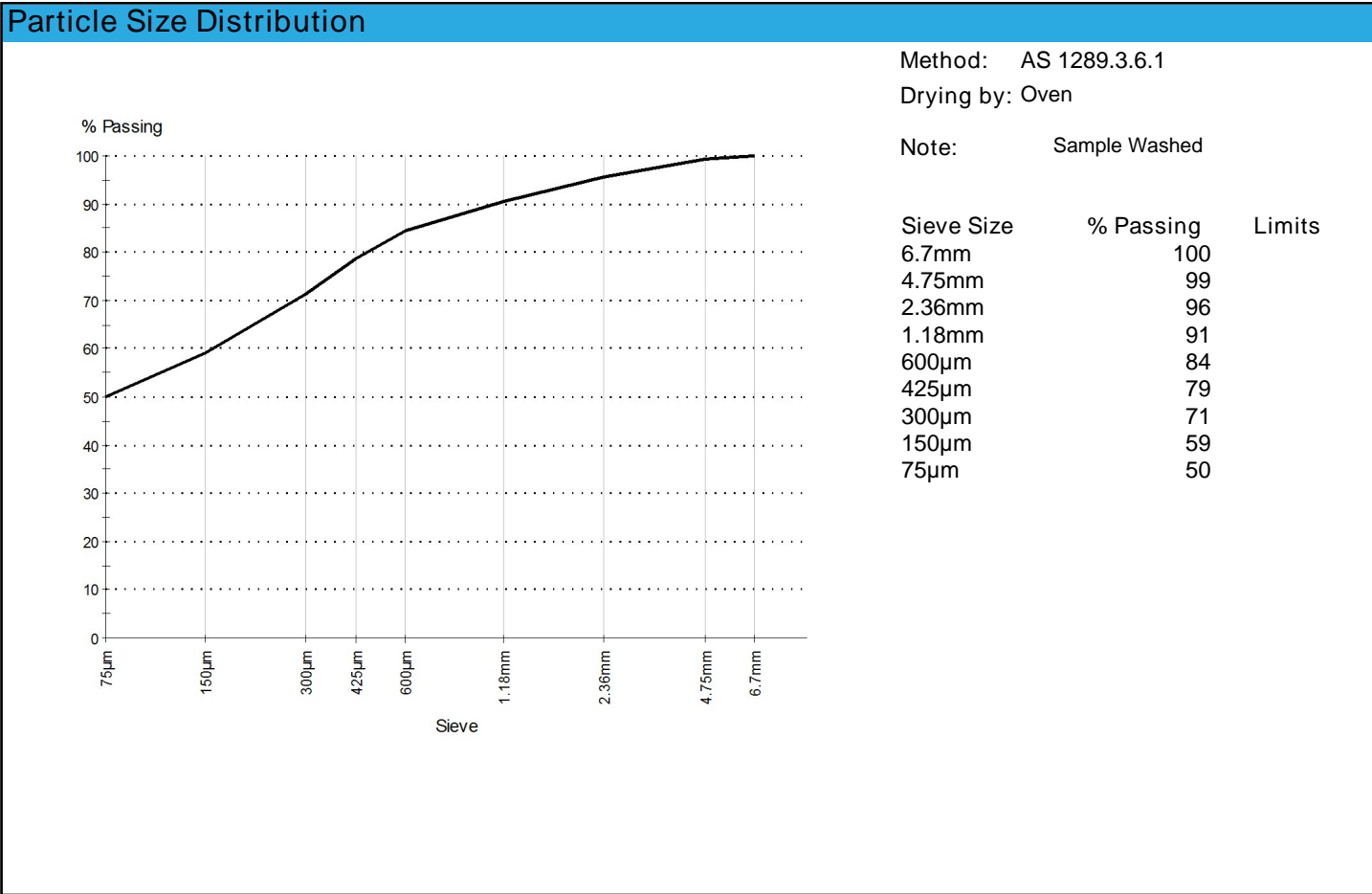
Principal:
 Project No.: NEW17P-0193
 Project Name: Proposed Residential Subdivision



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 The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards

B. Cullen
 Approved Signatory: Brent Cullen
 (Senior Geotechnician)
 NATA Accredited Laboratory Number: 18686
 Date of Issue: 31/10/2017

Sample Details		Other Test Results			
		Description	Method	Result	Limits
Sample ID:	NEW17W-4913--S04				
Sampling Method:	AS1289.1.2.1 cl 6.5				
Date Sampled:	24/10/2017				
Source:	On-Site				
Material:	Sandy Clay				
Specification:	No Specification				
Project Location:	71 Branxton Street, Greta, NSW				
Sample Location:	HA01 - (0.05 - 0.2m)				



Comments

N/A

Certificate of Analysis

Qualtest
8 Ironbark Close
Warabrook
NSW 2304



NATA Accredited
Accreditation Number 1261
Site Number 1254

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 The results of the tests, calibrations and/or
 measurements included in this document are traceable
 to Australian/national standards.

Attention: **Dane Cullen**

Report **569735-S**
 Project name **PROPOSED RESIDENTIAL SUBDIVISION**
 Project ID **NEW17P-0193**
 Received Date **Oct 27, 2017**

Client Sample ID			NEW17W-4913-S02	NEW17W-4913-S03	NEW17W-4913-S04
Sample Matrix			Soil	Soil	Soil
Eurofins mgt Sample No.			M17-Oc31312	M17-Oc31313	M17-Oc31314
Date Sampled			Oct 24, 2017	Oct 24, 2017	Oct 24, 2017
Test/Reference	LOR	Unit			
Conductivity (1:5 aqueous extract at 25°C)	10	uS/cm	72	53	11
pH (1:5 Aqueous extract)	0.1	pH Units	7.7	8.1	7.4
% Moisture	1	%	12	3.2	15

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported. A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Conductivity (1:5 aqueous extract at 25°C) - Method: LTM-INO-4030	Melbourne	Oct 30, 2017	7 Day
pH (1:5 Aqueous extract) - Method: LTM-GEN-7090 pH in soil by ISE	Melbourne	Oct 30, 2017	7 Day
% Moisture - Method: LTM-GEN-7080 Moisture	Melbourne	Oct 27, 2017	14 Day

Company Name: Qualtest	Order No.: NEW17W-4913	Received: Oct 27, 2017 8:44 AM
Address: 8 Ironbark Close Warabrook NSW 2304	Report #: 569735	Due: Nov 3, 2017
	Phone: 02 4968 4468	Priority: 5 Day
	Fax: 02 4960 9775	Contact Name: Dane Cullen
Project Name: PROPOSED RESIDENTIAL SUBDIVISION		
Project ID: NEW17P-0193		

Eurofins | mgt Analytical Services Manager : Andrew Black

Sample Detail						Conductivity (1:5 aqueous extract at 25°C)	pH (1:5 Aqueous extract)	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X
Sydney Laboratory - NATA Site # 18217								
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
External Laboratory								
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID			
1	NEW17W-4913-S02	Oct 24, 2017		Soil	M17-Oc31312	X	X	X
2	NEW17W-4913-S03	Oct 24, 2017		Soil	M17-Oc31313	X	X	X
3	NEW17W-4913-S04	Oct 24, 2017		Soil	M17-Oc31314	X	X	X
Test Counts						3	3	3

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	Quality Systems Manual ver 5.1 US Department of Defense
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.1 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank										
Conductivity (1:5 aqueous extract at 25°C)				uS/cm	< 10			10	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1				Acceptance Limits	Pass Limits	Qualifying Code
Duplicate										
				Result 1	Result 2	RPD				
% Moisture	M17-Oc31313	CP	%	3.2	3.4	9.0		30%	Pass	
Duplicate										
				Result 1	Result 2	RPD				
Conductivity (1:5 aqueous extract at 25°C)	M17-Oc31314	CP	uS/cm	11	13	12		30%	Pass	
pH (1:5 Aqueous extract)	M17-Oc31314	CP	pH Units	7.4	7.5	pass		30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Comments

Authorised By

Andrew Black	Analytical Services Manager
Alex Petridis	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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APPENDIX C:

**Selected Excerpts from AGS 2007 -
Practice Note Guidelines for Landslide Risk
Management**

Foundation Maintenance and Footing Performance: A Homeowner's Guide



CSIRO

BTF 18
replaces
Information
Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation

This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth

Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation

Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpend).

Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

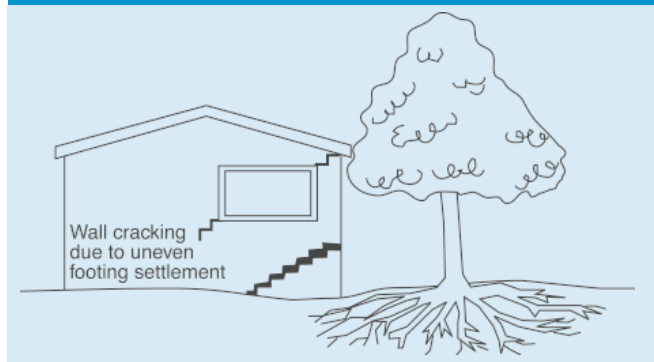
Seasonal swelling/shrinkage in clay

Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots

In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself

Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures

Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures

Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures

Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.

Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.

- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing

Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage

In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

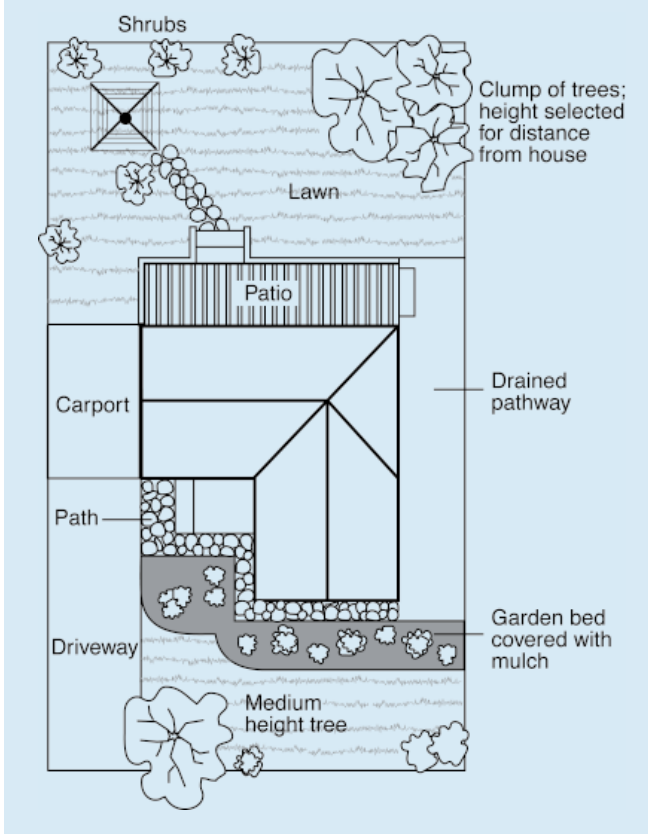
Protection of the building perimeter

It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4



- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

The information in this and other issues in the series was derived from various sources and was believed to be correct when published.

The information is advisory. It is provided in good faith and not claimed to be an exhaustive treatment of the relevant subject.

Further professional advice needs to be obtained before taking any action based on the information provided.

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Proposed Subdivision
Preliminary
Contamination
Assessment

71 Branxton Street, Greta
NSW

NEW17P-0193-AB
20 November 2017



20 November 2017

Mr Karl Waeger
c/- Hunter Development Brokerage Pty Ltd
1st Floor, 44 Church Street,
Maitland NSW 2320

Attention: Mr Karl Waeger

Dear Karl

**RE: PROPOSED RESIDENTIAL SUBDIVISION
71 BRANXTON STREET, GRETA NSW
PRELIMINARY CONTAMINATION ASSESSMENT**

Qualtest Laboratory NSW Pty Ltd (Qualtest) is pleased to present this report to Hunter Development Brokerage Pty Ltd (HDB) on behalf of Mr Karl Waeger. Please find enclosed our Preliminary Contamination Assessment report for the proposed residential subdivision located at 71 Branxton Street, Greta NSW.

Based on the brief and plans provided in an email from HBD dated 28 September 2017, the proposed development is understood to comprise subdivision into about 41 residential allotments, associated road pavements and subdivision infrastructure. Therefore, an application to Cessnock City Council is required for rezoning for residential subdivision. A Preliminary Contamination Assessment is required as part of the rezoning application.

This report was prepared in accordance with the relevant sections of the NSW OEH (2011) Guidelines for Consultants Reporting on Contaminated Sites.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

For and on behalf of Qualtest Laboratory (NSW) Pty Ltd



Emma Coleman
Senior Environmental Scientist

Table of Contents:

1.0	Introduction.....	3
1.1	Objectives	3
1.2	Scope of Works	3
2.0	Site Description.....	4
2.1	Site Identification	4
2.2	Topography and Drainage	4
2.3	Regional Geology	5
2.4	Hydrogeology.....	5
2.5	Acid Sulfate Soils	5
3.0	Site History Review	6
3.1	Historical titles search.....	6
3.2	Aerial photograph review.....	6
3.3	Site Observations	7
3.4	NSW EPA records	8
3.5	Anecdotal information	8
3.6	Section 149 Certificate	9
3.7	Previous reports	9
3.8	Summary of site history	9
3.9	Gaps in the Site History	9
4.0	Conceptual Site Model.....	10
4.1	Potential Sources of Contamination	10
4.2	Potentially Affected Media, Receptors and Exposure Pathways	10
4.3	Potential and Complete Exposure Pathways.....	11
5.0	Discussion.....	12
6.0	Conclusions and Recommendations.....	12
7.0	Limitations.....	13
8.0	References	13

Attachments:

Appendix A - Figures: Figure 1 - Site Location Plan

Figure 2 – Proposed Subdivision Layout

Figure 3 – Site Layout

Appendix B: Groundwater Bore Data

Appendix C: Historical Titles

Appendix D: Aerial Photographs

Appendix E: Site Photographs

Appendix F: NSW EPA Search

Appendix G: Section 149 Certificate

1.0 Introduction

Qualtest Laboratory NSW Pty Ltd (Qualtest) is pleased to present this report to Hunter Development Brokerage Pty Ltd (HDB) on behalf of Mr Karl Waeger for the proposed residential subdivision to be located at 71 Branxton Street, Greta (the site). Figure 1 (Appendix A) shows the site location.

Based on the brief and plans provided in an email from HDB dated 28 September 2017, the proposed development is understood to comprise about 41 residential allotments, associated road pavements and subdivision infrastructure. The proposed subdivision layout is shown in Figure 2.

The project included the following assessments:

- Preliminary Contamination Assessment;
- Preliminary Geotechnical Assessment in the form of an Urban Capability Assessment to assess suitability of the site for development, including: acid sulfate soil and salinity Assessment; risk of slope instability and associated geotechnical constraints; and suitability of the site for development from a geotechnical perspective.
- Mine Subsidence Desktop Assessment, completed by Regional Geotechnical Solutions Pty Ltd (RGS).

This report presents the results of the Preliminary Contamination Assessment. This report was prepared in general accordance with the relevant sections of the NSW OEH (2011) Guidelines for Consultants Reporting on Contaminated Sites.

The preliminary geotechnical assessment and mine subsidence assessment are presented in reports NEW17P-0197-AA, and RGS31387.1-AA, respectively.

1.1 Objectives

The objectives of the PCA were to provide a preliminary assessment of the potential for soil contamination to be present on the site.

1.2 Scope of Works

In order to meet the above objectives, Qualtest carried out the following scope of works:

- Desk study and site history review to assess Areas of Environmental Concern (AECs) and associated Chemicals of Potential Concern (COPC);
- A site walkover by a Qualtest senior environmental scientist;
- Data assessment and preparation of a PCA report.

2.0 Site Description

2.1 Site Identification

General site information is provided below in Table 2.1. The site location is shown in Figure 1, Appendix A.

Table 2.1: Summary of Site Details

Site location:	71 Branxton Street, Greta NSW
Approximate site area:	5.85 hectares (ha)
Title Identification Details:	Lot 1 DP 873220, within the Cessnock Council local government area, Branxton Parish in the county of Northumberland.
Current Ownership:	The title documents show the site is owned by Karl Waeger.
Previous Landuse:	Rural residential property with predominantly undeveloped vacant land. Former coal mine workings in the northwest portion of the site.
Current Landuse:	Rural residential property with predominately undeveloped vacant land.
Proposed Landuse:	Residential housing development.
Adjoining Site Uses:	<ul style="list-style-type: none"> • Branxton Street to the west followed by rural residential properties and vacant blocks; • A vacant block, possibly grazing land, lies to the south, followed by residential properties south of Water Street; • Hollingshed Street to the north followed by rural/ residential properties, • Bushland and rural residential properties to the east.
Site Coordinates:	32°40'21 S 151°23'25 E

2.2 Topography and Drainage

Reference to the NSW Land and Property Information Spatial Information Exchange website (<https://six.nsw.gov.au/wps/portal/>) indicated the elevation of the site ranged from approximately 60m AHD in the north of the site to approximately 50m AHD in the south of the site.

Surface water would be expected to infiltrate into the site soils, with excess surface water draining to the waterway on site, which is a tributary of Anvil Creek. This onsite waterway flows to the west into Anvil Creek, which flows south to south east.

2.3 Regional Geology

Reference to the 1:100,000 Cessnock Regional Geology Sheet (Sheet 9132) indicates that the site is underlain by the Greta Coal Measures, which are characterised by lenticular conglomerate, sandstone, shale and splitting coal seams.

2.4 Hydrogeology

Groundwater beneath the site is anticipated be present in semi-confined aquifers in weathered rock greater than 5m below ground surface (bgs). Groundwater beneath the site would be expected to follow the surface topography and flow towards the north east. There is an unnamed creek that crosses the southeastern and southwestern corners of the site. The unnamed creek flows offsite in a westerly direction and joins with Anvil creek about 500m west of the site.

It should be noted that groundwater conditions can vary due to rainfall and other influences including regional groundwater flow, temperature, permeability, recharge areas, surface condition, and subsoil drainage.

A search of the NSW Department of Primary Industries (Office of Water) registered groundwater bores located within a 500m radius of the site was undertaken. The search revealed that there are 5 registered bores within this radius. A copy of the search is provided in Appendix D and summarised below in Table 2.2.

Table 2.2 – Summary of Groundwater Bore Data

Bore ID	Purpose	Approximate Distance & Direction from Site	Water Bearing Zone (m bgs)	Standing Water Level (m bgs)
GW202767	Monitoring Bore	344m South West	2.2-2.8	2.3
GW202768	Monitoring Bore	351m South West	2.5-3.0	2.8
GW201659	Monitoring Bore	352m South West	2.75-4.5	2.75
GW201658	Monitoring Bore	380m South West	2.75-4.5	2.75
GW201657	Monitoring Bore	402m South West	2.2-4.2	2.20

2.5 Acid Sulfate Soils

Reference to the 1:25,000 Greta Acid Sulfate Soil Risk Map 9132S1 (supplied by the NSW Department of Land and Water Conservation) indicates that the site is located within an area of "no known occurrence" of Acid Sulfate Soils (ASS).

It is noted that the Greta coal measures contain rocks and soils which are known to be acidic (pH <4.5) and to contain jarosite, a straw coloured mineral, which is an oxidation product of pyrite (FeS₂). The presence of pyrite and jarosite means these soils can have a high potential to generate acid run-off if not managed appropriately.

The potential environmental impact, and the treatment and management of acidic soils and rocks from the Greta coal measures are similar to those for ASS. Should excavations on site be likely to encounter acidic soils or rocks from the Greta coal measures, then a management plan should be prepared which would outline the handling, management and treatment of the material.

3.0 Site History Review

A site history review was undertaken as part of the assessment, and included:

- A review of historical ownership of the site;
- A review of aerial photography from the past 50 years;
- A site walkover to help identify current and previous activities carried out on the site, identify surrounding land uses, and assess AECs and COPCs;
- Interviews with people familiar with the site history; and,
- Search of the NSW EPA's list of contaminated sites applying to the site and nearby properties.

The information provided from the above reviews is summarised in the sections below.

3.1 Historical titles search

A search of historical titles for the site was undertaken by Advanced Legal Searchers Pty Ltd. A list of past registered proprietors for the lot was obtained dating back to 1987. The results of the search are included in Appendix C and presented below in Table 3.1.

Table 3.1: Summary of historical titles

Date	Proprietor	Inferred Land Use
1987 - Present	Karl Waeger (supervisor) with Hela Evelyne Waeger between 1989 and 1997	Private
Pre-1987	Crown Land, with notes: <ul style="list-style-type: none"> • 1965-1987 Special Lease 1965 – 31 Maitland to Clement Patrick Withers • 1959-1965 Within Reserve 2664 from the Leasing Provision of the Mining Act vide Government Gazettal 9 January 1959 • 1912-1959 Within Mining Lease 3 	Government / Mining

The historical titles search indicated that the site from about 1987 to present, has predominately been owned by private individuals, who likely used the site for rural residential purposes. Prior to 1987, it appears the site was leased from the government for mining purposes. This is likely associated with the area in the north-western portion of the site, which shows some surface subsidence effects from former mining.

3.2 Aerial photograph review

Aerial photographs of the site from 1963, 1974, 1984 and 1994 were purchased from the Department of Land and Property Information, and satellite images from Google Earth for 2004 to 2017. The photographs were assessed by a Qualtest Environmental Scientist. The results of the aerial photograph review are summarised below in Table 3.2. The aerial photographs are presented in Appendix C.

Table 3.2: Aerial photograph review

Year	Site	Surrounding Land
1963	The site appears to be a predominantly vacant cleared block of land.	The surrounding land is largely vacant land. Branxton Street and Hollingshed Street border the site on the western and northern extremes of the site. Residential properties lay to the south of the site in the town of Greta.
1974	The site appears similar to the 1963 photograph.	The surrounding area appears to be similar to the previous photograph.
1984	A building, likely the existing residence, has been constructed in the centre of the site, with an access road from Branxton Street.	Properties to the north west of Leconfield Road have been constructed. Revegetation of a vacant lot to the north east has occurred.
1994	The site appears similar to the 1984 photograph.	The surrounding areas are similar to the previous photographs.
2004	Extensions on the western side of the existing structure on site appear to have been constructed.	A housing development to the south east of the property has been established including both rural and residential properties. The remaining surrounding area appears similar to the previous photograph.
2017	The site appears similar to the previous google earth image.	Further residential development has occurred to the south east and north west of the site. The remaining surrounding area appears similar to the previous google earth image.

3.3 Site Observations

A Qualitest Environmental Scientist carried out a site walkover on 24 October 2017. Selected site photographs are presented in Appendix E. Figure 3 (Appendix B) shows the layout of the site and some of the observed features. The observations noted during the site walkover are summarised below:

- The site was located within a region of gently undulating topography, on the lower slopes of a broadly sloping east-west oriented spur formation.
- The majority of the site was undeveloped, with a single storey dwelling with attached garage, a short concrete driveway and swimming pool located near the centre of the western boundary (see Photograph 4).

- To the north and west of the residence, several shipping containers and piles of construction / waste materials (such as concrete, timber, metal sheeting and wire) were observed (see Photographs 5 to 7). It is not known what is stored in the shipping containers.
- A small derelict brick and concrete structure was observed near the centre of the eastern boundary (see Photograph 8). It is not known what this building may have been used for.
- An unsealed driveway connects the dwelling to Branxton Street to the west. The site is divided into several paddocks by timber post and barbed wire fencing.
- A road is being constructed to the southeast of the site. From site observations it appears the construction contractor uses the site as a turning bay, and for storage of boulder of sandstone rock.
- There was observed to be several areas of surface settlement and open potholes which were likely due to mine subsidence in the north-western areas of the site (see Photograph 9). A pothole was also observed in the southern portion of the site. This pothole had been infilled with soil and boulders, which may have been sourced from off site (see Photograph 10). It is not known if this pothole was associated with mining or other site activities.
- An unnamed creek crosses the site in the southeast and southwest corners of the site (see Photograph 1).
- Vegetation generally comprised grass cover and a few scattered trees, with sparse bushland present in the north-western area of the site.

3.4 NSW EPA records

A search of the NSW EPA database revealed that there are two properties within the Cessnock City Council area that are registered as having current notices:

- Caltex Service Station, 279-281 Lang Street, Kurri Kurri – located about 20km from the site; and,
- Ayrefield Colliery, Main Road, Rothbury – located about 12km from the site.

Based on the distance from the site, contamination on these properties is considered unlikely to impact the site. A copy of the search is provided in Appendix C.

A search of properties that have been reported to NSW EPA as potentially contaminated identified three properties in Greta:

- Redevelopment Site (now McDonalds restaurant) 112-114 High Street, Greta – about 500m southwest of the site;
- Coles Express Service Station, 122 New England Highway, Greta – about 500m southwest of the site; and,
- Former Landfill, Hollingshed Street, Greta – about 300m northwest of the site.

The NSW EPA has determined that these properties do not require regulation under the Contaminated Land Management Act, 1997. Based on information provided by NSW EPA, these sites are unlikely to have significant contamination migrating off-site onto surrounding sites.

3.5 Anecdotal information

The site owner, Mr Karl Waeger, has provided the following information:

- They have been familiar with the site since 1977 (about 40 years);
- The site was used for small scale market gardening during Mr Waeger's ownership;
- During this small scale market gardening no chemicals were used or stored on site;
- Wastes were not stored or disposed on the site;
- No fuelling facilities or fuel storage areas were present on the site;
- Prior to his ownership, the site was Crown Land, which he thinks was used for grazing;
- They are not aware of other past activities that may have caused contamination.

3.6 Section 149 Certificate

A Section 149 Certificate for the site was obtained from Cessnock City Council. Relevant information is summarised below.

Zoning	RU2 Rural Landscape.
Critical Habitat	The land is not land that includes or comprises critical habitat declared to be critical habitat under Part 3 of the Threatened Species Conservation Act 1995.
Conservation Area	The land is not a conservation area under the Cessnock Local Environmental Plan 2011.
Environmental Heritage	An item of environmental heritage identified in Cessnock Local Environmental Plan 2011 is not situated on the land.
Mine Subsidence	Land is within a proclaimed district.
Bushfire	Land is bushfire prone.
Contaminated Land Management Act 1997	Nil prescribed matters

3.7 Previous reports

No previous reports for the site have been provided to Qualtest.

3.8 Former Coal Mining

Based on information provided in the mine subsidence report (RGS31387.1-AA), the north-western portion of the site was historically mined for coal. The mines were the New Greta Colliery and the Whitburn Colliery, which worked the Greta Coal Seam. The assessed maximum depth of the Greta Coal Seam beneath the sites ground level is 16m to 20m, and the thickness of the seam was 1.86m. The former mine workings appeared to be present under the north-western half of the site, based on the observed pothole and depression features observed during the site walkover for the mine subsidence assessment. The record tracings did not indicate that surface infrastructure associated with the former collieries were located on the site. It is noted that the record tracings do not always include this information.

3.9 Summary of Site History

The information obtained from the site history review has been summarised below:

- Based on the information provided in the historical titles, aerial photographs and anecdotal information, the majority of the site has remained undeveloped land, previously used as grazing and mining (coal) land (northwestern portion).
- The anecdotal information indicates that chemicals were not used or stored on site during the time the site was used for small scale market gardening.

3.10 Gaps in the Site History

Whilst the site history is reasonably comprehensive there are some gaps identified in the review as follows:

- The extent of mining practices in the north-western section of the site is uncertain, but appears to cover the north-western half of the site;
- The exact operation and use of chemicals on site prior to 1987 is uncertain.

4.0 Conceptual Site Model

Based on the results of the PCA carried out on the site a conceptual site model (CSM) has been developed.

4.1 Potential Sources of Contamination

Table 4.1 (below) shows the areas of environmental concern (AECs) and associated Chemicals of Concern (COCs) identified for the site.

Table 4.1 – Potential AECs and COCs

AEC	Potentially Contaminating Activity	Potential COCs	Likelihood of Contamination	Comments
1. Use of site for small scale market farming.	Potential use of chemicals pesticides and herbicides.	Heavy Metals, OCPs, OPPs, phenoxy herbicides, Nutrients.	Low	The site owner indicated that chemicals were not used or stored on site.
2. Former site buildings and structures.	Potential use of hazardous building materials.	Asbestos, heavy metals .	Low	No hazardous building materials were observed, however a hazardous materials survey was not completed as part of the scope of work.
3. Potential use of fill in mine subsidence voids.	Potential importation of fill of unknown origin and quality.	TRH, BTEX, PAH, Heavy metals, Asbestos, OCP, OPP.	Low	No widespread use of fill was observed. Small mounds of fill were observed in several locations.
4. Unnamed creek	Potential contamination of unnamed creek from run-off from site.	Heavy Metals, OCPs, OPPs pH, salinity.	Low	Run-off from low pH soils weathered from Greta Coal Measures, could be impacting the surface water

4.2 Potentially Affected Media, Receptors and Exposure Pathways

Table 4.2 summarises the potentially affected media, potential receptors to contamination, and potential and complete exposure pathways.

Table 4.2 – Summary of Potentially Affected Media, Receptors and Exposure Pathways

Consideration	Information
Potentially affected media	Soil Surface water Groundwater
Potential transport mechanisms & exposure pathways	Leaching of soil contaminants to surface water and/or groundwater Direct dermal contact with contaminated soil and surface water Ingestion of contaminated soil Surface water discharge to the unnamed creek which runs through the southern corner and western corner of the site, and flows offsite in a westerly direction to Anvil Creek.
Potential receptors of contamination	<p>Site occupants & construction/maintenance workers Potential exposure via dermal contact with soil and surface water, and ingestion of soil. Contact with groundwater is considered unlikely, taking into account the anticipated depth to groundwater (>5m bgs in a semi confined/confined aquifer), groundwater is not currently extracted on site for beneficial use, and the discharge zone is anticipated to be Anvil Creek located about 500m west of the site.</p> <p>Surface water Contaminants could leach from soils into the unnamed creek.</p> <p>Groundwater Contaminants could leach from soils into groundwater. This is considered a low risk, as potential contaminants are “top-down” source and likely contained within the top 0.5m of the site (if present), and groundwater is expected to be present at depths >5m bgs within a semi confined/confined aquifer.</p>

4.3 Potential and Complete Exposure Pathways

Table 4.3 summarises the potential and complete exposure pathways.

Table 4.3 – Potential and Complete Exposure Pathways

Receptor/Media	Exposure Pathway	Comment
Site occupants and construction/maintenance workers	Complete	There is a potential for site users and workers to be exposed to contaminated soil, if present.
Surface water ecosystems and users	Partially complete	Excess surface water on the site is expected to flow into Anvil Creek To the west of the site. If soil contamination is present, this could run-off into the unnamed creek.

Receptor/Media	Exposure Pathway	Comment
Groundwater users	Incomplete	Groundwater is anticipated to be at depths >5m. Therefore, a complete exposure pathway probably does not exist.

5.0 Discussion

The site history review showed that the site has predominately been used for rural-residential purposes. The site was used for small scale market gardening from about 1987, and the owner indicated that no chemicals were used for this activity. The north-western portion of the site was subjected to coal mining historically. Available information indicates that there was no surface infrastructure associated with the former mining on the site.

Four AECs were identified for the site, relating to: use of the site for small scale market gardening; use of hazardous building materials in the existing residence; potential use of fill of unknown origin and quality to infill mine subsidence voids; and low pH surface water in onsite unnamed creek. These AECs were assessed to have a low likelihood of contamination.

The site is underlain by the Greta Coal Measures, which are known to contain acidic soils and rocks, and can have a high potential to generate acid run-off if not managed appropriately.

The existing residence is proposed to remain, with its own allotment in the proposed subdivision. Based on this, further assessment of the existing residence and its allotment is not proposed.

6.0 Conclusions and Recommendations

Based on the site history and site inspection, it is considered that the site is suitable for the proposed residential development, providing the following is completed:

- The stockpiles of waste materials (concrete, timber, brick, metals etc) are removed and disposed off-site to appropriately licensed recyclers or waste facilities;
- Due to the presence of waste materials, small fill mounds, and the former mining on the northwest portion of the site, an Unexpected Finds Procedure should be prepared and implemented during earthworks. The Unexpected Finds Procedure would provide guidance on identifying potentially contaminated materials, and procedures for handling and management of potentially contaminated materials.

If soils are proposed to be disposed offsite, they will require further assessment. The natural soils (excluding topsoil) may be able to be classified as Virgin Excavated Natural Material (VENM), although assessment for acidic soils and rocks would be required as part of the VENM assessment, given that the site being underlain by the Greta Coal Measures. Other materials may be suitable for assessment as Excavated Natural Material (ENM) under the Resource Recovery Order/Exemption under Part 9, Clause 91 to 93 of the POEO (Waste) Regulation, or they may require waste classification in accordance with the NSW EPA (2014) Waste Classification Guidelines, and disposal to an appropriate licensed landfill or facility.

7.0 Limitations

The findings presented in the report and used as the basis for recommendations presented herein, were obtained using normal, industry accepted practices and standards. To our knowledge, they represent a reasonable interpretation of the general conditions of the site.

Data and opinions contained within the report may not be used in other contexts or for any other purposes without prior review and agreement by Qualtest. If this report is reproduced, it must be in full.

If you have any further questions regarding this report, please do not hesitate to contact the undersigned.



Emma Coleman
Senior Environmental Scientist

8.0 References

Friebel & Nadebaum (2011). *Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater* (technical paper No.10) Guidelines, CRC for Contamination Assessment and Remediation of the Environment (CRC CARE).

NEPC (2013) *National Environmental Protection (Assessment of Site Contamination) Measure 1999*, as amended in 2013, National Environment Protection Council (ASC NEPM, 2013).

NSW Department of Primary Industries (Office of Water) Registered Groundwater Bore Map, accessed from <http://allwaterdata.water.nsw.gov.au/water.stm>, accessed on 23 October 2017.

NSW Land and Property Information, Spatial Information eXchange (SIX) Maps - Topographic Map, accessed from <https://maps.six.nsw.gov.au/>, accessed on 23 October 2017.

NSW Department of Land and Water Conservation (1997) Greta Acid Sulfate Soil Risk Map (1:25,000 scale, Edition Two)

NSW OEH (2011) Guidelines for Consultants Reporting on Contaminated Sites.

NSW EPA (1995) Sampling Design Guidelines

APPENDIX A:

Figures



Source: Google Earth Image 2016.



Client:	KARL WAEGER C/- HUNTER DEVELOPMENT BROKERAGE PTY LTD	Drawing No:	FIGURE 1
Project:	PROPOSED RESIDENTIAL SUBDIVISION	Project No:	NEW17P-0193-AB
Location:	71 BRANXTON STREET, GRETA	Scale:	AS SHOWN
Title:	SITE LOCATION	Date:	09/11/2017



Based on proposed site plan provided by HDB ("Option 1, Lot 1 DP 873228, 71 Branxton Street, Greta", Rev. A, dated 24/07/2017) overlain on Google Earth image.



Client:	KARL WAEGER C/- HUNTER DEVELOPMENT BROKERAGE PTY LTD	Drawing No:	FIGURE 2
Project:	PROPOSED RESIDENTIAL SUBDIVISION	Project No:	NEW17P-0193-AB
Location:	71 BRANXTON STREET, GRETA	Scale:	AS SHOWN
Title:	PROPOSED SUBDIVISION LAYOUT	Date:	09/11/2017



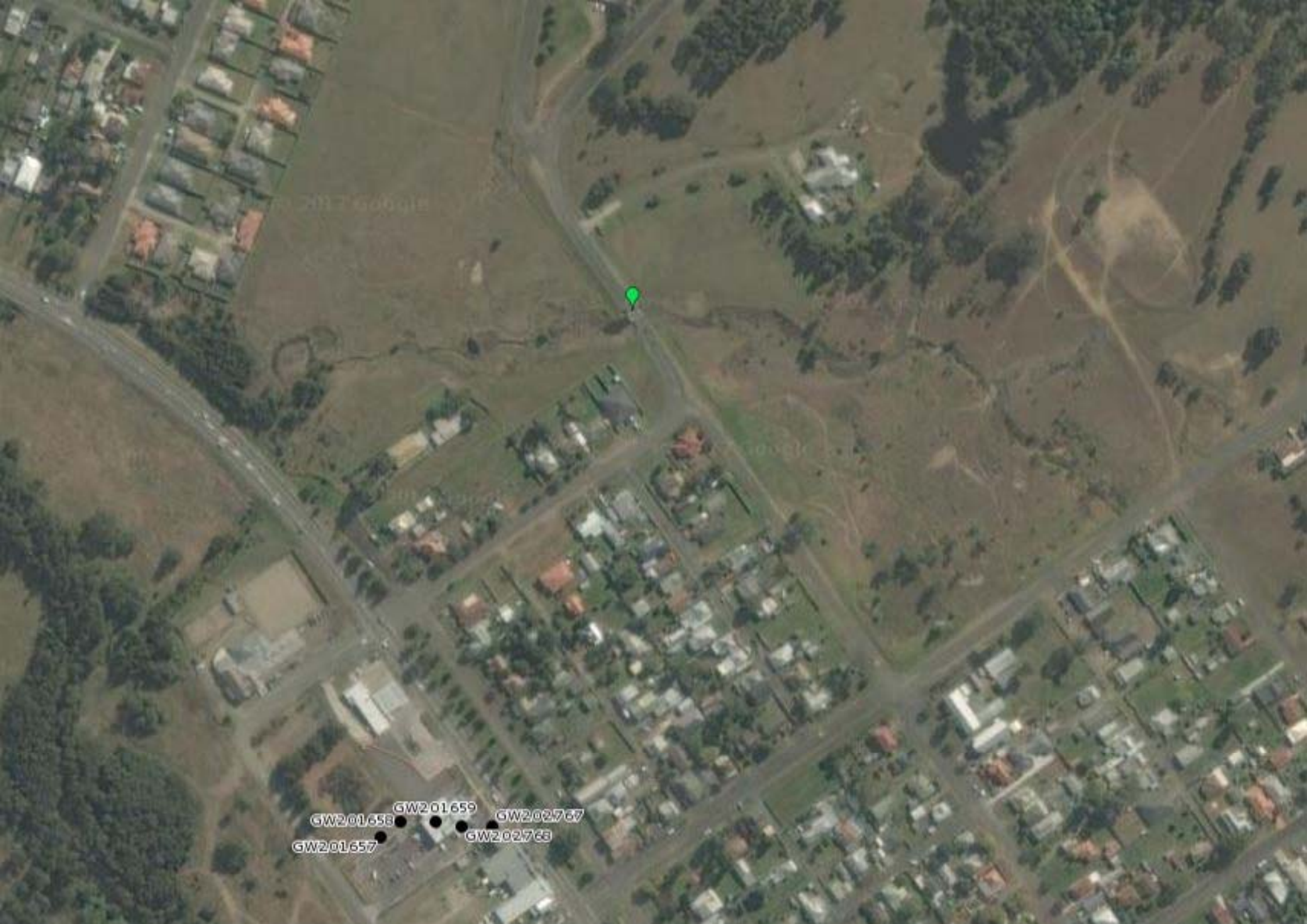
Based on Near Maps image dated 26 September 2017.



Client:	KARL WAEGER C/- HUNTER DEVELOPMENT BROKERAGE PTY LTD	Drawing No:	FIGURE 3
Project:	PROPOSED RESIDENTIAL SUBDIVISION	Project No:	NEW17P-0193-AB
Location:	71 BRANXTON STREET, GRETA	Scale:	AS SHOWN
Title:	SITE LAYOUT	Date:	09/11/2017

APPENDIX B:

Groundwater Bore Data



© 2006 Google

GW201658
GW201657
GW201659
GW202767
GW202768

NSW Office of Water

Work Summary

GW201657
Licence: 20BL172996

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method: Auger - Solid Flight

Owner Type: Private

Commenced Date:
Completion Date: 29/06/2010

Final Depth: 4.20 m
Drilled Depth: 4.20 m

Contractor Name: Total Drilling
Driller: Ryan Alan Whyte
Assistant Driller: C Howle

Property: N A 112 HIGH STREET GRETA
 2334 NSW

Standing Water Level: 2.200

GWMA:
GW Zone:
Salinity:
Yield:

Site Details

Site Chosen By:

County	Parish	Cadastre
Form A: NORTH Licensed:	NORTH.9	21/708439

Region: 20 - Hunter

CMA Map: 9132-1S

River Basin: 210 - HUNTER RIVER
Area/District:
Grid Zone:
Scale:
Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6383370.0
Easting: 348806.0

Latitude: 32°40'37.2"S
Longitude: 151°23'14.8"E

GS Map: -

MGA Zone: 0

Coordinate Source: GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.20	100			Auger - Solid Flight
1		Annulus	Bentonite	0.00	0.80	100	60		PL:Poured/Shovelled
1		Annulus	Waterworn/Rounded	0.80	4.20	100	60		Graded, PL:Poured/Shovelled
1	1	Casing	Pvc Class 18	0.00	1.20	60	50		Seated on Bottom, Kwik-lock
1	1	Opening	Slots - Horizontal	1.20	4.20	60		1	Mechanically Slotted, PVC Class 18, Screwed, SL: 5.0mm, A: 0.40mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.20	4.20	2.00	Unknown	2.20					

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

0.00	0.60	0.60	Fill; sandy clay, brown/orange	Fill	
0.60	2.60	2.00	Sand, silty clayed	Sand	
2.60	4.20	1.60	Sand, Silty clayed, & weathered sandstone	Sand	

Remarks

29/06/2010: Form A Remarks:

Nat Carling, 1-May-2012; Coordinates based on location map provided with the Form-A.

***** End of GW201657 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

NSW Office of Water

Work Summary

GW201658

Licence: 20BL172996

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method: Auger - Solid Flight

Owner Type: Private

Commenced Date:

Completion Date: 29/06/2010

Final Depth: 4.50 m

Drilled Depth: 4.50 m

Contractor Name: Total Drilling

Driller: Ryan Alan Whyte

Assistant Driller: C Howle

Property: N A 112 HIGH STREET GRETA
2334 NSW

Standing Water Level: 2.750

GWMA:
GW Zone:

Salinity:
Yield:

Site Details

Site Chosen By:

County
Form A: NORTH
Licensed:

Parish
NORTH.9

Cadastre
21/708439

Region: 20 - Hunter

CMA Map: 9132-1S

River Basin: 210 - HUNTER RIVER
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6383380.0
Easting: 348819.0

Latitude: 32°40'36.9"S
Longitude: 151°23'15.3"E

GS Map: -

MGA Zone: 0

Coordinate Source: GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.50	100			Auger - Solid Flight
1		Annulus	Bentonite	0.00	1.00	100	60		PL:Poured/Shovelled
1		Annulus	Waterworn/Rounded	1.00	4.50	100	60		Graded, PL:Poured/Shovelled
1	1	Casing	Pvc Class 18	0.00	1.50	60	50		Seated on Bottom, Kwik-lock
1	1	Opening	Slots - Horizontal	1.50	4.50	60		1	Mechanically Slotted, PVC Class 18, Screwed, SL: 5.0mm, A: 0.40mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.75	4.50	1.75	Unknown	2.75					

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

0.00	1.50	1.50	Fill; Gravelly Clayey Sand	Fill	
1.50	3.20	1.70	Sandy Clay; brown	Sandy Clay	
3.20	4.50	1.30	Clay; stiff, grey	Clay	

Remarks

29/06/2010: Form A Remarks:

Nat Carling, 1-May-2012; Coordinates based on location map provided with the Form-A.

***** End of GW201658 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

NSW Office of Water

Work Summary

GW201659
Licence: 20BL172996

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method: Auger - Solid Flight

Owner Type: Private

Commenced Date:
Completion Date: 29/06/2010

Final Depth: 4.50 m
Drilled Depth: 4.50 m

Contractor Name: Total Drilling
Driller: Ryan Alan Whyte
Assistant Driller: C Howle

Property: N A 112 HIGH STREET GRETA
 2334 NSW

Standing Water Level: 2.750

GWMA:
GW Zone:
Salinity:
Yield:

Site Details

Site Chosen By:

County	Parish	Cadastre
Form A: NORTH Licensed:	NORTH.9	21/708439

Region: 20 - Hunter

CMA Map: 9132-1S

River Basin: 210 - HUNTER RIVER
Area/District:
Grid Zone:
Scale:
Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6383381.0
Easting: 348842.0

Latitude: 32°40'36.9"S
Longitude: 151°23'16.2"E

GS Map: -

MGA Zone: 0

Coordinate Source: GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.50	100			Auger - Solid Flight
1		Annulus	Bentonite	0.00	1.00	100	60		PL:Poured/Shovelled
1		Annulus	Waterworn/Rounded	1.00	4.50	100	60		Graded, PL:Poured/Shovelled
1	1	Casing	Pvc Class 18	0.00	1.50	60	50		Seated on Bottom, Kwik-lock
1	1	Opening	Slots - Horizontal	1.50	4.50	60		1	Mechanically Slotted, PVC Class 18, Screwed, SL: 5.0mm, A: 0.40mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.75	4.50	1.75	Unknown	2.75					

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

0.00	0.50	0.50	Fill; Gravelly Sand	Fill	
0.50	1.00	0.50	Fill; Sandy Clay	Fill	
1.00	2.50	1.50	Silty Clay; orange/grey	Silty Clay	
2.50	3.60	1.10	Sand, brown, moist	Sand	
3.60	4.50	0.90	Sand, Clayey Silty	Sand	

Remarks

29/06/2010: Form A Remarks:

Nat Carling, 1-May-2012; Coordinates based on location map provided with the Form-A.

***** End of GW201659 *****

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NSW Office of Water

Work Summary

GW202767

Licence: 20BL173204

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method: Auger - Solid Flight

Owner Type: Private

Commenced Date:
Completion Date: 12/07/2012

Final Depth: 4.10 m
Drilled Depth: 4.10 m

Contractor Name: FICO

Driller: Mark Lynch

Assistant Driller: Dean Gardiner

Property: N A 112-114 HIGH STREET GRETA
2334 NSW

Standing Water Level: 2.300

GWMA:
GW Zone:

Salinity:
Yield:

Site Details

Site Chosen By:

County
Form A: NORTH
Licensed:

Parish
NORTH.9

Cadastre
1/1184140

Region: 20 - Hunter

CMA Map: 9132-1S

River Basin: 210 - HUNTER RIVER
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6383378.0
Easting: 348879.0

Latitude: 32°40'37.0"S
Longitude: 151°23'17.6"E

GS Map: -

MGA Zone: 0

Coordinate Source: GPS - Global Positioning System

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.10	100			Auger - Solid Flight
1		Annulus	Waterworn/Rounded	0.00	0.30	100	60		Graded, PL:Pooured/Shovelled
1		Annulus	Bentonite/Grout	0.30	0.80	100	60		PL:Pooured/Shovelled
1		Annulus	Waterworn/Rounded	0.80	4.10	100	60		Graded, PL:Pooured/Shovelled
1	1	Casing	Pressure Cemented Casing	0.00	1.10	60	50		Seated on Bottom, Screwed
1	1	Opening	Slots - Horizontal	1.10	4.10	60		1	Mechanically Slotted, PVC Class 18, Screwed, SL: 5.0mm, A: 1.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.20	2.80	0.60	Unknown	2.30					

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.90	0.90	Fill; gravelly sandy clay	Fill	
0.90	2.20	1.30	Fill; sandy clay	Fill	
2.20	4.10	1.90	Clay, sandy; refusal on rock	Clay	

Remarks

12/07/2012: Form A Remarks:

Nat Carling, 3-mar-2014; GPS provided by the drillers.

*** End of GW202767 ***

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

NSW Office of Water

Work Summary

GW202768

Licence: 20BL173205

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method: Auger - Solid Flight

Owner Type: Private

Commenced Date:
Completion Date: 12/07/2012

Final Depth: 4.40 m
Drilled Depth: 4.40 m

Contractor Name: FICO

Driller: Mark Lynch

Assistant Driller: Dean Gardiner

Property: N A 112-114 HIGH STREET GRETA
2334 NSW

Standing Water Level: 2.800

GWMA:
GW Zone:

Salinity:
Yield:

Site Details

Site Chosen By:

County
Form A: NORTH
Licensed:

Parish
NORTH.9

Cadastre
1/1184140

Region: 20 - Hunter

CMA Map: 9132-1S

River Basin: 210 - HUNTER RIVER
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6383378.0
Easting: 348859.0

Latitude: 32°40'37.0"S
Longitude: 151°23'16.8"E

GS Map: -

MGA Zone: 0

Coordinate Source: GPS - Global Positioning System

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.40	100			Auger - Solid Flight
1		Annulus	Waterworn/Rounded	0.00	0.40	100	60		Graded, PL:Pooured/Shovelled
1		Annulus	Bentonite	0.40	0.90	100	60		PL:Pooured/Shovelled
1		Annulus	Waterworn/Rounded	0.90	4.40	100	60		Graded, PL:Pooured/Shovelled
1	1	Casing	Pvc Class 18	0.00	1.40	60	50		Seated on Bottom, Screwed
1	1	Opening	Slots - Horizontal	1.40	4.40	60		1	Mechanically Slotted, PVC Class 18, Screwed, SL: 50.0mm, A: 1.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.50	3.00	0.50	Unknown	2.80					

Geologists Log

Drillers Log

From	To	Thickness	Drillers Description	Geological Material	Comments
------	----	-----------	----------------------	---------------------	----------

(m)	(m)	(m)		
0.00	0.60	0.60	Fill; gravelly clay	Fill
0.60	2.20	1.60	Fill; sandy clay	Fill
2.20	4.40	2.20	Clay, sandy, refusal on rock	Clay

Remarks

12/07/2012: Form A Remarks:

Nat Carling, 3-Mar-2014; GPS provided by the drillers.

***** End of GW202768 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

APPENDIX C:

Historical Titles

Requested Parcel : Lot 1 DP 873220

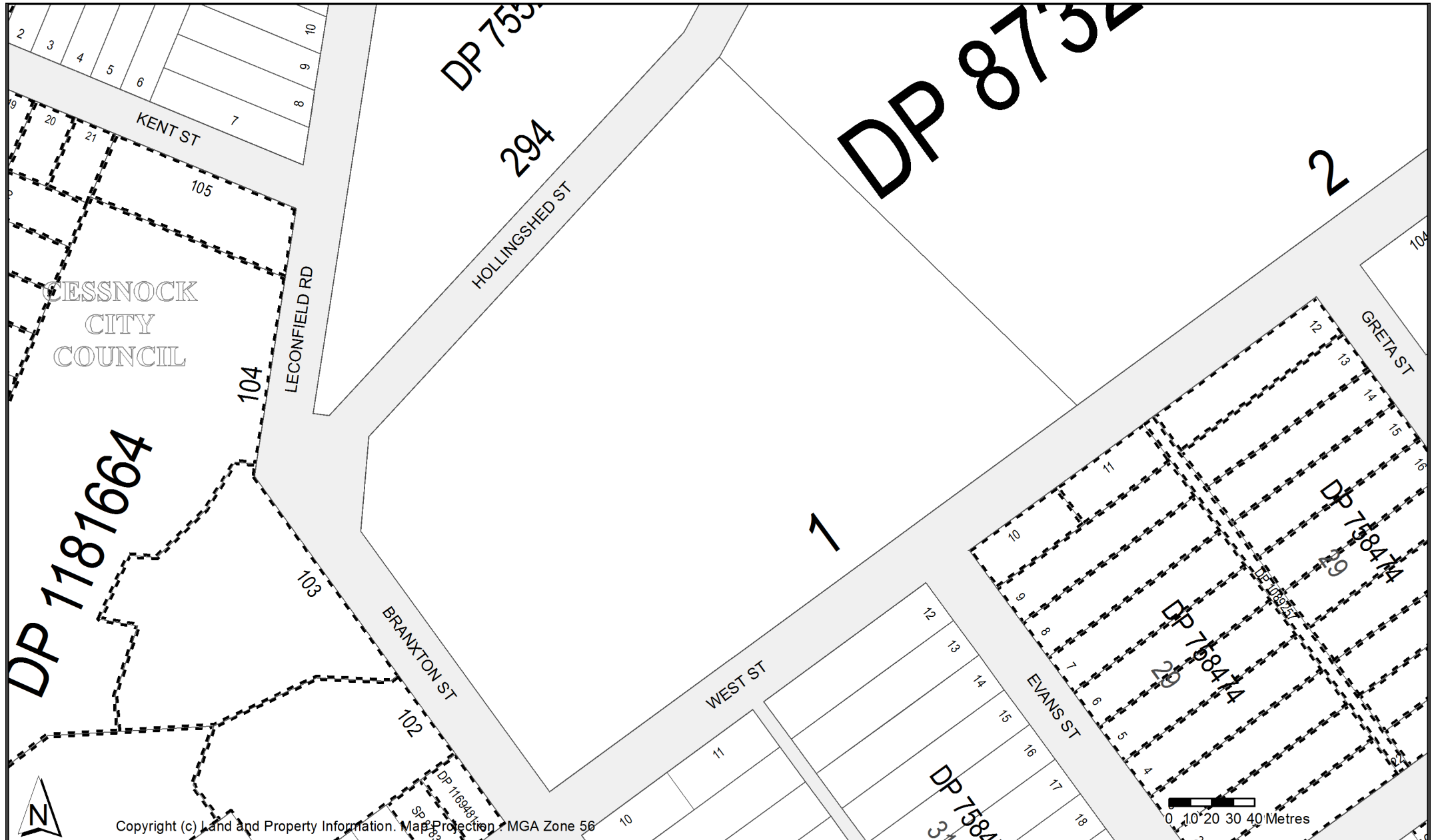
Identified Parcel : Lot 1 DP 873220

Locality : GRETA

LGA : CESSNOCK

Parish : BRANXTON

County : NORTHUMBERLAND



Copyright (c) Land and Property Information. Map Projection: MGA Zone 56

Requested Parcel : Lot 1 DP 873220

Identified Parcel : Lot 1 DP 873220

Locality : GRETA

LGA : CESSNOCK



Parish : BRANXTON

County : NORTHUMBERLAND

Status	Surv/Comp	Purpose
--------	-----------	---------

DP758474

Lot(s): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 Section : 29

 CA96824 - LOTS 1-21 SECTION 29 DP758474 AND LOT 22 DP1089257			
 NSW GAZ.	17-06-1977	Folio : 2429	
VESTED IN COUNCIL AS PUBLIC RESERVE LOTS 1-21 SECTION 29 DP758474 AND LOT 22 DP1089257			



DP1043392

Lot(s): 6

 DP852037	HISTORICAL	SURVEY	SUBDIVISION
 DP1027360	REGISTERED	SURVEY	SUBDIVISION

DP1089257

Lot(s): 22

 CA96824 - LOTS 1-21 SECTION 29 DP758474 AND LOT 22 DP1089257			
 NSW GAZ.	17-06-1977	Folio : 2429	
VESTED IN COUNCIL AS PUBLIC RESERVE LOTS 1-21 SECTION 29 DP758474 AND LOT 22 DP1089257			

DP1102576

Lot(s): 12

 DP5904	HISTORICAL	SURVEY	UNRESEARCHED
--	------------	--------	--------------

DP1118026

Lot(s): 7, 12, 13, 14, 15, 17, 19, 20, 21

 DP829250	HISTORICAL	SURVEY	DELIMITATION
--	------------	--------	--------------



DP1169481

Lot(s): 5



 DP1087	HISTORICAL	COMPILATION	UNRESEARCHED
--	------------	-------------	--------------

DP1181664

Lot(s): 101, 102, 103, 104, 105

 DP755211	HISTORICAL	COMPILATION	CROWN ADMIN NO.
 NSW GAZ.	07-03-2008	Folio : 1458	
REVOCATION OF RESERVATION OF CROWN LAND RESERVE NO. 755211 - LOT 142 DP755211			

SP87834

 DP1087	HISTORICAL	COMPILATION	UNRESEARCHED
 DP1169481	REGISTERED	SURVEY	REDEFINITION

Caution: For all **ACTIVITY PRIOR to SEPT 2002** you must refer to the RGs Charting and Reference Maps.

Plan	Surv/Comp	Purpose
DP1087	COMPILATION	UNRESEARCHED
DP5904	SURVEY	UNRESEARCHED
DP755211	COMPILATION	CROWN ADMIN NO.
DP758474	COMPILATION	CROWN ADMIN NO.
DP850912	SURVEY	SUBDIVISION
DP852037	SURVEY	SUBDIVISION
DP873220	SURVEY	SUBDIVISION
DP1043392	SURVEY	SUBDIVISION
DP1089257	COMPILATION	LIMITED FOLIO CREATION
DP1102576	SURVEY	SUBDIVISION
DP1118026	SURVEY	SUBDIVISION
DP1118026	UNRESEARCHED	SUBDIVISION
DP1169481	SURVEY	REDEFINITION
DP1169481	UNRESEARCHED	REDEFINITION
DP1181664	SURVEY	SUBDIVISION
SP87834	COMPILATION	STRATA PLAN

PLAN OF PORTION 157

PARISH BRANXTON
 LAND DISTRICT MAITLAND

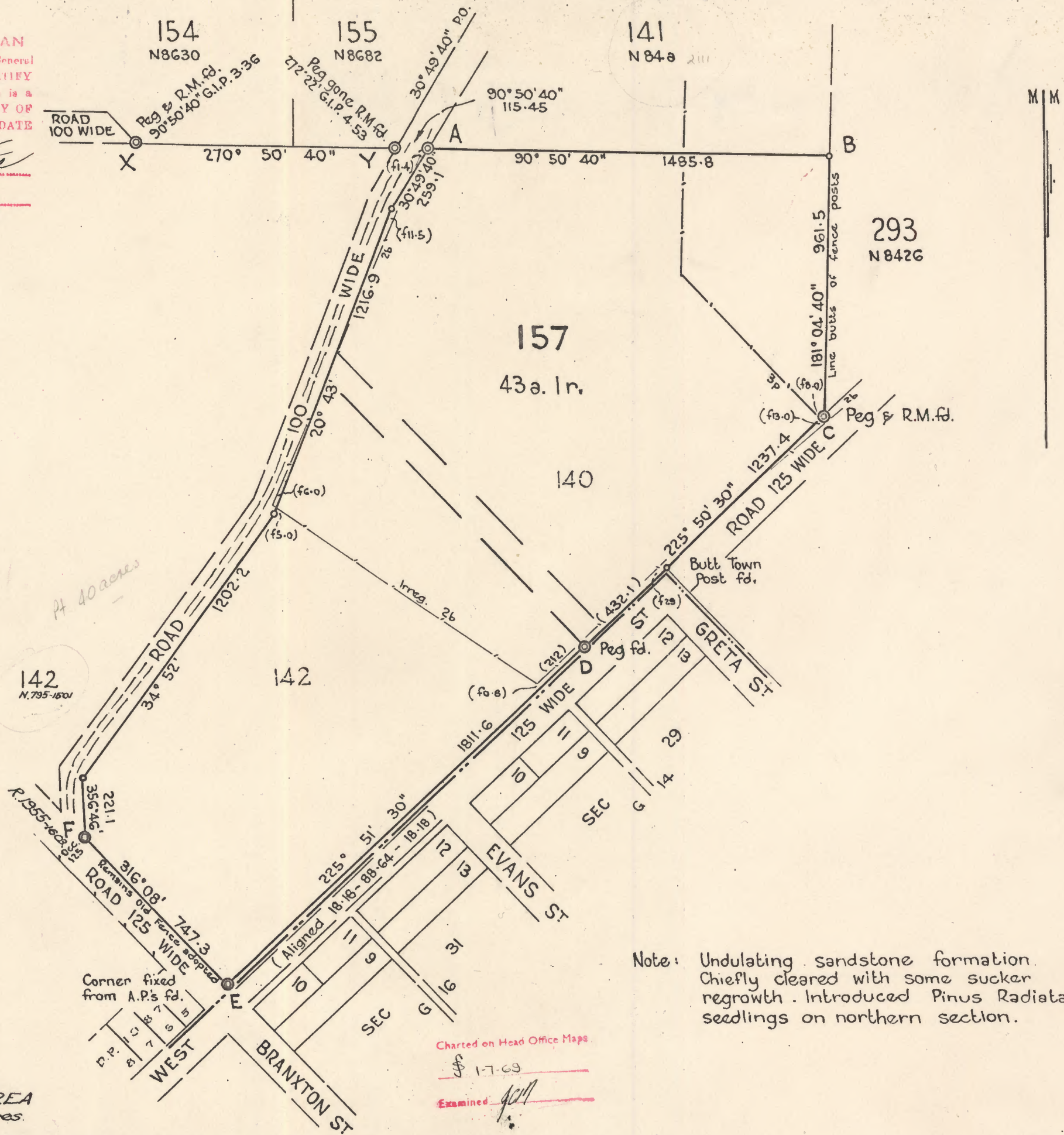
COUNTY NORTHUMBERLAND
 CITY OF GREATER CESSNOCK

NOTATION PLAN

I, the Officer-in-Charge, General
 Drafting Branch, CERTIFY
 that this notation plan is a
 PHOTOGRAPHIC COPY OF
 THE ORIGINAL AT DATE
 OF ITS APPROVAL.

Alvate

DATE 20 JUN 1969



Note: Undulating sandstone formation.
 Chiefly cleared with some sucker
 regrowth. Introduced Pinus Radiata
 seedlings on northern section.

SURROUND AREA
 43.37268 Acres.

SCALE 4 CHAIN TO AN INCH. All measurements shown in Links.

CANCELS: Part Plans N.84a-2111 and N.795-1501
 WITHIN: Council of the City of Greater Cessnock Town and Country Planning Scheme.
 : Suburban Lands; Town of Greta. Proclaimed 3-10-1891.
 : R.2664 from the Leasing Provisions of the Mining Act, 1906-52. Not'd 9-1-1969
 Title limited to the surface and to a depth of 50 ft. below the surface.
 Portion 157: Sp.L. 65-31 Clement Patrick WITHERS.

CORNER	BEARING	FROM	DISTANCE	NO. ON TREE
A	90° 50' 40"	G.I.P.	5.0	157
		Peg on Corner		
B	260° 30'	Gum	62.7	157
C	1° 04' 40"	G.I.P.	3.27	
D	45° 52'	G.I.P.	5.2	
E	45° 52'	G.I.P.	5.0	157
		Peg on Corner		
F	136° 08'	G.I.P.	5.0	157
		Peg on Corner		

AZIMUTH TAKEN FROM XY
 FIELD BOOK LDGG06 PAGES 1-4

I, Jan Harold Marshall at Cessnock
 a Surveyor registered under the Surveyors Act, 1929-1946, hereby
 certify that the survey represented in this plan is accurate and has
 been made by me under my immediate supervision in accordance with
 the Survey Practice Regulations, 1933, and the special requirements
 of the Department of Lands and was completed on 8th Nov.

Signature Jan Marshall

Surveyor registered under the Surveyors Act, 1929-1946

CHECKED & CHARTED Richard Cairns 17/69
 PLAN APPROVED RP

Authorised Officer 18-3-1969

PLAN MICROFILMED
 NO ADDITIONS OR AMENDMENTS TO BE MADE

This space for office use only.

Requested Parcel : Lot 1 DP 873220

Identified Parcel : Lot 1 DP 873220

Locality : GRETA

LGA : CESSNOCK



Parish : BRANXTON

County : NORTHUMBERLAND



Status	Surv/Comp	Purpose
--------	-----------	---------

DP758474



Lot(s): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 Section : 29

	CA96824 - LOTS 1-21 SECTION 29 DP758474 AND LOT 22 DP1089257		
	NSW GAZ. 17-06-1977		Folio : 2429
	VESTED IN COUNCIL AS PUBLIC RESERVE LOTS 1-21 SECTION 29 DP758474 AND LOT 22 DP1089257		


DP1043392

	DP852037	HISTORICAL	SURVEY	SUBDIVISION
	DP1027360	REGISTERED	SURVEY	SUBDIVISION


DP1089257

	CA96824 - LOTS 1-21 SECTION 29 DP758474 AND LOT 22 DP1089257		
	NSW GAZ. 17-06-1977		Folio : 2429
	VESTED IN COUNCIL AS PUBLIC RESERVE LOTS 1-21 SECTION 29 DP758474 AND LOT 22 DP1089257		

DP1102576

	DP5904	HISTORICAL	SURVEY	UNRESEARCHED
---	--------	------------	--------	--------------



DP1118026

	DP829250	HISTORICAL	SURVEY	DELIMITATION
---	----------	------------	--------	--------------


DP1169481

	DP1087	HISTORICAL	COMPILATION	UNRESEARCHED
---	--------	------------	-------------	--------------

DP1181664

	DP755211	HISTORICAL	COMPILATION	CROWN ADMIN NO.
	NSW GAZ. 07-03-2008			Folio : 1458
	REVOCATION OF RESERVATION OF CROWN LAND RESERVE NO. 755211 - LOT 142 DP755211			

SP87834

	DP1087	HISTORICAL	COMPILATION	UNRESEARCHED
	DP1169481	REGISTERED	SURVEY	REDEFINITION

Caution: For all **ACTIVITY PRIOR to SEPT 2002** you must refer to the RGs Charting and Reference Maps.

Plan	Surv/Comp	Purpose
DP1087	COMPILATION	UNRESEARCHED
DP5904	SURVEY	UNRESEARCHED
DP755211	COMPILATION	CROWN ADMIN NO.
DP758474	COMPILATION	CROWN ADMIN NO.
DP850912	SURVEY	SUBDIVISION
DP852037	SURVEY	SUBDIVISION
DP873220	SURVEY	SUBDIVISION
DP1043392	SURVEY	SUBDIVISION
DP1089257	COMPILATION	LIMITED FOLIO CREATION
DP1102576	SURVEY	SUBDIVISION
DP1118026	SURVEY	SUBDIVISION
DP1118026	UNRESEARCHED	SUBDIVISION
DP1169481	SURVEY	REDEFINITION
DP1169481	UNRESEARCHED	REDEFINITION
DP1181664	SURVEY	SUBDIVISION
SP87834	COMPILATION	STRATA PLAN

RP 13

STAMP DUTY

OFFICE FOR REVENUE
(NEW SOUTH WALES)
1988/89 R73
STAMP
\$12.00
DUTY
CHIEF COMMISSIONER



Y580778



TRANSFER
REAL PROPERTY ACT, 1900

T	CA	101	X	R/1
	\$	44		

DESCRIPTION OF LAND Note (a)	Torrens Title Reference	If Part Only, Delete Whole and Give Details	Location
	Identifier 157/755211	WHOLE	at Greta
TRANSFEROR Note (b)	KARL WAEGER		

ESTATE Note (c) (the abovenamed TRANSFEROR) hereby acknowledges receipt of the consideration of \$27,000.00 and transfers an estate in fee simple as to his one-third share as tenant in common in the land above described to the TRANSFEREE

TRANSFEREE Note (d)	HELA EVELYNE WAEGER of 62 Wyndham Street, Greta, Supervisor	OFFICE USE ONLY
TENANCY Note (e)	as joint tenants/tenants in common	OVER

PRIOR ENCUMBRANCES Note (f) subject to the following PRIOR ENCUMBRANCES 1. Nil
2. 3.

DATE 17th August 1989

We hereby certify this dealing to be correct for the purposes of the Real Property Act, 1900.

EXECUTION Note (g) Signed in my presence by the transferor who is personally known to me

Signature of Witness
BARBARA IKENE TROWBRIDGE
Name of Witness (BLOCK LETTERS)
9 RAILWAY STREET, CESSNOCK 2325
Address and occupation of Witness

Signature of Transferor

JUSTICE OF THE PEACE.

Signed in my presence by the transferee who is personally known to me

Note (g) Signature of Witness

Name of Witness (BLOCK LETTERS)

Address and occupation of Witness

Signature of Transferee
Solicitor
R.P. Mallik

TO BE COMPLETED BY LODGING PARTY
Notes (h) and (i)

LODGED BY Morris, Hayes & Edgar LAW STATIONERS 99 ELIZABETH STREET SYDNEY AK6089 DX 420 232-2411 Ref: 35 D Delivery Box Number	LOCATION OF DOCUMENTS	
	CT	OTHER
	<input checked="" type="checkbox"/>	Ministers CONSENT
	Herewith	<input checked="" type="checkbox"/>
	In L.T.O. with	
	Produced by	
Checked EB3	Passed	REGISTERED -19
Signed	Extra Fee	Secondary Directions
		Delivery Directions

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE

18/10/2017 8:50AM

FOLIO: 1/873220

First Title(s): 157/755211

Prior Title(s): 157/755211

Recorded	Number	Type of Instrument	C.T. Issue
11/12/1997	DP873220	DEPOSITED PLAN	FOLIO CREATED EDITION 1
12/12/1997	3601651	TRANSFER	EDITION 2
31/3/2000	6682358	MORTGAGE	EDITION 3
17/6/2004	AA726158	MORTGAGE	EDITION 4

*** END OF SEARCH ***

advlegs

PRINTED ON 18/10/2017

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* ANY ENTRIES PRECEDED BY AN ASTERISK DO NOT APPEAR ON THE CURRENT EDITION OF THE CERTIFICATE OF TITLE
WARNING: THE INFORMATION APPEARING UNDER **NOTATIONS** HAS NOT BEEN FORMALLY RECORDED IN THE REGISTER.

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE

18/10/2017 8:52AM

FOLIO: 157/755211

First Title(s): 157/755211

Prior Title(s): CROWN LAND

Recorded	Number	Type of Instrument	C.T. Issue
24/9/1987	FI305504	FOLIO INSTRUCTION	FOLIO CREATED EDITION 1
22/2/1989	Y196397	APPLICATION FOR RECORDING OF ACTION AFFECTING CROWN HOLDING	
12/9/1989	Y580778	TRANSFER	EDITION 2
21/11/1997	3601649	CHANGE OF NAME	
21/11/1997	3601650	CHANGE OF NAME	
11/12/1997	DP873220	DEPOSITED PLAN	FOLIO CANCELLED
25/8/1999	6130240	DEPARTMENTAL DEALING	

*** END OF SEARCH ***

advlegs

PRINTED ON 18/10/2017

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WARNING: THE INFORMATION APPEARING UNDER **NOTATIONS** HAS NOT BEEN FORMALLY RECORDED IN THE REGISTER.

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 1/873220

SEARCH DATE	TIME	EDITION NO	DATE
18/10/2017	8:49 AM	4	17/6/2004

LAND

LOT 1 IN DEPOSITED PLAN 873220
AT GRETA
LOCAL GOVERNMENT AREA CESSNOCK
PARISH OF BRANXTON COUNTY OF NORTHUMBERLAND
TITLE DIAGRAM DP873220

FIRST SCHEDULE

KARL HEINZ WAEGER (T 3601651)

SECOND SCHEDULE (6 NOTIFICATIONS)

- 1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE MEMORANDUM S700000B
- 2 EXCEPTING LAND BELOW A DEPTH FROM THE SURFACE OF 20 METRES
- 3 DP873220 EASEMENT FOR ELECTRICITY TRANSMISSION LINES 10 WIDE AND 15 WIDE AFFECTING THE PART(S) SHOWN SO BURDENED IN THEIN THE TITLE DIAGRAM
- 4 DP873220 EASEMENT FOR WATER SUPPLY 3 WIDE AFFECTING THE PART(S) SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 5 6682358 MORTGAGE TO WESTPAC BANKING CORPORATION
- 6 AA726158 MORTGAGE TO WESTPAC BANKING CORPORATION

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

advlegs

PRINTED ON 18/10/2017

GlobalX Information Services Pty Ltd (ABN 99 073 436 414) an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with section 96B(2) of the Real Property Act 1900.
* ANY ENTRIES PRECEDED BY AN ASTERISK DO NOT APPEAR ON THE CURRENT EDITION OF THE CERTIFICATE OF TITLE
WARNING: THE INFORMATION APPEARING UNDER NOTATIONS HAS NOT BEEN FORMALLY RECORDED IN THE REGISTER.

APPENDIX D:

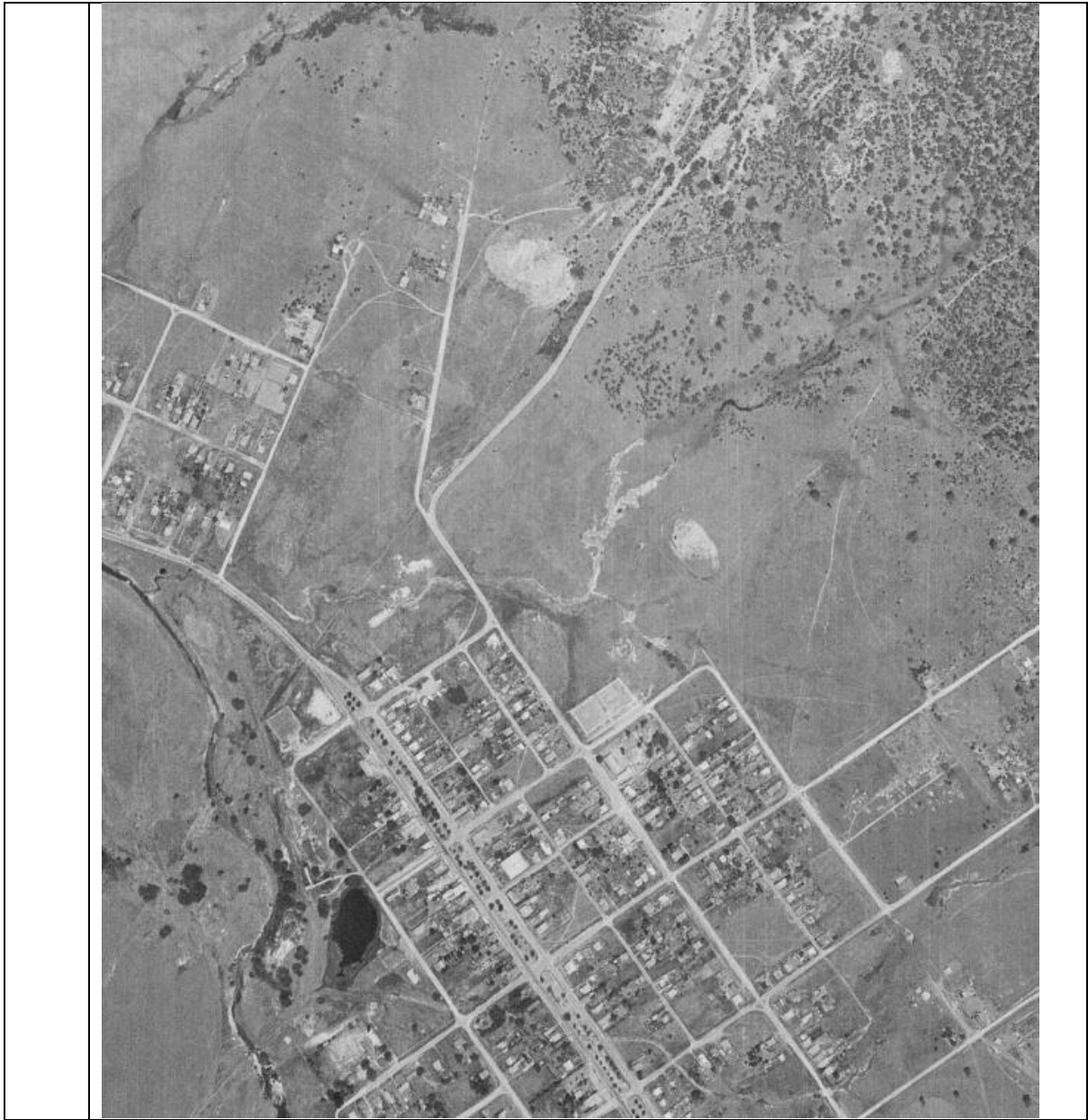
Aerial Photographs

Aerial Photographs

1963



Aerial Photographs



Aerial Photographs

1974



Aerial Photographs



Aerial Photographs

1984



Aerial Photographs

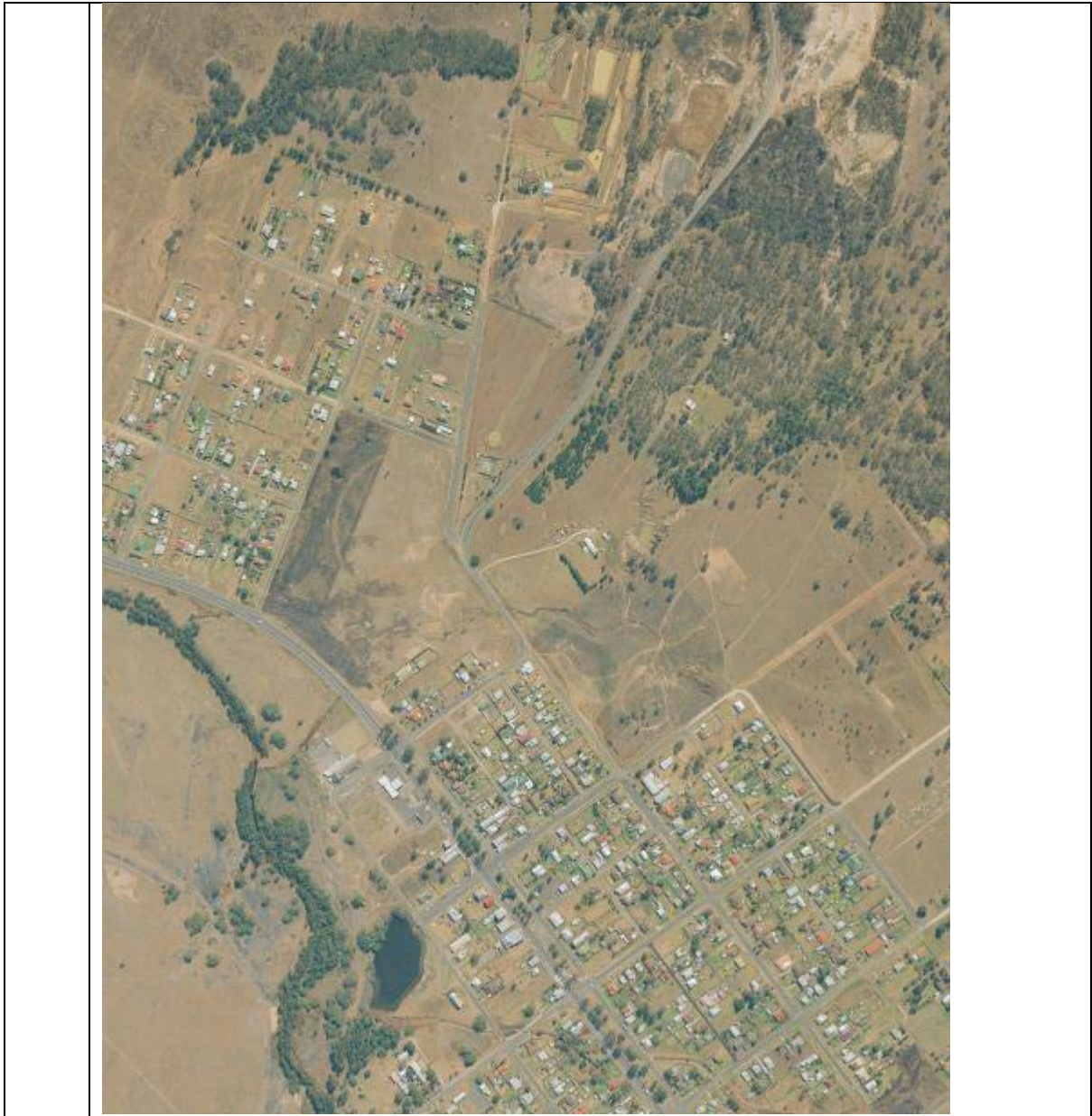


Aerial Photographs

1994



Aerial Photographs



APPENDIX E:

Site Photographs



Photograph 1 - Southeast portion of site, showing Anvil Creek tributary.



Photograph 2 - View from south-eastern portion of site facing north-northwest.



Photograph 3 - View from south-southwestern part of the site facing south, showing site entrance from Branxton Street



Photograph 4 - View from northwestern portion of the site facing south, looking at residence.



Client:	HUNTER DEVELOPMENT BROKERAGE	Photo No:	3 to 4
Project:	PROPOSED RESIDENTIAL SUBDIVISION	Project No:	NEW17P-0193
Location:	71 BRANXTON STREET, GRETA NSW	Date Taken:	24/10/2017
Title:	SITE PHOTOGRAPHS	Date Compiled:	9/11/2017



Photograph 5 - Showing shipping containers located to north of residence



Photograph 6 - Showing waste/construction materials located north-west of site



Client:	HUNTER DEVELOPMENT BROKERAGE	Photo No:	5 to 6
Project:	PROPOSED RESIDENTIAL SUBDIVISION	Project No:	NEW17P-0193
Location:	71 BRANXTON STREET, GRETA NSW	Date Taken:	24/10/2017
Title:	SITE PHOTOGRAPHS	Date Compiled:	9/11/2017



Photograph 7 - Waste materials, and one of the small fill mounds observed



Photograph 8 - Small derelict building in northern part of the site.



Photograph 9 - Example of pothole from mine subsidence in northwestern portion of the site.



Photograph 10 - Pothole in southern portion of the site, infilled with fill including boulders.

APPENDIX F:
NSW EPA Search

Contaminated land

[Management of contaminated land](#)[Licences and site auditor](#)[Land petroleum storage](#)[Sites under the CLM Act](#)[Amendment](#)[Guidance](#)[Record of notices](#)[View the record](#)[View the record](#)[Help tips](#)[Home](#)[View contaminated sites](#)[EPA](#)[Frequently asked questions](#)[Home](#) [Contaminated land](#) [Record of notices](#)

Search results

Your search for: LGA: Cessnock City Council

Matched 4 notices relating to

[Search Again](#)[Refine Search](#)

Suburb	Address	Site Name	Notices related to this site
KURRI KURRI	279-281 Lang STREET	Caltex Service Station	3 current
NORTH ROTHBURY	Main ROAD	Ayrefield Colliery	1 current

Page 1 of 1

APPENDIX G:

Section 149 Certificate



PLANNING CERTIFICATE
ISSUED UNDER SECTION 149(2) and (5)
ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979
and
ENVIRONMENTAL PLANNING & ASSESSMENT REGULATION
2000

Emma Coleman
8 Ironbark Close
Warabook
New South Wales 2304

Applicants Reference
HDB Greta

CERTIFICATE DETAILS

CERTIFICATE NUMBER: 2822
DATE OF CERTIFICATE: 18/10/2017

PROPERTY DETAILS

ADDRESS: 71 Branxton Street GRETA NSW 2334
TITLE: LOT: 1 DP: 873220
PARCEL NO.: 27340

BACKGROUND INFORMATION

This certificate provides information on how the relevant parcel of land may be developed, including the planning restrictions that apply to development of the land, as at the date the certificate is issued. The certificate contains information Council is aware of through its records and environmental plans, along with data supplied by the State Government. The details contained in this certificate are limited to that required by Section 149 of the *Environmental Planning and Assessment Act, 1979*.

TELEPHONE: (02) 4993 4100. FAX (02) 4993 2500
POSTAL ADDRESS: PO BOX 152, CESSNOCK, 2325 or DX 21502 CESSNOCK
EMAIL ADDRESS: council@cessnock.nsw.gov.au Visit us at: <http://www.cessnock.nsw.gov.au>
ABN 60 919 148 928



PLANNING CERTIFICATE
ISSUED UNDER SECTION 149(2) and (5)
ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979
and
ENVIRONMENTAL PLANNING & ASSESSMENT REGULATION
2000

1. Name of relevant planning instruments and DCPs

- (1) **The name of each environmental planning instrument that applies to the carrying out of development on the land:**

[Cessnock Local Environmental Plan 2011](#)

[Hunter Regional Plan 2036](#)

[State Environmental Planning Policy No 14—Coastal Wetlands](#)

[State Environmental Planning Policy No 21—Caravan Parks](#)

[State Environmental Planning Policy No 30—Intensive Agriculture](#)

[State Environmental Planning Policy No 33—Hazardous and Offensive Development](#)

[State Environmental Planning Policy No 36—Manufactured Home Estates](#)

[State Environmental Planning Policy No 44—Koala Habitat Protection](#)

[State Environmental Planning Policy No 50—Canal Estate Development](#)

[State Environmental Planning Policy No 52—Farm Dams and Other Works in Land and Water Management Plan Areas](#)

[State Environmental Planning Policy No 55—Remediation of Land](#)

[State Environmental Planning Policy No 62—Sustainable Aquaculture](#)

[State Environmental Planning Policy No 64—Advertising and Signage](#)

[State Environmental Planning Policy No 65—Design Quality of Residential Apartment Development](#)

[State Environmental Planning Policy No 70—Affordable Housing \(Revised Schemes\)](#)

[State Environmental Planning Policy No 71—Coastal Protection](#)

[State Environmental Planning Policy \(Affordable Rental Housing\) 2009](#)

[State Environmental Planning Policy \(Building Sustainability Index: BASIX\) 2004](#)

[State Environmental Planning Policy \(Educational Establishments and Child Care Facilities\) 2017](#)

[State Environmental Planning Policy \(Exempt and Complying Development Codes\) 2008](#)

[State Environmental Planning Policy \(Housing for Seniors or People with a Disability\) 2004](#)

[State Environmental Planning Policy \(Infrastructure\) 2007](#)

[State Environmental Planning Policy \(Integration and Repeals\) 2016](#)

[State Environmental Planning Policy \(Mining, Petroleum Production and Extractive Industries\) 2007](#)

[State Environmental Planning Policy \(Miscellaneous Consent Provisions\) 2007](#)

[State Environmental Planning Policy \(Penrith Lakes Scheme\) 1989](#)

[State Environmental Planning Policy \(Rural Lands\) 2008](#)

[State Environmental Planning Policy \(State and Regional Development\) 2011](#)

[State Environmental Planning Policy \(State Significant Precincts\) 2005](#)

[State Environmental Planning Policy \(Vegetation in Non-Rural Areas\) 2017](#)



PLANNING CERTIFICATE
ISSUED UNDER SECTION 149(2) and (5)
ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979
and
ENVIRONMENTAL PLANNING & ASSESSMENT REGULATION
2000

- (2) **The name of each proposed environmental planning instrument that will apply to the carrying out of development on the land and that is or has been the subject of community consultation or on public exhibition under the Act (unless the Director-General has notified the council that the making of the proposed instrument has been deferred indefinitely or has not been approved):**

There are no Draft Local Environmental Plan/s affecting this land.

- (3) **The name of each development control plan that applies to the carrying out of development on the land.**

Cessnock Development Control Plan 2010

2. Zoning and land use under relevant LEPs

- (a) **The land is identified as being in:**

RU2 Rural Landscape under the Cessnock Local Environmental Plan 2011

- (b) **The purpose for which development may be carried out without consent within the zone;**
(c) **The purposes for which development may not be carried out within the zone except with development consent; and**
(d) **The purpose for which development is prohibited within the zone.**

RU2 Rural Landscape

- 2) Permitted without consent

Extensive agriculture; Home occupations; Horticulture

- 3) Permitted with consent

Cellar door premises; Dual occupancies; Dwelling houses; Environmental protection works; Farm buildings; Garden centres; Hardware and building supplies; Health consulting rooms; Home industries; Hospitals; Landscaping material supplies; Neighbourhood shops; Plant nurseries; Pubs; Restaurants or cafes; Roads; Roadside stalls; Rural supplies; Self-storage units; Timber yards; Vehicle sales or hire premises; Any other development not specified in item 2 or 4

- 4) Prohibited

Boat building and repair facilities; Car parks; Charter and tourism boating facilities; Commercial premises; Depots; Entertainment facilities; Exhibition homes; Exhibition villages; Freight transport facilities; Health services facilities; Heavy industrial storage establishments; Heliports; Highway service centres; Home occupations (sex services); Industrial retail outlets; Industrial training facilities; Industries; Marinas; Mooring pens; Moorings; Mortuaries; Passenger transport facilities; Recreation facilities (indoor); Residential accommodation; Restricted premises; Sex services premises; Storage premises; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Warehouse or distributions centres; Wharf or boating facilities; Wholesale supplies



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ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979
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2000

- (e) **Whether any development standards applying to the land fix minimum land dimensions for the erection of a dwelling-house on the land and, if so, the minimum land dimensions so fixed:**

No

- (f) **Whether the land includes or comprises critical habitat:**

The land is not land that includes or comprises critical habitat declared to be critical habitat under Part 3 of the Threatened Species Conservation Act 1995.

- (g) **Whether the land is a conservation area (however described):**

The land is not a conservation area under the Cessnock Local Environmental Plan 2011.

- (h) **Whether an item of environmental heritage (however described) is situated on the land:**

An item of environmental heritage identified in Cessnock Local Environmental Plan 2011 is not situated on the land.

3. Complying Development

- (1) **Complying development may be carried out on the land under each of the following codes for complying development, to the extent stated, because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*.**
- (2) **Complying development may not be carried out on the land under each of the following codes for complying development, to the extent and for the reasons stated under clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*.**

Housing Code

Complying Development may not be carried out under the Housing Code as the subject land falls within a Local Environmental Plan zone that does not meet the requirements of the code.

Rural housing code

Complying Development may be carried out under the Rural Housing Code where it meets the requirements of Clause 3.5 Complying development on flood control lots contained within the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.

Complying Development may be carried out under the Rural Housing Code where it meets the requirements of Clause 3.4 Complying development on bush fire prone land contained within the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.

Housing Alterations Code

Complying Development may be carried out on the land under the Housing Alterations Code, subject to the development complying with the relevant standards contained within the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.



PLANNING CERTIFICATE

ISSUED UNDER SECTION 149(2) and (5)
ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979
and
ENVIRONMENTAL PLANNING & ASSESSMENT REGULATION
2000

General Development Code

Complying Development may be carried out on the land under the General Development Code, subject to the development complying with the relevant standards contained within the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.

Commercial and Industrial Alterations Code

Complying Development may be carried out on the land under the Commercial and Industrial Alterations Code, subject to the development complying with the relevant standards contained within the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.

Commercial and Industrial (New Buildings and Additions) Code

Complying Development may not be carried out under the Commercial & Industrial (New Buildings and Additions) Code as the subject land falls within a Local Environmental Plan zone that does not meet the requirements of the code.

Container Recycling Facilities Code

Complying Development may not be carried out under the Container Recycling Facilities Code as the subject land falls within a Local Environmental Plan zone that does not meet the requirements of the code.

Subdivisions Code

Complying Development may be carried out on the land under the Subdivision Code, subject to the development complying with the relevant standards contained within the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.

Demolition Code

Complying Development may be carried out on the land under the Demolition Code, subject to the development complying with the relevant standards contained within the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.

Fire Safety Code

Complying Development may be carried out on the land under the Fire Safety Code, subject to the development complying with the relevant standards contained within the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.

5. Mine subsidence

Whether or not the land is proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961*.

Yes

6. Road widening and road alignment



PLANNING CERTIFICATE
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ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979
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ENVIRONMENTAL PLANNING & ASSESSMENT REGULATION
2000

Whether or not the land is affected by any road widening or road realignment under:

- (a) Division 2 of Part 3 of the *Roads Act 1993*, or
- (b) any environmental planning instrument, or
- (c) any resolution of the council.

The land is not affected by a road widening or road realignment proposal under:

- (a) Division 2 of Part 3 of the *Roads Act 1993*, or
- (b) any environmental planning instrument, or
- (c) any resolution of the council.

7. Council and other public authority hazard risk restrictions

Whether or not the land is affected by a policy:

- (a) adopted by the council, or
- (b) adopted by any other public authority and notified to the council for the express purpose of its adoption by that authority being referred to in planning certificates issued by the council,

That restricts the development of the land because of the likelihood of:

- (1) Landslip
No
- (2) Bushfire
No
- (3) Tidal inundation
No
- (4) Subsidence
No
- (5) Acid Sulphate Soils
No
- (6) Any other risk (other than flooding)
No

7A. Flood related development controls information

- (1) Whether or not development on the land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the purposes of group homes or seniors housing) is subject to flood related development controls.



PLANNING CERTIFICATE
ISSUED UNDER SECTION 149(2) and (5)
ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979
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2000

Yes

- (2) **Whether or not development on the land or part of the land for any other purpose subject to flood related development controls.**

Yes

Note: Words and expressions in this clause have the same meanings as in the instrument set out in the Schedule to the *Standard Instrument (Local Environmental Plans) Order 2006*.

8. Land reserved for acquisition

Whether or not any environmental planning instrument or proposed environmental planning instrument referred to in clause 1 (above) makes provision in relation to the acquisition of the land by a public authority, as referred to in section 27 of the *Environmental Planning & Assessment Act 1979*.

No

9. Contributions plans

The name of each contributions plan/s applying to the land.

Section 94 Contribution Plan for Residential Development

Section 94 Contribution Plan for Tourist Development

9A. Biodiversity certified land

The land is not biodiversity certified land under Part 8 of the Biodiversity Conservation Act 2016.

Note. Biodiversity certified land includes land certified under Part 7AA of the *Threatened Species Conservation Act 1995* that is taken to be certified under Part 8 of the *Biodiversity Conservation Act 2016*.

10. Biodiversity stewardship sites

The land is not a biodiversity stewardship site under a biodiversity stewardship agreement under Part 5 of the Biodiversity Conservation Act 2016, but only insofar as the Council has been notified of the existence of the agreement by the Chief Executive of the Office of Environment and Heritage.

Note. Biodiversity stewardship agreements include biobanking agreements under Part 7A of the *Threatened Species Conservation Act 1995* that are taken to be biodiversity stewardship agreements under Part 5 of the *Biodiversity Conservation Act 2016*.

10A. Native vegetation clearing set asides

The land is not a set aside area under section 60ZC of the Local Land Services Act 2013, but only insofar as the Council has been notified of the existence of the set aside area by Local Land Services or it is registered in the public register under that section.



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11. Bush fire prone land

All of the land is bushfire prone land as defined in the Environmental Planning & Assessment Act 1979.

12. Property vegetation plans

The land is not land to which a property vegetation plan approved under Part 4 of the Native Vegetation Act 2003 (and that continues in force) applies, only insofar as the Council has been notified of the existence of the plan by the person or body that approved the plan under the Act.

13. Orders under *Trees (Disputes Between Neighbours) Act 2006*

Whether an order has been made under the *Trees (Disputes Between Neighbours) Act 2006* to carry out work in relation to a tree on the land (but only if the council has been notified of the order).

No

14. Directions under Part 3A

There is not a direction by the Minister in force under Section 75P(2)(c1) of the Environmental Planning & Assessment Act 1979 that a provision of an environmental planning instrument prohibiting or restricting the carrying out of a project or a stage of a project of the land under Part 4 of that Act does not have effect.

15. Site compatibility certificates and conditions for seniors housing

- (1) The land is not land to which the State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004 applies.

There is no current site compatibility certificate (senior's housing) of which Council is aware, in respect of proposed development on the land.

- (2) There are no terms of a kind referred to in clause 18(2) of that policy that have been imposed as a condition of consent to a development application granted after 11 October 2007 in respect of the land.

16. Site compatibility certificates for infrastructure

There is not a valid site compatibility certificate (infrastructure) of which Council is aware, in respect of proposed development on the land.

17. Site compatibility certificates and conditions for affordable rental housing

- (1) There is not a current site compatibility certificate (affordable rental housing), of which the Council is aware, in respect of proposed development on the land.



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- (2) There are no terms of a kind referred to in clause 17(1) or 38(1) of the State Environmental Planning Policy (Affordable Rental Housing) 2009 that have been imposed as a condition of consent to a development application in respect of the land.

18. Paper subdivision information

- (1) There is no development plan adopted by a relevant authority that applies to the land of that is proposed to be subject to a consent ballot.
- (2) There is no subdivision order that applies to the land

Note: words and expressions in this clause have the same meaning as they have in Part 16C of the *Environmental Planning and Assessment Regulation 2000*.

19. Site verification certificates

There is not a current site verification certificate, of which Council is aware, in respect of the land.

Matters are prescribed by section 59 (2) of the *Contaminated Land Management Act 1997* as additional matters to be specified in a planning certificate:

- (a) The land or part of the land is not significantly contaminated land within the meaning of the Contaminated Land Management Act 1997 at the date this certificate is issued.
- (b) The land is not subject to a management order within the meaning of the Contaminated Land Management Act 1997 at the date this certificate is issued.
- (c) The land is not the subject of an approved voluntary management proposal within the meaning of the Contaminated Land Management Act 1997 at the date this certificate is issued.
- (d) The land is not the subject of an ongoing maintenance order within the meaning of the Contaminated Land Management Act 1997 at the date this certificate is issued.
- (e) The land is not the subject of a site audit statement within the meaning of the Contaminated Land Management Act 1997 (if a copy of such a statement has been provided at any time) to the local authority issuing the certificate.



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Emma Coleman
8 Ironbark Close
Warabook
New South Wales 2304

Applicants Reference
HDB Greta

CERTIFICATE DETAILS

CERTIFICATE NUMBER: 2822
DATE OF CERTIFICATE: 18/10/2017

PROPERTY DETAILS

ADDRESS: 71 Branxton Street GRETA NSW 2334
TITLE: LOT: 1 DP: 873220
PARCEL NO.: 27340

BACKGROUND INFORMATION

This certificate provides information on how the relevant parcel of land may be developed, including the planning restrictions that apply to development of the land, as at the date the certificate is issued. The certificate contains information Council is aware of through its records and environmental plans, along with data supplied by the State Government. The details contained in this certificate are limited to that required by Section 149 of the *Environmental Planning and Assessment Act, 1979*.

TELEPHONE: (02) 4993 4100. FAX (02) 4993 2500
POSTAL ADDRESS: PO BOX 152, CESSNOCK, 2325 or DX 21502 CESSNOCK
EMAIL ADDRESS: council@cessnock.nsw.gov.au Visit us at: <http://www.cessnock.nsw.gov.au>
ABN 60 919 148 928



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ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979
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Additional information pursuant to Section 149(5) of the *Environmental Planning & Assessment Act 1979*

(5) A council may, in a planning certificate, include advice on such other relevant matters affecting the land of which it may be aware.

Council's records do not indicate that the land the subject of this Certificate is subject to Noise Exposure.

The land the subject of this Certificate is not affected by a Tree Preservation Order. Land that is not covered by Council's urban Tree Preservation Order is subject to the provisions of the Native Vegetation Act 2003. Referrals can be made to Local Lands Services on Tel: 02 4930 1030.

UNFORMED ROADS POLICY - DUAL FRONTAGE LOT. The subject land is affected by Council's unformed roads policy wherein a road contribution is applicable if access is to be gained off the unformed road. No contribution is payable if access is off the alternate formed road. Development Consent is required if access is to be off the unformed road.

For further information, please contact Council's Strategic Land Use Planning unit, of the Planning & Environment directorate on 02 4993 4183.

A handwritten signature in black ink, appearing to read "Gareth Curtis".

Gareth Curtis
Director Planning & Environment

Hunter Development Brokerage Pty Ltd

Proposed Residential Development

71 Branxton Street, Greta

Geotechnical Assessment

Report No. RGS31387.1-AA

17 November 2017

REGIONAL
GEOTECHNICAL SOLUTIONS





Manning-Great Lakes

Port Macquarie

Coffs Harbour

17 November 2017

Mr Karl Waeger

c/- Hunter Development Brokerage Pty Ltd

1st Floor, 44 Church Street,

Maitland NSW 2320

Attention: Mr Karl Waeger

Dear Karl

RE: Proposed Residential Development at 71 Branxton Street, Greta - Geotechnical Assessment

Regional Geotechnical Solutions are pleased to provide this report providing a Mine Subsidence Desktop Study for the proposed development at 71 Branxton Street, Greta.

If you require any further information regarding the report please do not hesitate to contact the undersigned.

For and on behalf of

Regional Geotechnical Solutions Pty Ltd

A handwritten signature in black ink, appearing to read 'S Morton', is written over a white background.

Steven Morton

Principal

CONTENTS

1	INTRODUCTION	2
2	SCOPE OF WORK	2
3	DETAILS OF MINED COAL SEAMS BENEATH THE PROPOSED DEVELOPMENT	2
4	SITE WALKOVER ASSESSMENT	4
5	DISCUSSION OF MINE SUBSIDENCE FINDINGS	6
6	RECOMMENDATIONS AND SUITABILITY FOR DEVELOPMENT	7
7	LIMITATIONS	7

Figures



1 INTRODUCTION

Regional Geotechnical Solutions (RGS) has conducted a geotechnical assessment for a proposed residential development to be located at 71 Branxton Street, Greta. The work was commissioned by Mr Karl Waeger. The site is currently occupied by rural residential lot.

The aim of the desktop study was to provide an assessment of the extent and nature of workings beneath the site, including assessment of the stability of typical coal pillars remaining (if applicable to pillar crushing subsidence). The assessment was based on record tracings based on the as surveyed plans of the workings undertaken in the Greta Seam underlying the site.

2 SCOPE OF WORK

The desktop study involved:

- Discussions with the Mine Subsidence Board to determine which seams were mined beneath the subject site;
- Procurement of the surveyed mine record tracings from the Department of Mineral Resources in Maitland;
- Assessment of the approximate depth and thickness of each of the seams worked;
- Overlaying the surveyed mine workings from each of the coal seams over the site and surrounding area to assess the extent of mining and dimensions of coal pillars remaining in the vicinity of the site;
- Assessing the zone of influence in which mine subsidence has the potential to affect the site, based on an angle of draw of 26.5° measured from vertical.
- Assessment of the mode of failure of the mine workings.

3 DETAILS OF MINED COAL SEAMS BENEATH THE PROPOSED DEVELOPMENT

The site is underlain by workings of the Greta Coal Seam. Record tracings (RT0276 and RT0335) of mine workings were overlaid on aerial imagery of the site to assess the location of the mine workings. The record tracings indicate:

- The site is located over the southern edge of the New Greta Colliery and the Whitburn Colliery workings.
- The Greta Seam subcrops south west of the site (entry shafts located south of the site).
- Bord and pillar mining techniques were used.

Some hatching on the New Greta Colliery record tracings in the area of the first workings indicates some secondary extraction of some coal pillars prior to abandonment of the mine, some areas of goaf are also noted on the plans.

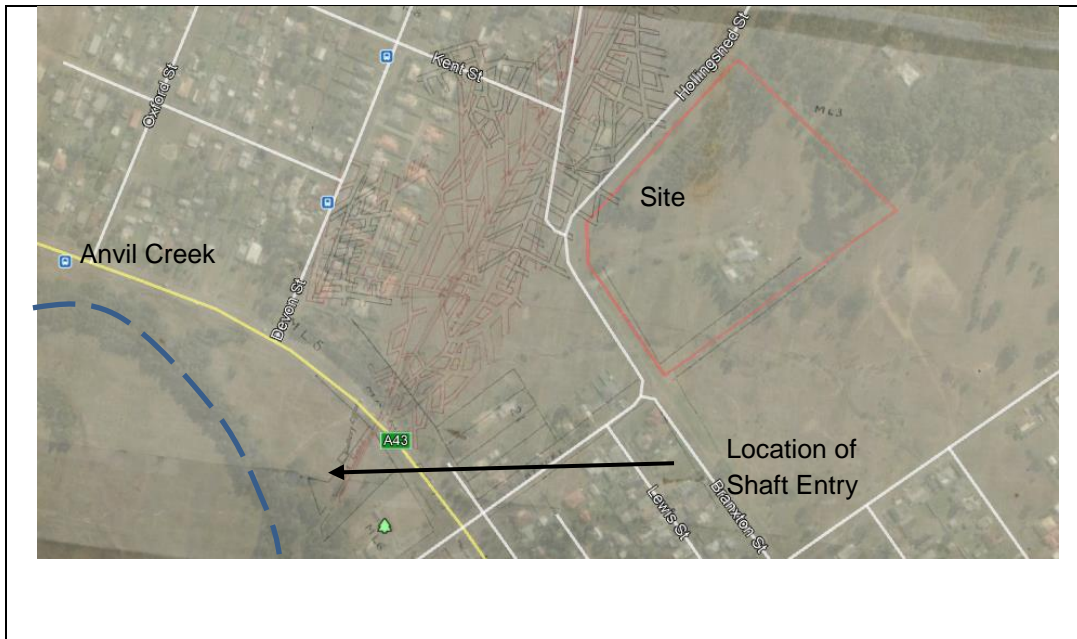


Plate 1: Approximate location of Mine Entry

Two seams have been worked within the coal seam and are noted by different coloured pen markings (top seam red and bottom seam black) on the record tracings. The details of the mining are presented in Table 1. A summary of the expected subsurface conditions beneath the site are presented in Table 2 which were extracted from the record tracings of the New Greta Colliery.

Table 1: Summary of Coal Seam Details

Coal Seam Mined	Assessed Maximum Depth Beneath Ground Level (m)	Thickness of Coal Seam (m)
Greta Seam	16 to 20	1.86

Table 2: Summary of Expected Subsurface Conditions Extracted From RT276 – New Greta Colliery

Depth Measured from Surface Level (m)	Depth (Feet)	Material Description
3.95	13 Feet (3.95m)	Clay
4.86	3 Feet (0.91m)	Brown Sandstone
14.01	30 Feet (9.15m)	Blue Grey Sandstone With Beds of Conglomerate
14.77	2 feet 5 Inches (0.76m)	Puritious Coal and Clay



Depth Measured from Surface Level (m)	Depth (Feet)	Material Description
16.69	6 feet 3 Inches (1.92m)	Coal
>16.69		Shale Floor

Figures 1 to 3 show the site observations and the record tracings of the mine workings which were overlaid on the aerial photographs of the site.

As discussed in Section 3, the northern portion of the site is located above the southern extent of the mine workings completed by the New Greta Colliery. The New Greta Colliery was worked using the bord and pillar techniques up until 1952 at which time it was abandoned. The record tracings of the colliery indicated that the Greta was typically 6 feet and 3 inches in thickness including the split (approximately 1.92m in) in the area of the site.

Located in Figure 3 is an aerial image of the site with the mine overlay record tracings of the New Greta Colliery. The record tracings indicate the workings extend into the north western side of the site. A line has also been shown on the plan indicating the area of influence for the collapse of the mine workings assuming an angle of draw of 26.5°. The workings of the seam generally comprise irregular shaped pillars or varying height and size. The record tracings provided for the seam do indicate some goaf areas and areas of secondary working of the pillars outside the area of investigation.

4 SITE WALKOVER ASSESSMENT

A site walkover assessment was undertaken on 9 November 2017. The following site observations were made. The observations are also noted on Figures 1 to 3:

- Numerous pothole subsidence features and a drift subsidence feature was noted along the north western boundary of the site.
- Several shallow surface depression features were also noted in the far northern and far western areas of the site.

Photos of the area showing evidence of mine subsidence are presented in Plate 2.



Pothole formation near a tree on the northwestern side of the site



Pothole formation on the northwestern side of the site. Note the area being roped off.



Photo of a collapsed drift on the northwestern side of the site. Note the trees collapsing on both sides into the drift



Photo of large depression northeastern side of the site. Depressions do not appear to be a features associated with pothole subsidence as observed in other areas of site

5 DISCUSSION OF MINE SUBSIDENCE FINDINGS

Based on the the review of the record tracings and the site walkover assessment, the following is assessed:



- The record tracings either do not include all mine workings in the area or the workings are located further east of areas plotted in the overlay. The presence of the pothole depressions and drift subsidence features indicate the workings extend well into the northern portion of the site. It should be noted that the plans of the record tracings used to locate the workings do have features to orientate the maps (i.e. Maitland Road and West Street Intersections noted on the plans plus the alignment of Anvil Creek).
- The workings are relatively shallow 16m to 20m depth and therefore the site is more at risk of pothole subsidence than subsidence associated with pillar crushing. This is confirmed by the presence of pothole features across the site.
- Due to the presence of the surface subsidence features associated with pothole formation no assessment was undertaken to assess the FoS for crushing of pillars.

6 RECOMMENDATIONS AND SUITABILITY FOR DEVELOPMENT

Due to the presence of pothole subsidence features at the site, further investigation works will be required to identify the lateral extent and depth of the workings. We recommend that further works at the site involve both test pit investigations and drilling investigations. The investigations should be undertaken in the northeastern portion of the site which show the subsidence features. It should be noted that while further work will need to be undertaken to investigate the site to assess the extent of workings. It is considered that with appropriate geotechnical investigations and remediation works, the area would be considered suitable for development.

7 LIMITATIONS

The findings presented in the report and used as the basis for recommendations presented herein were obtained using normal, industry accepted geotechnical design practises and standards. To our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points.

If you have any questions regarding this project, or require any additional consultations, please contact Matt Rowbotham or the undersigned.

For and on behalf of

Regional Geotechnical Solutions Pty Ltd


Steven Morton

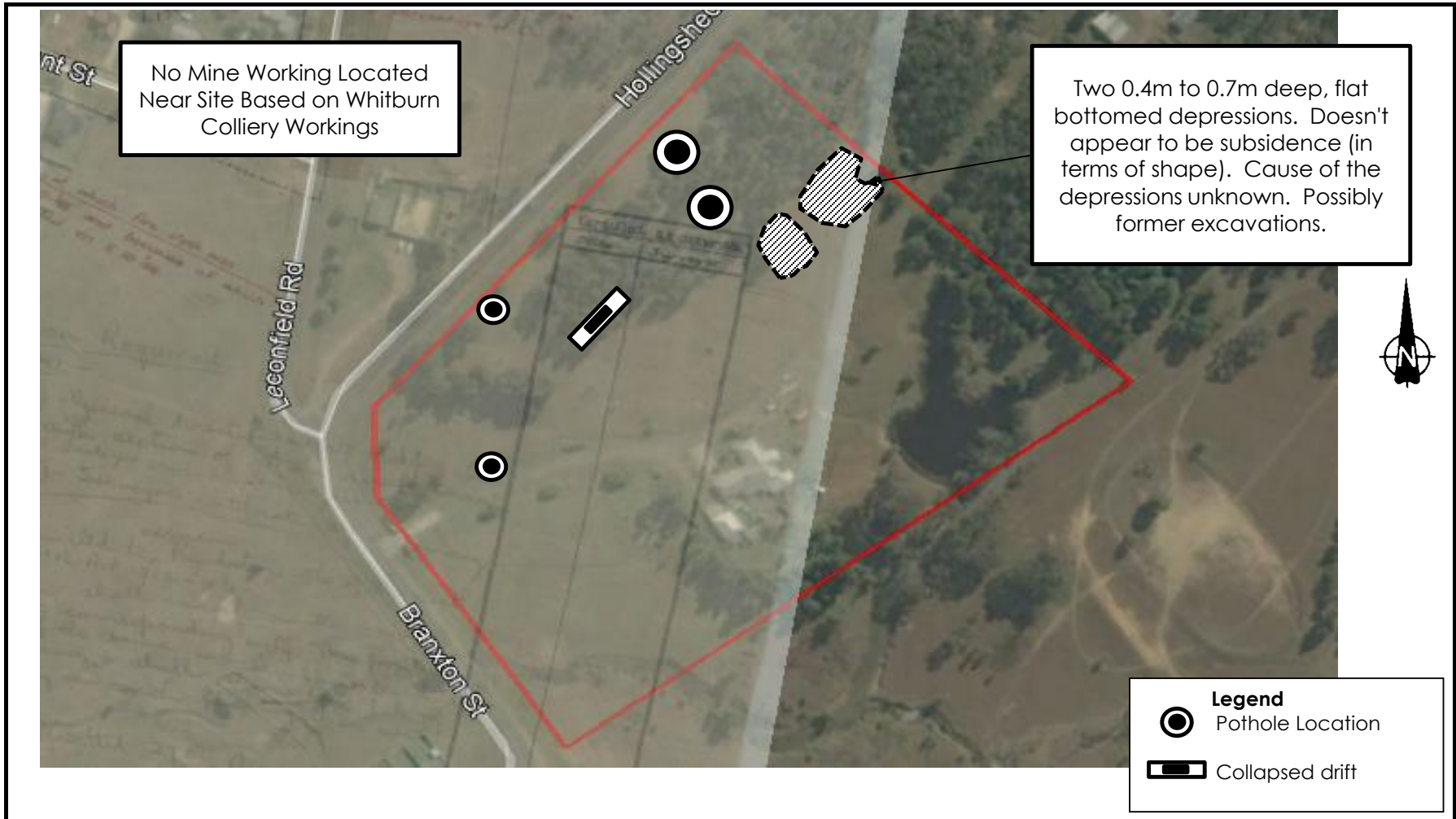
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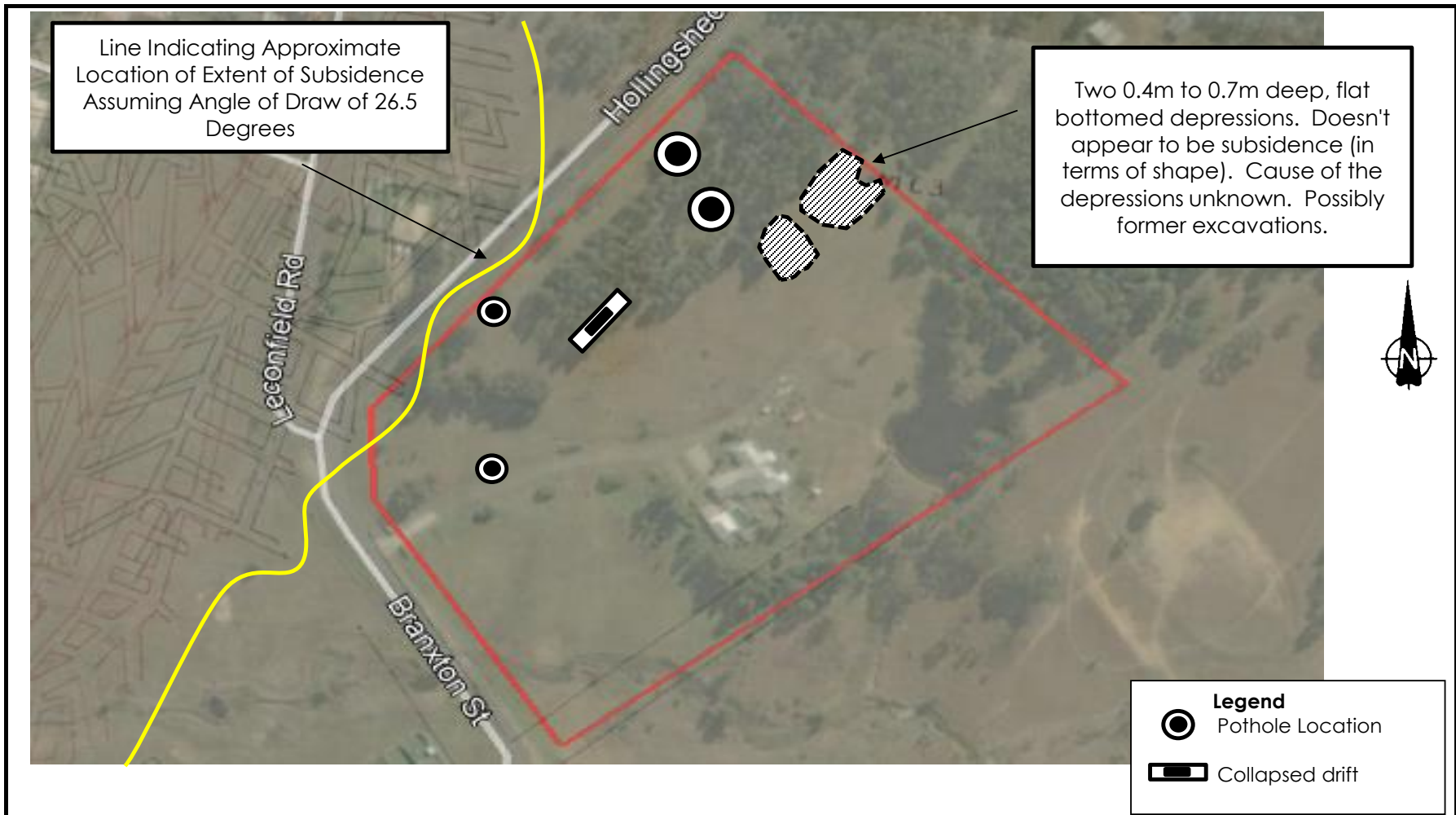
Figures




	Client	Hunter Development Brookerage Pty Ltd	Job No.	RGS31387.1
	Project:	Proposed Subdivision 71 Branxton Street Greta	Drawn By:	SRM
			Date:	13-Nov-17
	Title:	Mine Subsidence Site Observations	Drawing No.	Figure 1



	Client:	Hunter Development Brokerage Pty Ltd	Job No.	RGS31387.1
	Project:	Proposed Subdivision 71 Branxton Street Greta	Drawn By:	SRM
			Date:	13-Nov-17
	Title:	Whitburn Colliery Overlay with Subsidence	Drawing No.	Figure 2



	Client:	Hunter Development Brokerage Pty Ltd	Job No.	RGS31387.1
	Project:	Proposed Subdivision 71 Branxton Street Greta	Drawn By:	SRM
			Date:	13-Nov-17
	Title:	New Greta Colliery Overlay with Subsidence	Drawing No.	Figure 3

ATTACHMENT 9

PRELIMINARY CONSULTATION WITH GOVERNMENT AGENCIES

PRELIMINARY CONSULTATION – GOVERNMENT AGENCIES

HDB Town Planning and Design (HDB) has undertaken the initial consultation with Cessnock Council, several Government agencies and service providers in regards to the preparation of a planning proposal to enable the development of 71 Branxton Street, Greta.

A summary of the feedback received in regard to the preliminary concept is provided below.

Ausgrid

Ausgrid advised that capacity exists within the current network to support the proposed development.

Telstra

Telstra raised no objection to the proposed. Exact requirements for servicing should be consider at a later stage.

Roads and Maritime Service

Roads and Maritime Service did not consider that the proposal was likely to have a significant impact on the classified road network and as such no objection was raised.

Office of Environment and Heritage

The Office of Environment and Heritage requested that as part of the development of the planning proposal the following be undertaken:

- Assessment of the impact on areas of native vegetation including how any loss could be offset;
- An assessment of the environmental requirements as they relate to the Environmental Planning and Assessment Act, SEPP 44 – Koala Habitat Protection and the Native Vegetation Act; and
- An appropriate level of aboriginal cultural heritage assessment

Mine Subsidence Board

The Mine Subsidence Board noted that the north-west corner of the site has been undermined by shallow mining associated with the Greta Seam. Geotechnical investigations will be needed to be undertaken to ascertain the extent of this undermining. Development would need to be located so to avoid any areas identified as being undermined unless works can be undertaken to eliminate any risk.

Cessnock City Council

Cessnock City Council advised that the site is not identified in either the Lower Hunter Strategy and/or the Cessnock Settlement Strategy. The proposal is therefore considered to have no strategic justification and the proposal cannot be supported.

Department of Planning and Environment

The Department of Planning and Environment (DoPE) advised that they do not provide advice on rezoning proposals prior to receiving a formal request from Council. The Department did however note the need for any rural residential proposal to address the sustainability criteria and be consistent with the local strategy in addition to maintaining the character and role of the existing centre.

DoPE also noted that given the land surrounding the site was zoned R2 Low Density Residential there may be merit in reviewing the proposal to allow for residential expansion.