ATTENDED NOISE MONITORING

NOISE MONITORING EQUIPMENT

The attended short-term noise monitoring was carried out using a SVANTEK SVAN957 Class 1 Precision Sound Level Meters. The instrument was calibrated by a NATA accredited laboratory within two years of the measurement period. The instrument sets comply with AS IEC 61672.1-2004 and was set on A-weighted, fast response.

The microphone was positioned at 1.2 to 1.5 metres above ground level and was fitted with windsocks. The instrument was calibrated using a Rion NC-73 sound level calibrator prior and subsequent to the measurement period to ensure the reliability and accuracy of the instrument sets. There were no significant variances observed in the reference signal between the pre-measurement and post-measurement calibrations. Instrument calibration certificates have also been included in Attachment 2.

WEATHER CONDITIONS

It was clear, fine without significant breeze.

METHODOLOGY

The attended noise measurements were carried out generally in accordance with Australian Standard AS 1055—1997 - "*Acoustics – Description and Measurement of Environmental Noise*".

Logger A – Unattended Noise Monitoring Results, dB(A)

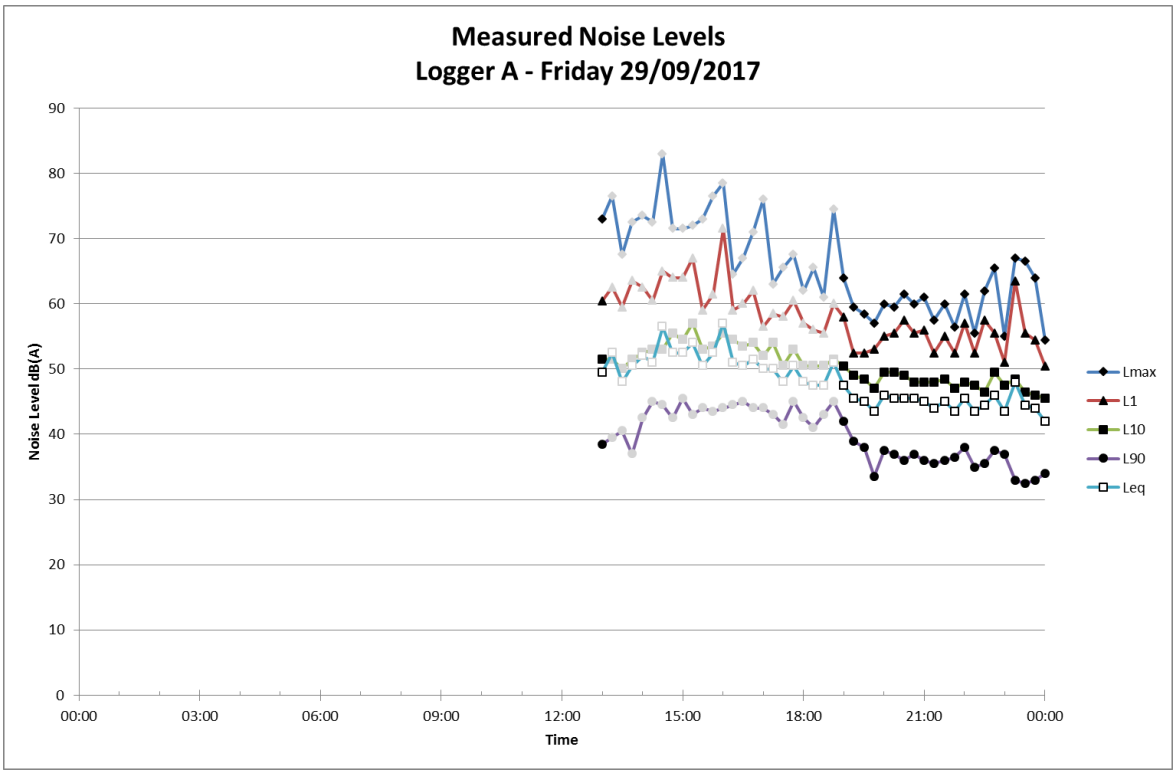
Location A						
Date	ABL (L_{90})			L_{eq}		
	Day	Evening	Night	Day	Evening	Night
29/09/2017	-	36	33	-	45	45
30/09/2017	-	33	-	-	46	-
1/10/2017	33	33	30	46	43	43
2/10/2017	-	35	29	-	47	42
3/10/2017	38	32	29	52	45	48
4/10/2017	38	34	30	52	46	49
5/10/2017	38	34	29	52	46	50
6/10/2017	-	33	29	-	48	47
7/10/2017	35	32	28	49	43	46
8/10/2017	36	32	28	47	44	42
9/10/2017	-	35	29	-	45	48
10/10/2017	-	-	-	-	-	-
Median (RBL)	**37**	**33**	**29**	*	*	*
Logarithmic Average	*	*	*	**50**	**46**	**47**

Note: - indicates values that has not been considered due to adverse weather conditions
* Indicates values that are not relevant to that noise descriptor

Road Traffic Noise Data at Location Logger A

Date	Existing Road Traffic Noise Location A – dB(A)			
	Daytime (7am to 10pm)		Night-time (10pm to 7am)	
	$L_{eq\ (15\ hour)}$	$L_{eq\ (1\ hour)}$	$L_{eq\ (9\ hour)}$	$L_{eq\ (1\ hour)}$
29/09/2017	-	-	-	-
30/09/2017	-	-	-	-
1/10/2017	46	47	41	43
2/10/2017	-	-	41	42
3/10/2017	53	53	45	49
4/10/2017	52	53	47	50
5/10/2017	53	54	47	51
6/10/2017	-	-	45	48
7/10/2017	50	51	44	47
8/10/2017	47	47	40	42
9/10/2017	-	-	45	48
10/10/2017	-	-	-	-
Logarithmic Average	51	52	45	48
Road Traffic Noise Levels at the Residence	47	48	41	44

– Data excluded because adverse weather conditions were present.


Measured Noise Levels
Logger A - Friday 29/09/2017
Noise Level dB(A)
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80
70
60
50
40
30
20
10
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03:00
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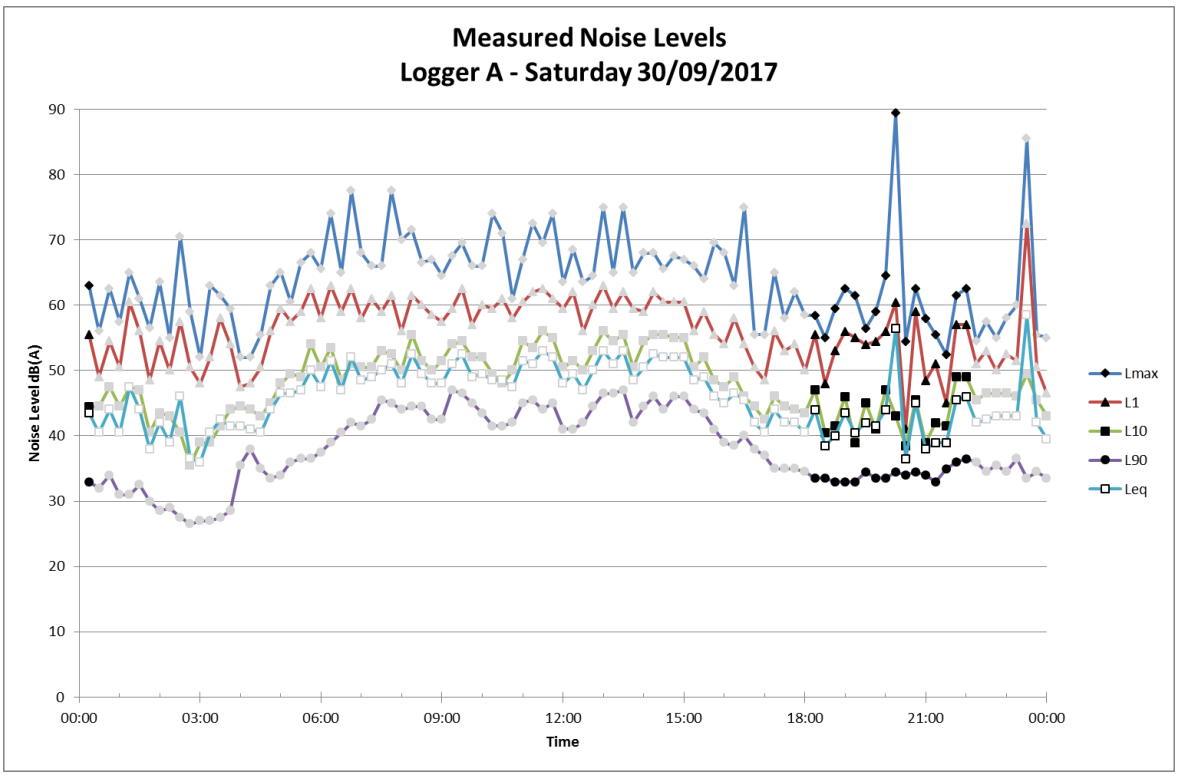
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger A - Saturday 30/09/2017
Noise Level dB(A)
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80
70
60
50
40
30
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10
0
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Time
Lmax
L1
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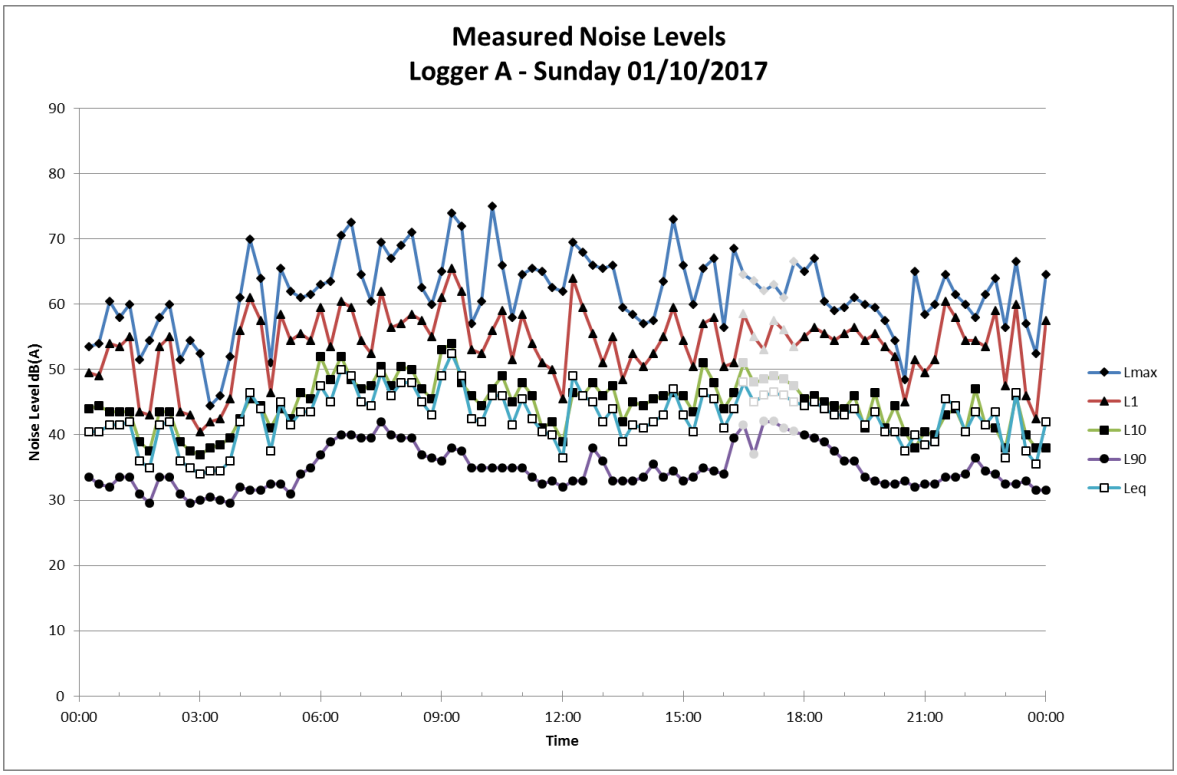
Measured Noise Levels
Logger A - Sunday 01/10/2017
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
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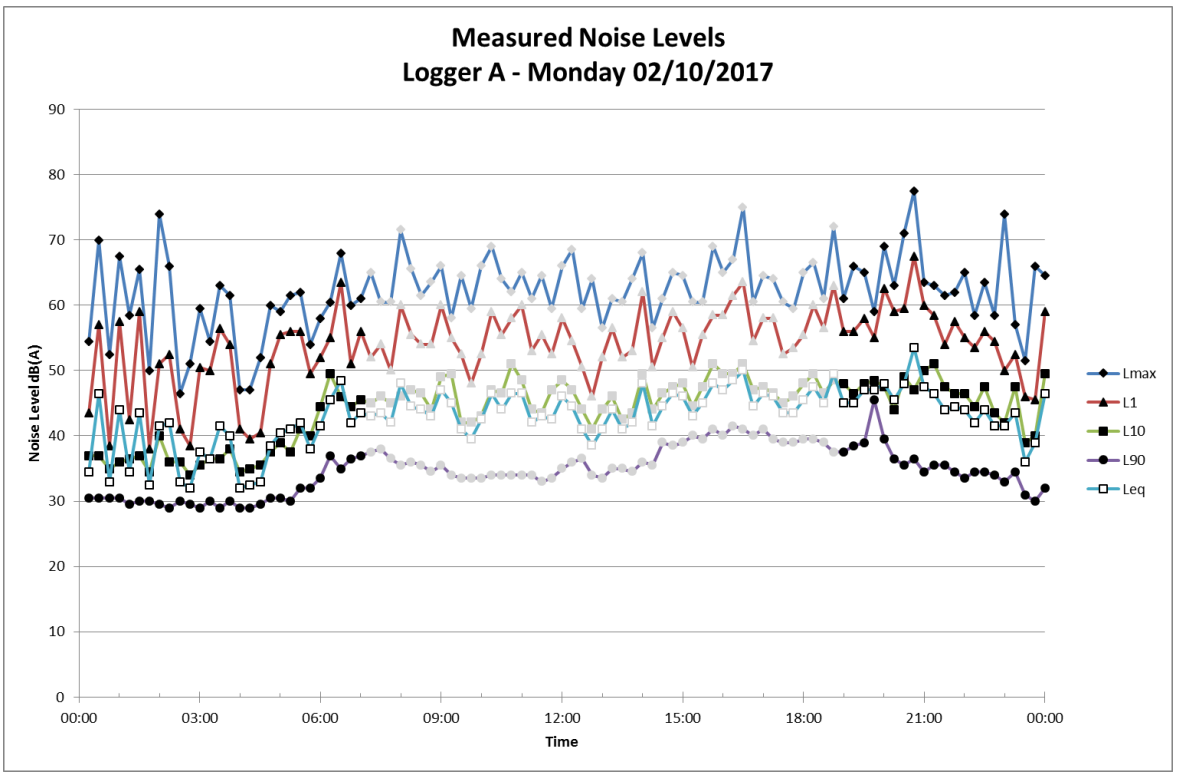
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger A - Monday 02/10/2017
Noise Level dB(A)
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70
60
50
40
30
20
10
0
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Time
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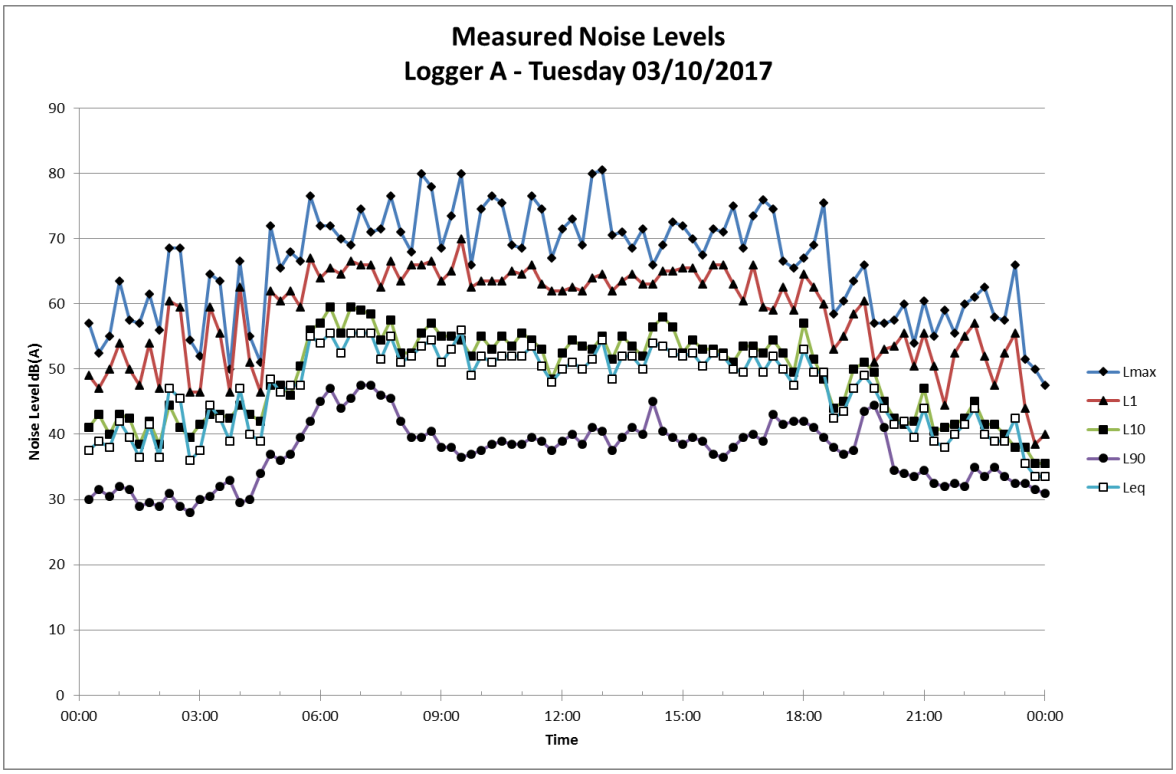
Leq


Measured Noise Levels
Logger A - Tuesday 03/10/2017
Noise Level dB(A)
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80
70
60
50
40
30
20
10
0
00:00
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Time
Lmax
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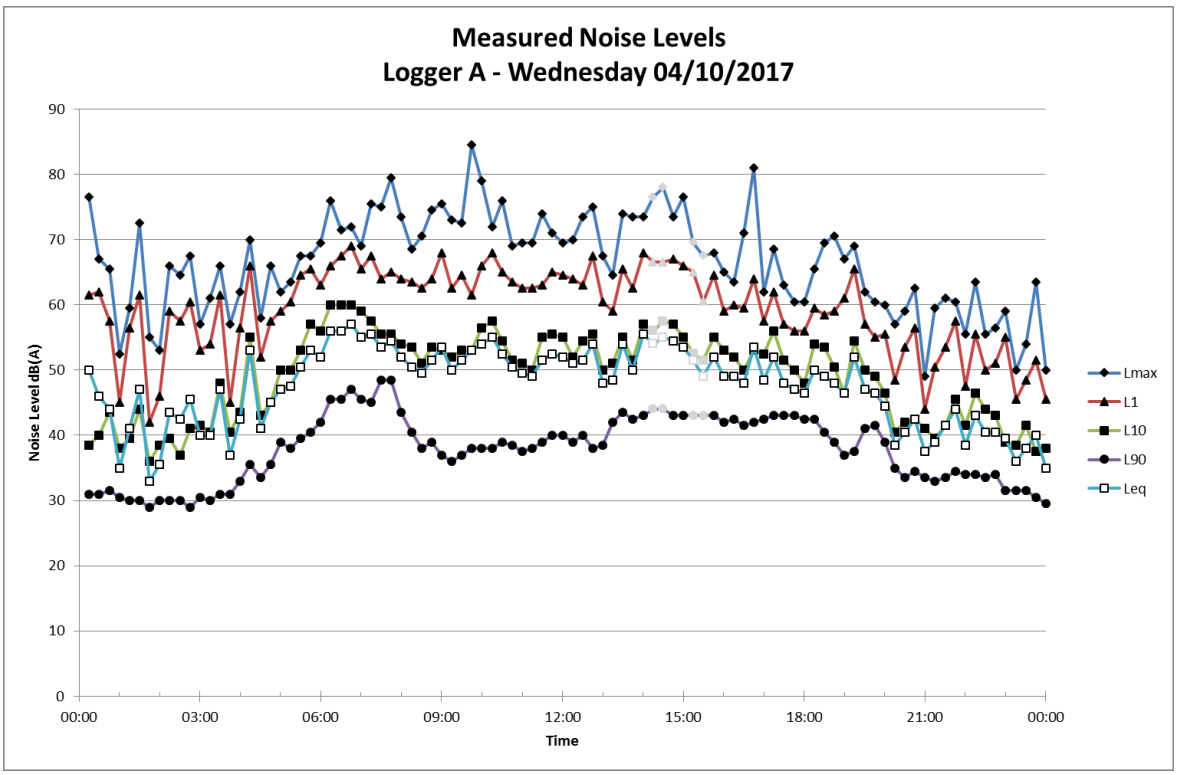
L10
L90
Leq


Measured Noise Levels
Logger A - Wednesday 04/10/2017
Noise Level dB(A)
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80
70
60
50
40
30
20
10
0
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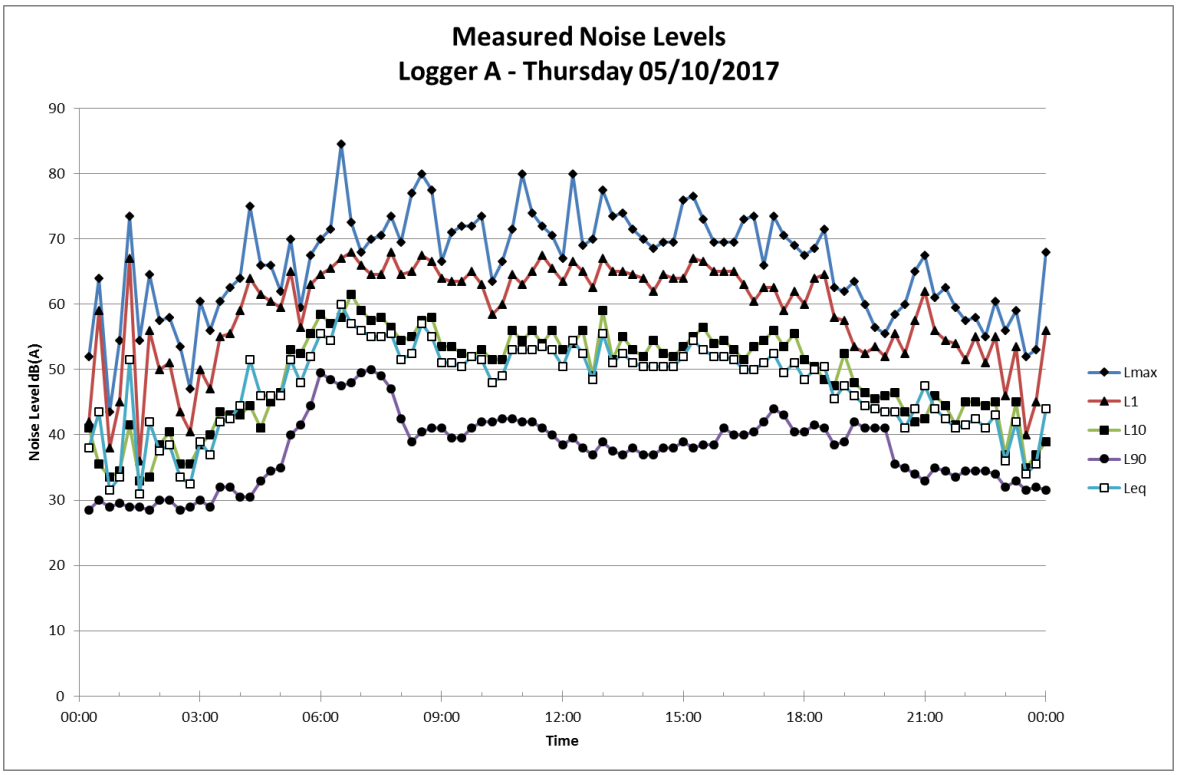
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger A - Thursday 05/10/2017
Noise Level dB(A)
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80
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60
50
40
30
20
10
0
00:00
03:00
06:00
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Time
Lmax
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L10
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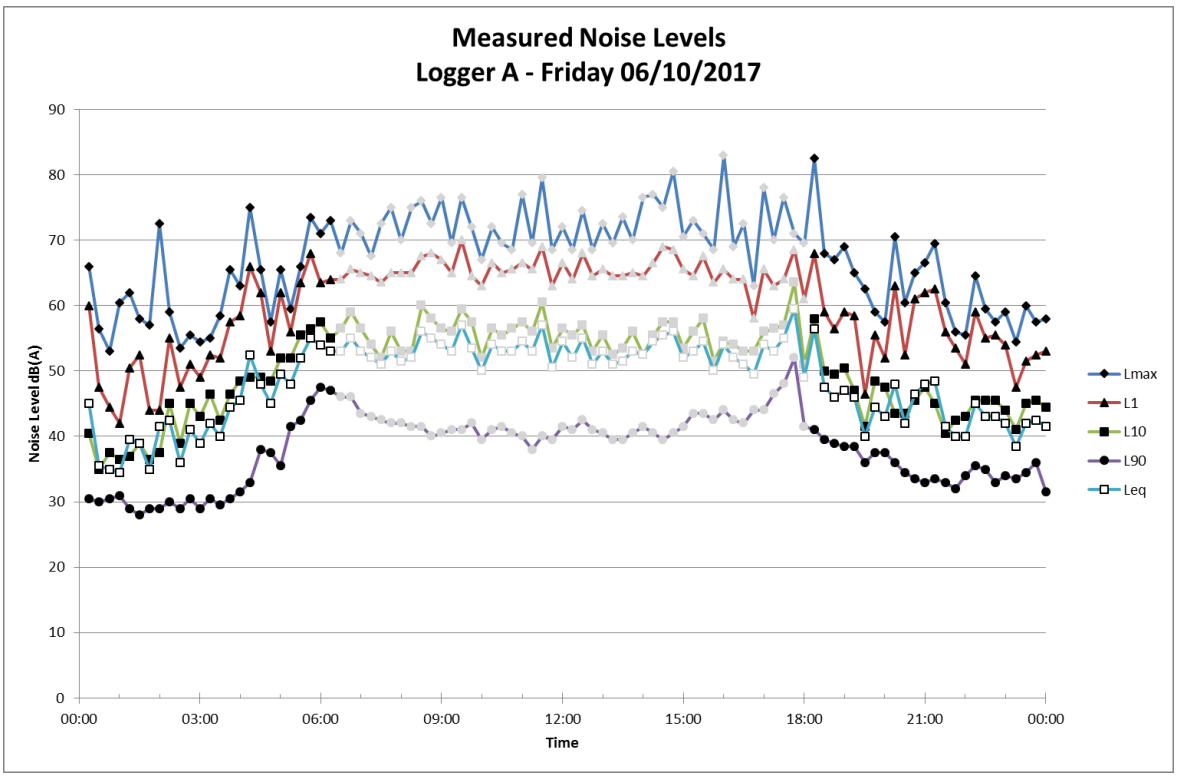
Leq


Measured Noise Levels
Logger A - Friday 06/10/2017
Noise Level dB(A)
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80
70
60
50
40
30
20
10
0
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Time
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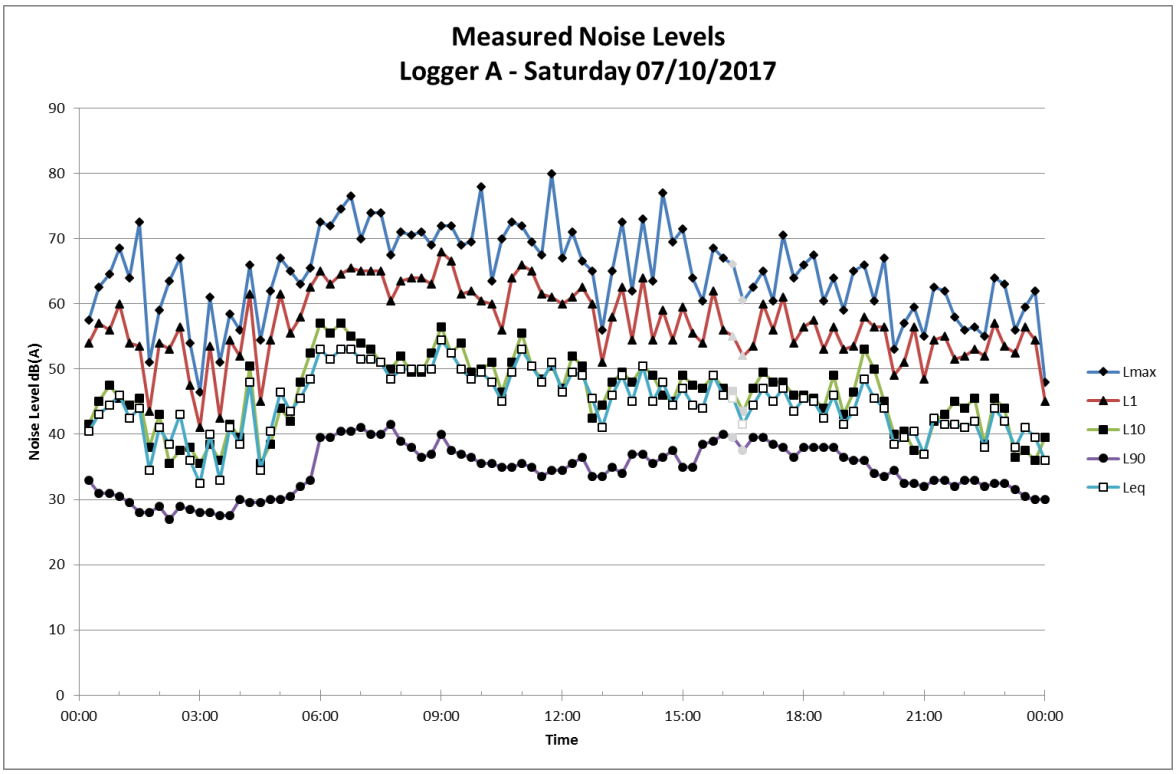
Measured Noise Levels
Logger A - Saturday 07/10/2017
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
00:00
03:00
06:00
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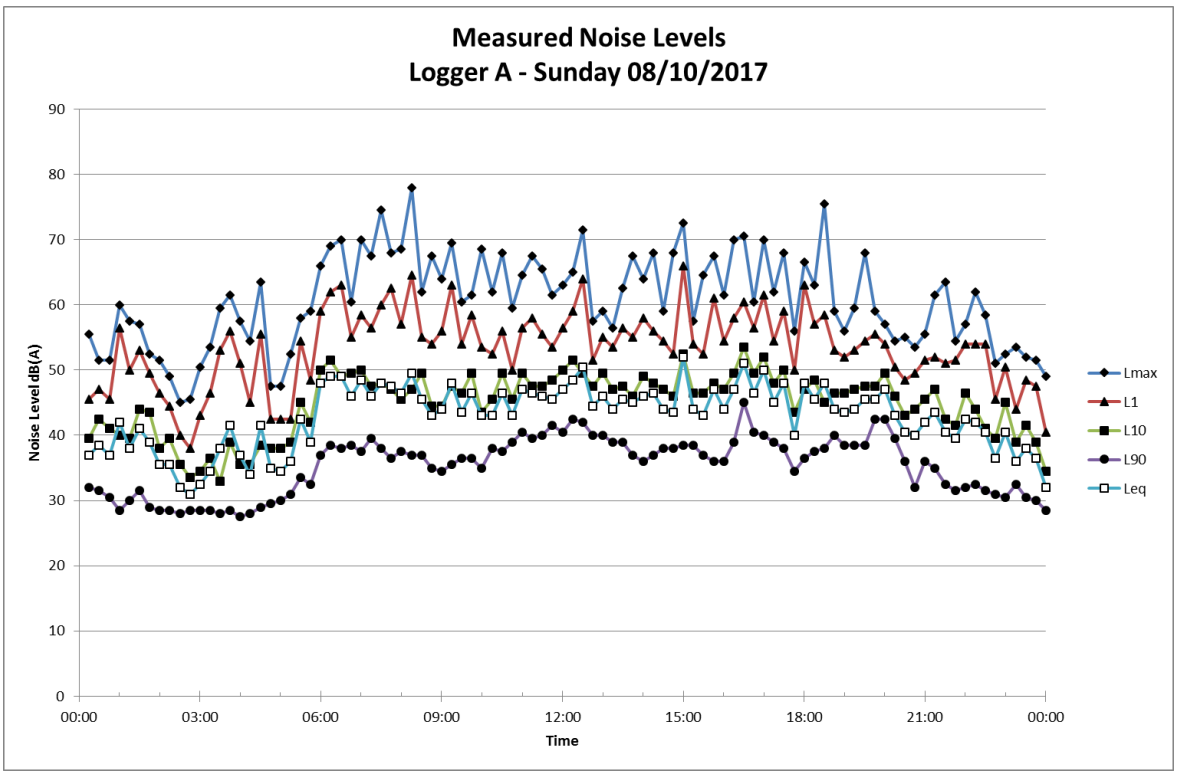
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger A - Sunday 08/10/2017
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
00:00
03:00
06:00
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Time
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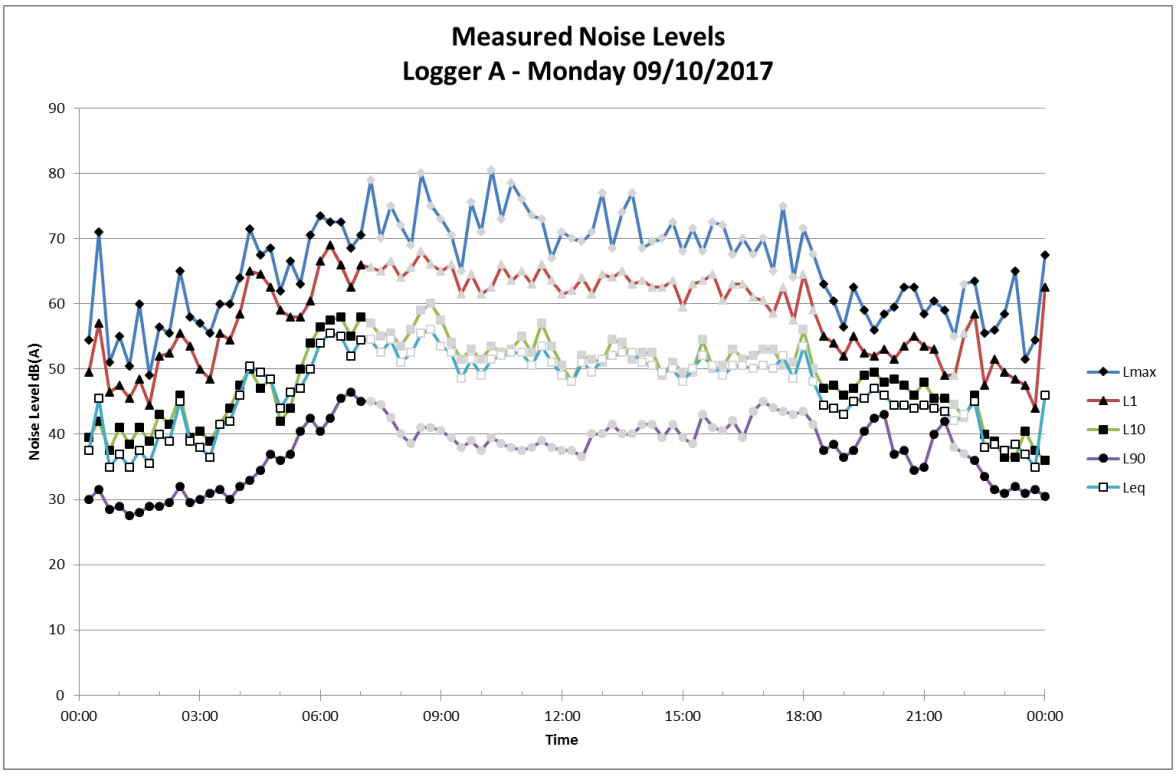
Measured Noise Levels
Logger A - Monday 09/10/2017
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
00:00
03:00
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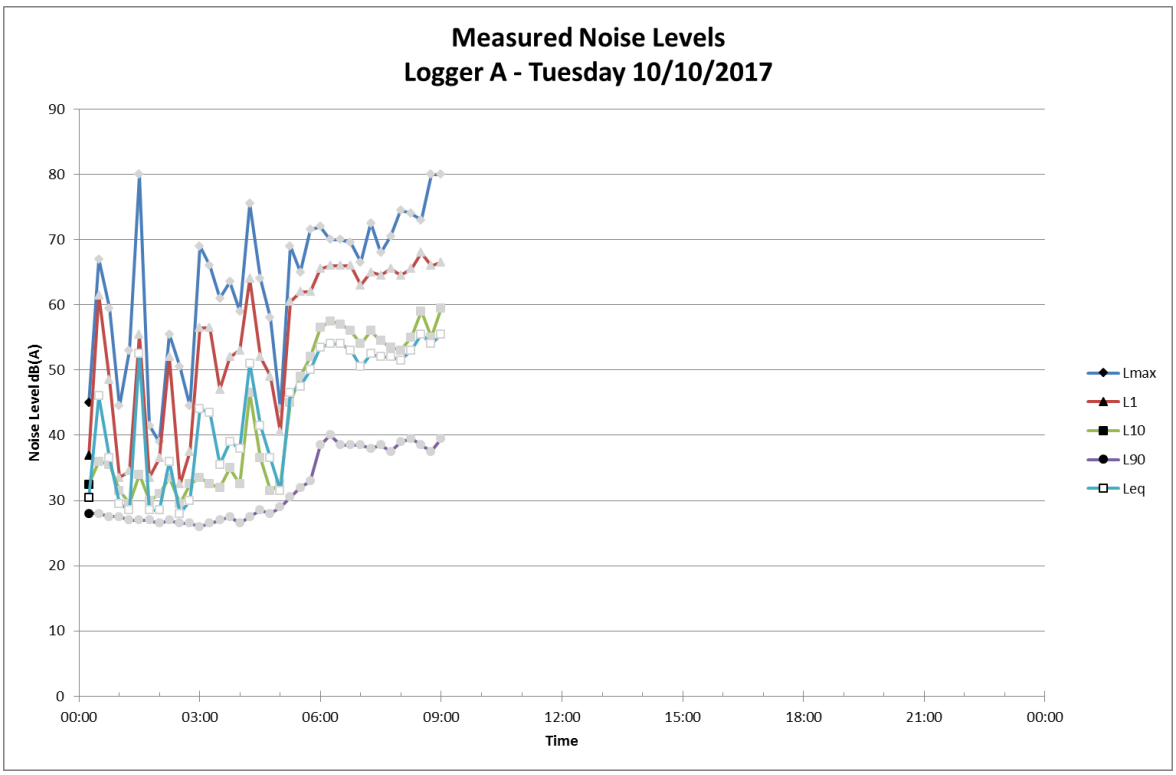
L90
Leq


Measured Noise Levels
Logger A - Tuesday 10/10/2017
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
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03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Time
Lmax
L1
L10
L90
Leq

Logger B – Unattended Noise Monitoring Results, dB(A)

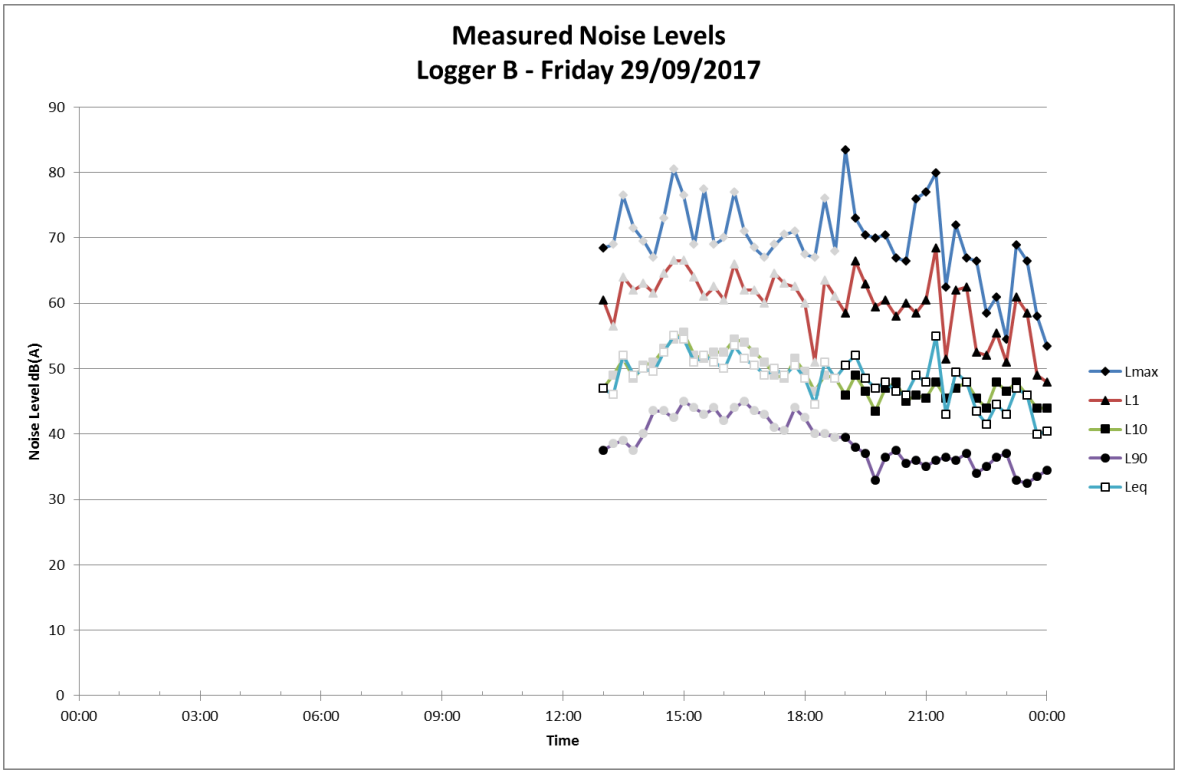
Location B						
Date	ABL (L_{90})			L_{eq}		
	Day	Evening	Night	Day	Evening	Night
29/09/2017	-	35	33	-	50	44
30/09/2017	-	33	-	-	45	-
1/10/2017	34	33	32	48	48	43
2/10/2017	-	37	30	-	52	51
3/10/2017	37	36	31	51	49	49
4/10/2017	38	35	31	51	50	53
5/10/2017	38	36	30	52	49	47
6/10/2017	-	35	30	-	48	44
7/10/2017	35	32	29	51	49	45
8/10/2017	36	33	30	50	48	43
9/10/2017	-	37	30	-	47	45
10/10/2017	-	-	-	-	-	-
Median (RBL)	**37**	**35**	**30**	*	*	*
Logarithmic Average	*	*	*	**51**	**49**	**48**

Note: - indicates values that has not been considered due to adverse weather conditions
* Indicates values that are not relevant to that noise descriptor

Road Traffic Noise Data at Location Logger B

Date	Existing Road Traffic Noise Location B – dB(A)			
	Daytime (7am to 10pm)		Night-time (10pm to 7am)	
	$L_{eq\ (15\ hour)}$	$L_{eq\ (1\ hour)}$	$L_{eq\ (9\ hour)}$	$L_{eq\ (1\ hour)}$
29/09/2017	-	-	-	-
30/09/2017	-	-	-	-
1/10/2017	49	49	43	44
2/10/2017	-	-	46	51
3/10/2017	51	52	46	50
4/10/2017	52	52	48	53
5/10/2017	53	54	44	48
6/10/2017	-	-	42	45
7/10/2017	52	53	44	45
8/10/2017	50	50	39	43
9/10/2017	-	-	42	45
10/10/2017	-	-	-	-
Logarithmic Average	51	52	45	49
Road Traffic Noise Levels at the Residence	47	48	41	45

– Data excluded because adverse weather conditions were present.


Measured Noise Levels
Logger B - Friday 29/09/2017
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
00:00
03:00
06:00
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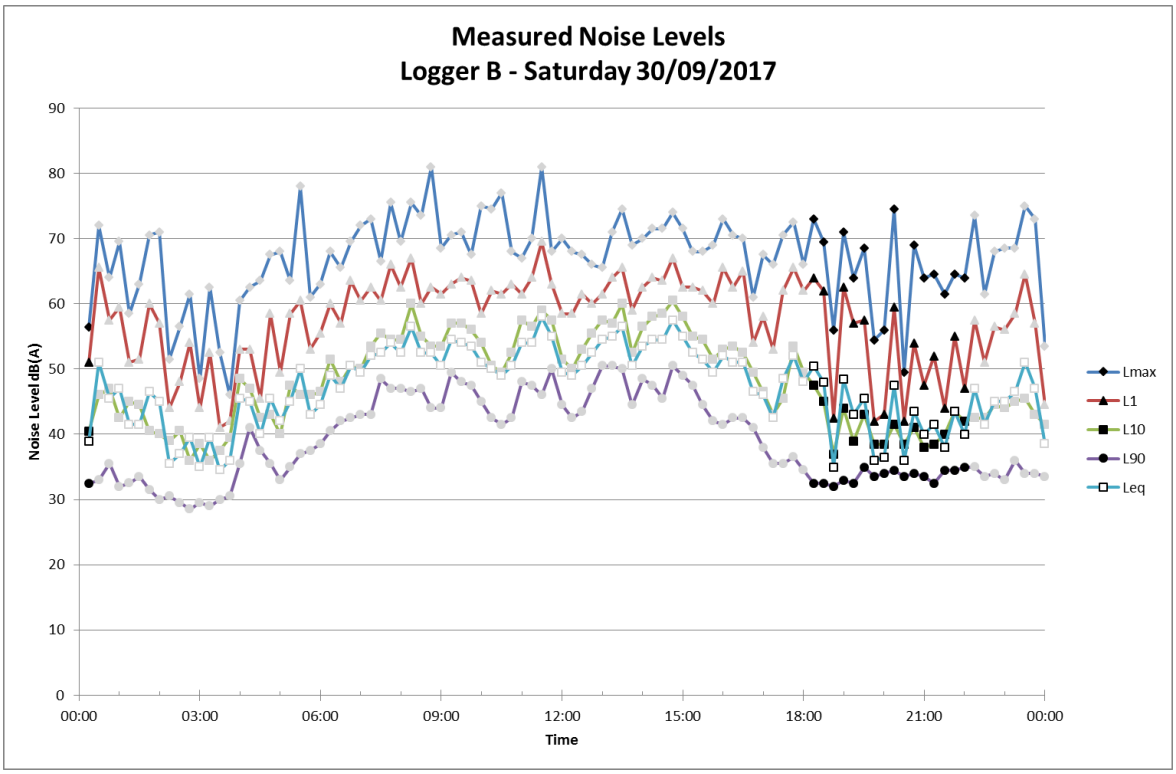
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger B - Saturday 30/09/2017
Noise Level dB(A)
90
80
70
60
50
40
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20
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00:00
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12:00
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18:00
21:00
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Time
Lmax
L1
L10
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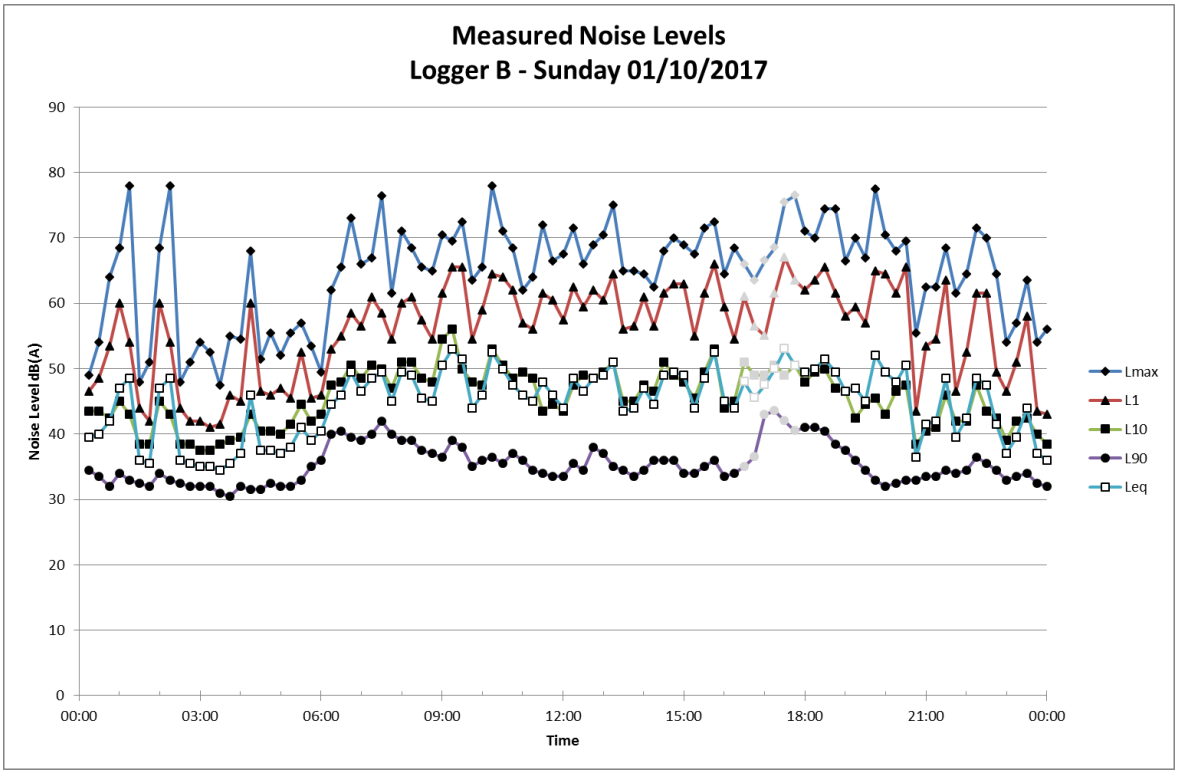
Measured Noise Levels
Logger B - Sunday 01/10/2017
Noise Level dB(A)
90
80
70
60
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40
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03:00
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Time
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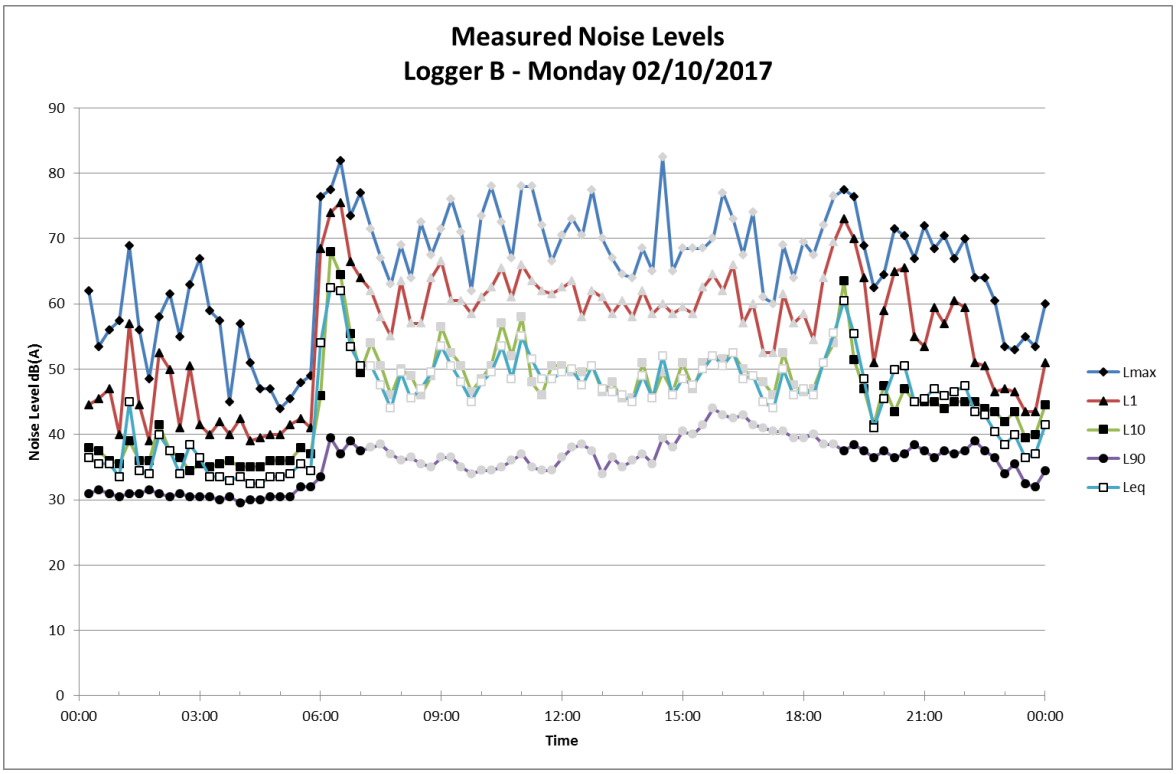
Measured Noise Levels
Logger B - Monday 02/10/2017
Noise Level dB(A)
90
80
70
60
50
40
30
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00:00
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Time
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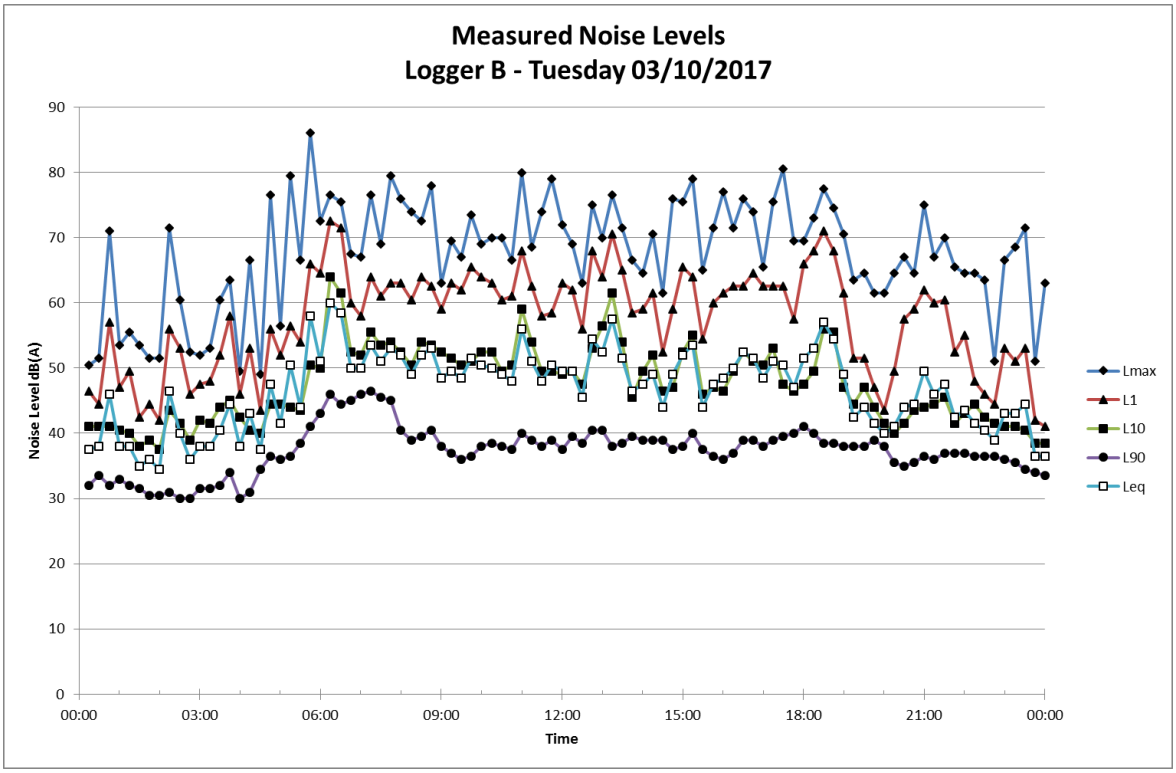
Measured Noise Levels
Logger B - Tuesday 03/10/2017
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
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Time
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L90
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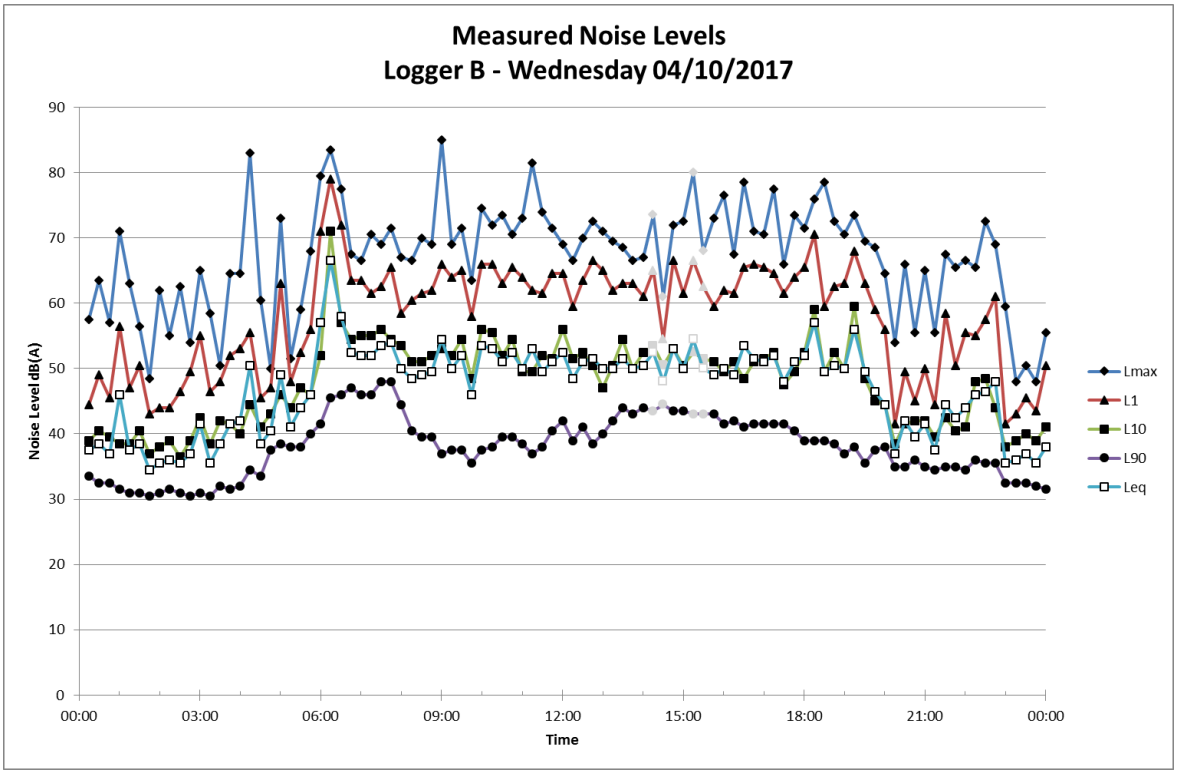
Measured Noise Levels
Logger B - Wednesday 04/10/2017
Noise Level dB(A)
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80
70
60
50
40
30
20
10
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00:00
03:00
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Time
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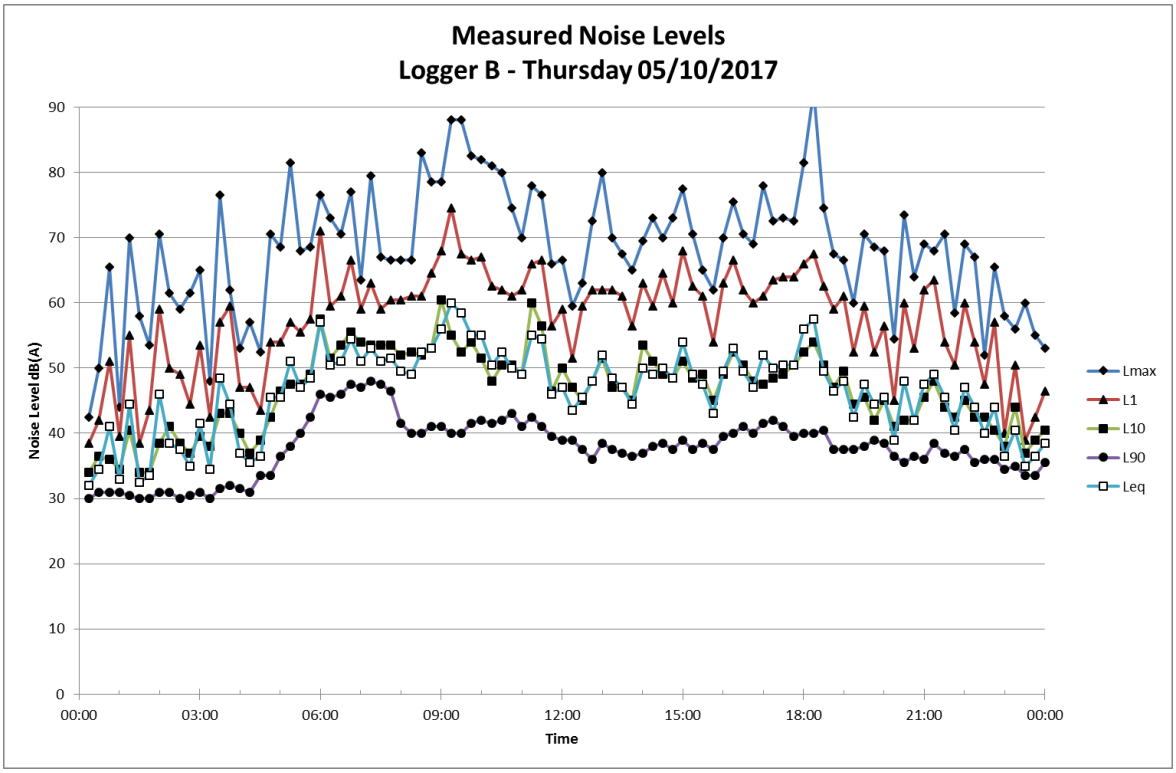
Measured Noise Levels
Logger B - Thursday 05/10/2017
Noise Level dB(A)
90
80
70
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40
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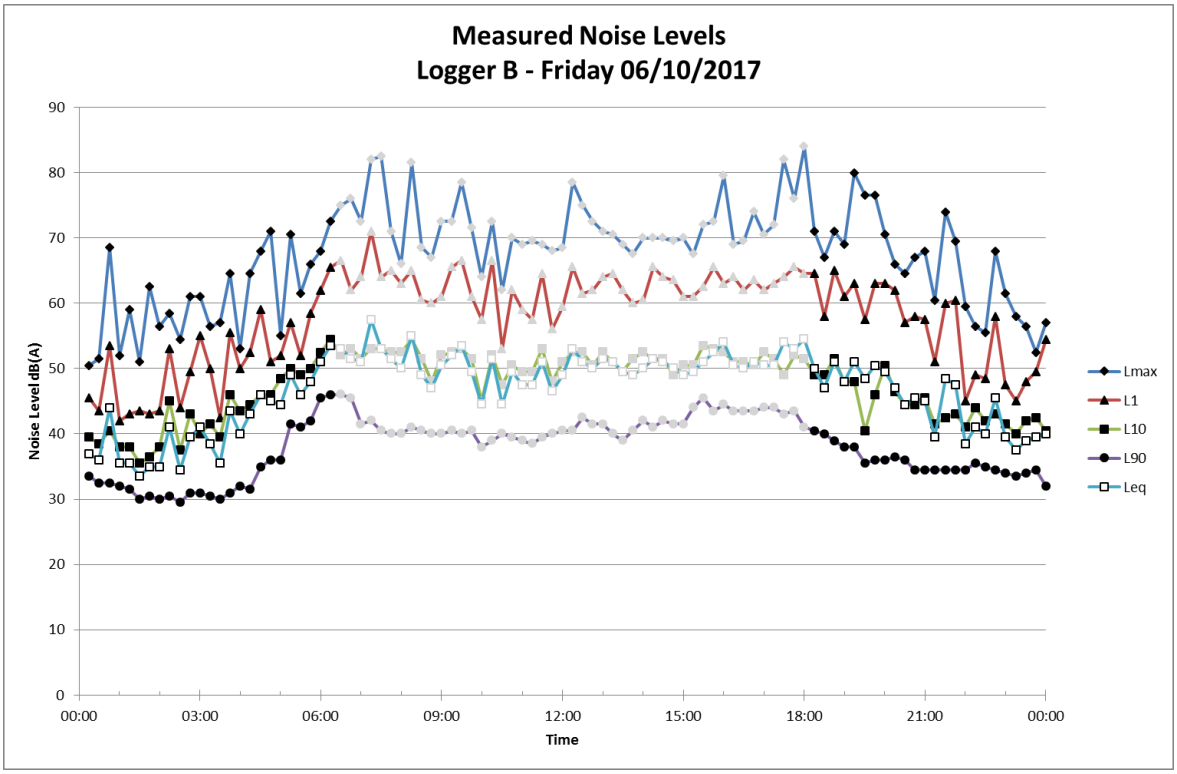
Measured Noise Levels
Logger B - Friday 06/10/2017
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
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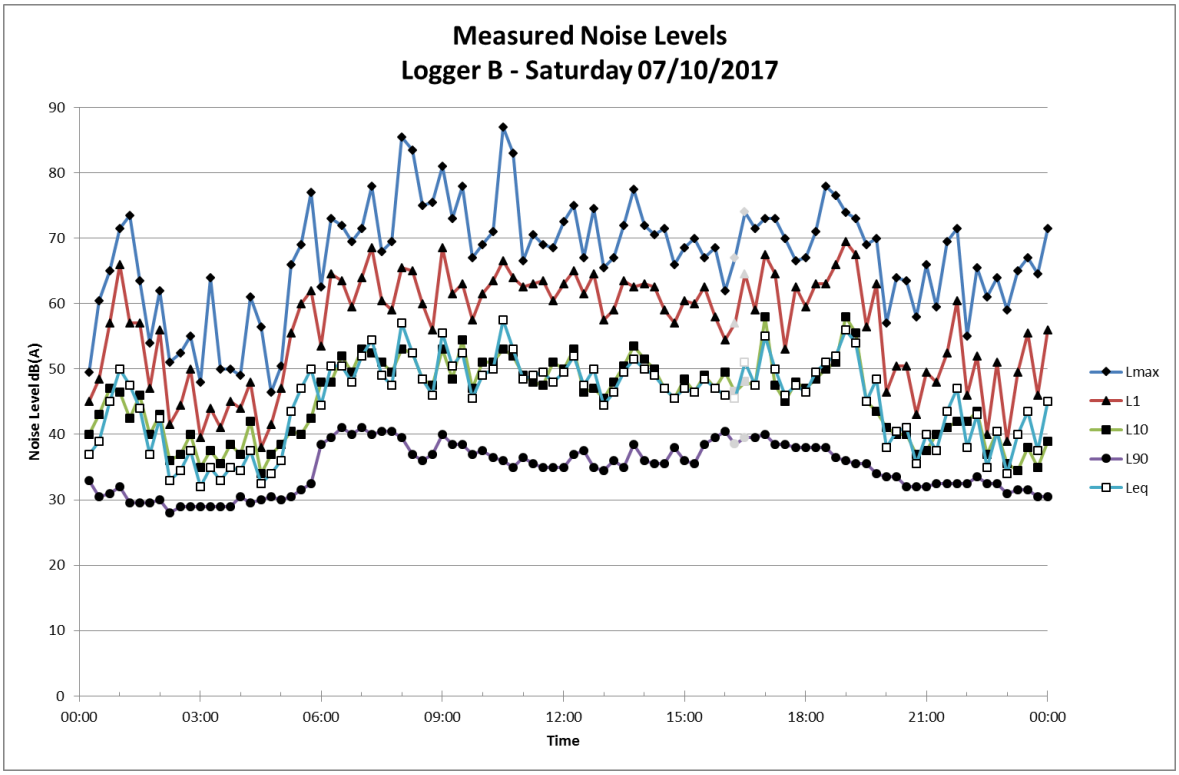
Leq


Measured Noise Levels
Logger B - Saturday 07/10/2017
Noise Level dB(A)
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80
70
60
50
40
30
20
10
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00:00
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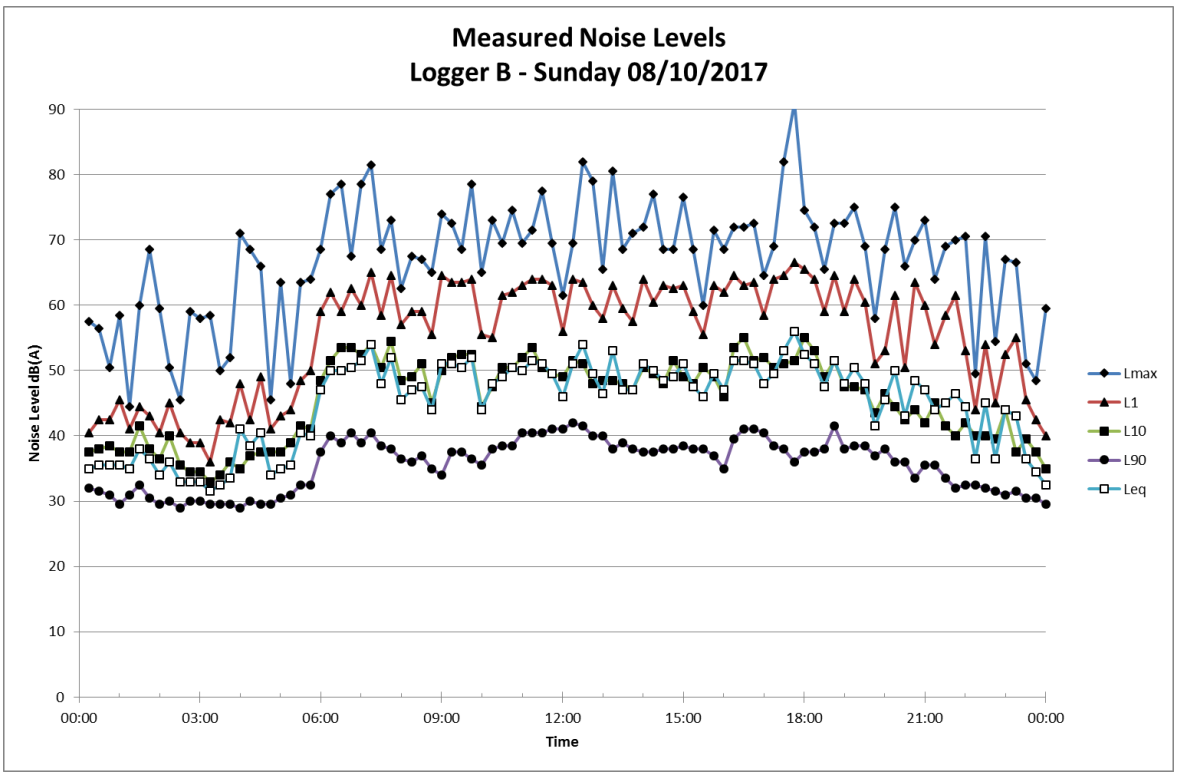
Measured Noise Levels
Logger B - Sunday 08/10/2017
Noise Level dB(A)
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80
70
60
50
40
30
20
10
0
00:00
03:00
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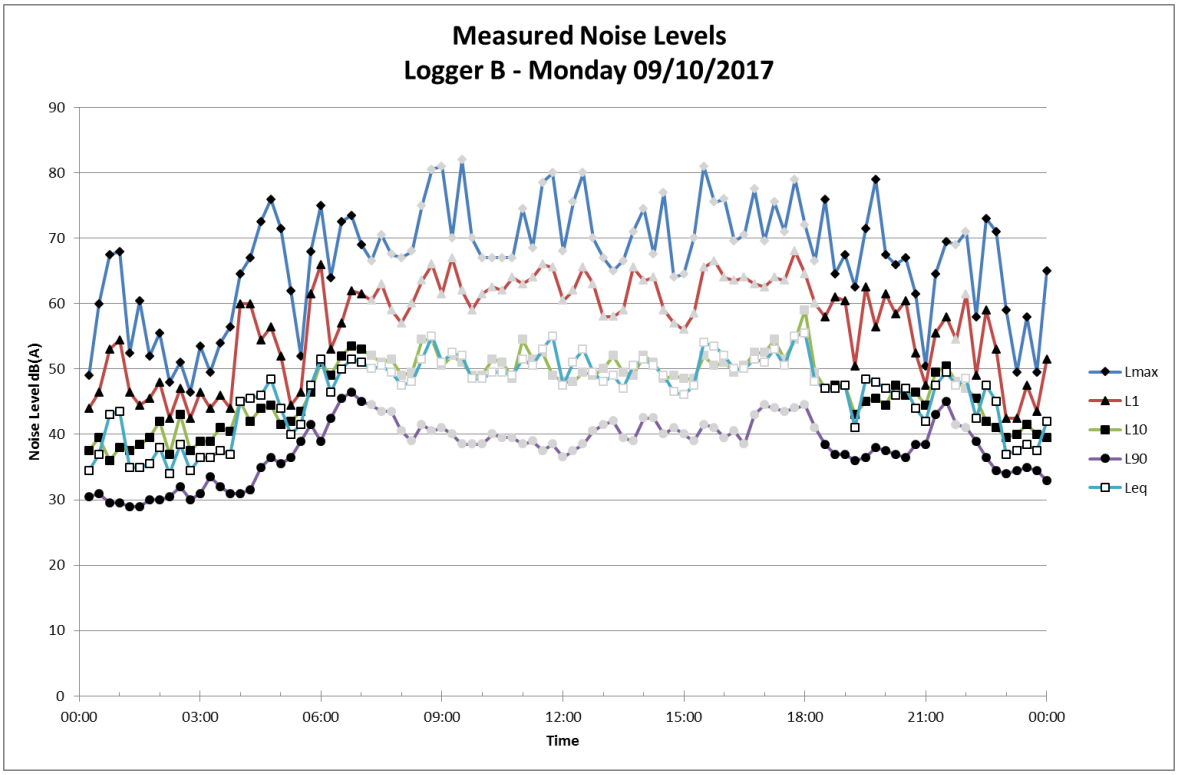
Measured Noise Levels
Logger B - Monday 09/10/2017
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
00:00
03:00
06:00
09:00
12:00
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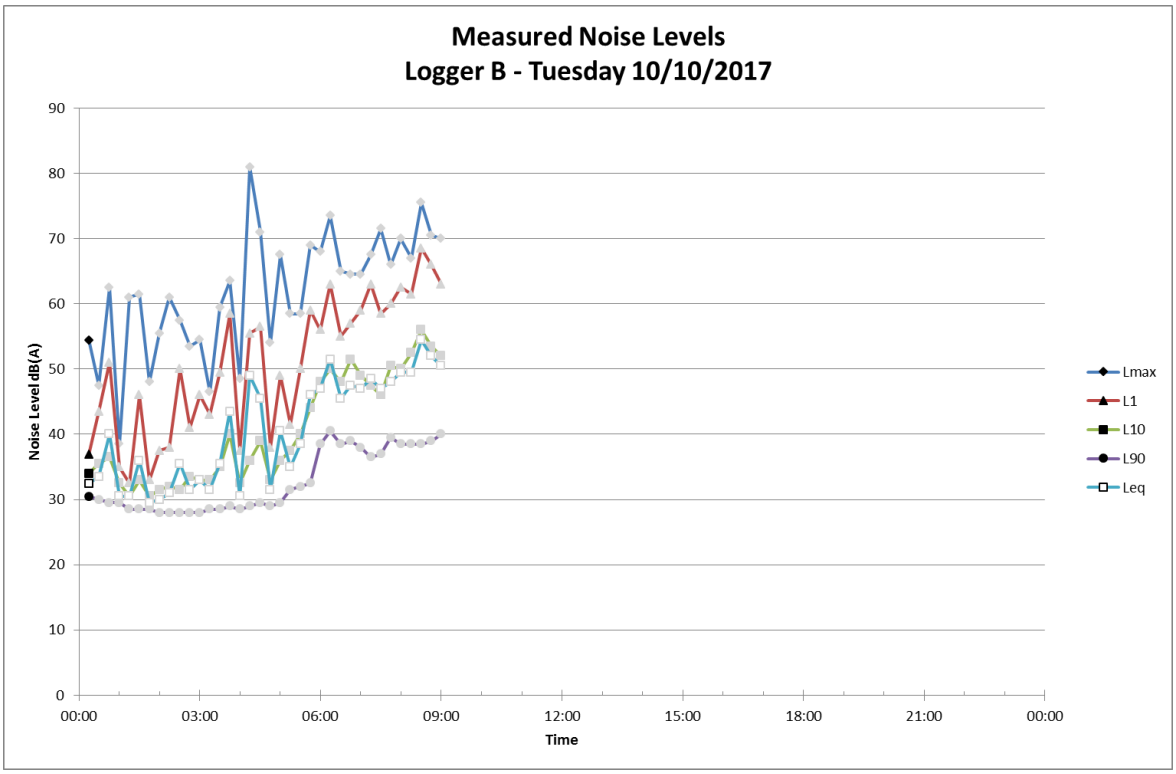
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger B - Tuesday 10/10/2017
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
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Time
Lmax
L1
L10
L90
Leq

55 Martin Road, Badgerys Creek:

Flora and Fauna Survey and Impact Assessment

For Brent M Winning JP

By Ecological Consultants Australia Pty Ltd

March 2018

About this document

Copyright Statement©

Statement of Authorship

This study and report was undertaken by Ecological Consultants Australia at Studio 1/33 Avalon Parade, Avalon. The author of the report is Mia Dalby-Ball with qualifications BSc. majoring in Ecology and Botany with over 20 years' experience in this field, Lisa Jones and Julian Reyes with qualifications BSc. Majoring in Ecology.

Limitations Statement

Information presented in this report is based on an objective study undertaken in response to the brief provided by the client. Any opinions expressed in this report are the professional, objective opinions of the authors and are not intended to advocate any particular proposal or pre-determined position.

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Signed: Geraldene Dalby-Ball – Director of Ecological Consultants Australia 

Executive Summary

Introduction

- The development will consist of the instalment of a waste resource and recovery facility, associated parking and retaining the existing dwelling at 55 Martin Rd Badgerys Creek NSW 2555.
- Due to the ecological values of the site, a Flora and Fauna Impact Assessment has been utilised to assess any damage from proposed works and off-target damage. Recommendations will be provided to reduce the likelihood of impact and mitigate loss.

Methods

- On-ground survey commenced on the 27th of October 2017 and again in November by Ecologist Nicholas Yu.
- Flora and fauna observations were recorded on-site using binoculars, torches and physical examination. Notes, photos and samples of flora species were taken to assess ecological health and value of the site.
- Bionet searches were performed for flora, fauna and endangered populations to identify if there were previous records of threatened species occurring within the local area using a 10km radius around the site.
- A flora and fauna survey and impact assessment were conducted rather than a biobanking assessment as this location falls within the interim proceedings (until later this year) being application of the 7-part test (rather than 5-part) and biobanking being optional. The co-author (Geraldene Dalby-Ball) if fully training in the most recent and Biobanking and environmental legislative changes and has included offsets, by way of on-site amelioration, through planting and native plant regeneration around trees to be retained. Details are included has been included in this report and accompanying landscape documentation.

Results

- The vegetation at the western end of the site is indicative of Shale Plains Woodland, also Identified as Cumberland Plain Woodland a Critically Endangered Ecological Community (CEEC) under the BC Act 2016 and Critically Endangered under the EPBC Act 1999. Shale Gravel Transition Forest EEC
- No threatened flora or fauna species were found on-site during on site searches;
- The site may be providing habitat for threatened fauna species a Test of Significance has been conducted for threatened species possibly in the area with habitat on-site;

Mitigation Measures

Prior to commencement of works:

- Tree Protection as per Arborist report by Glenyss Laws (March 2018).
- Work areas to be delineated to avoid unnecessary disturbance to soil and vegetation.
- Removal of Weeds to prevent spread of seed.
- Seed collection from any native trees approved for pruning or felling and from any other native vegetation. Seed to be propagated and used in post works revegetation or donated to an appropriate group for reuse near-by.

During works:

- Tree protection as per arborist report.
- Dead wood including upright dead trees and fallen logs (>10cm diameter) on the ground will be included into the areas retained both as landscaping and regeneration. Logs to be retained and protected during works as they provide high quality habitat for threatened fauna species, refer to
- Bush hygiene protocols are to be followed to prevent the spread of pathogens including *Phytophthora*.
- Weed management is required throughout works so that areas on site and surrounds are not degraded further by weed species.

After completion of works:

- Revegetation works with native species from the EEC and locally sourced. See Landscaping Plan for flora species and regeneration and planting details.
- Seed collected from removed vegetation to be propagated and where possible planted on-site or near-by or provided to a nursery that specialises in native species.
- Retained dead wood (over 10cm diameter) to be re-introduced to the site as habitat.
- At least two (2) microbat nest boxes are to be installed on site.

Conclusions and Recommendations

- The footprint of the proposed building / wash bay / carpark layout has been modified a number of times to reduce impact on ecological values – mostly the trees. Trees are still proposed for removal however with ~ 5 native trees proposed to be removed (see arborist report for details).
- Recommendations are to preserve and increase ecological value and condition of the site by maintaining EEC species present on-site, by having areas delineated for natural regeneration and areas for planting with planting being with locally native species to this vegetation group.
- Specific recommendations are provided in the document regarding weed management and arborist recommendations for tree care.
- Landscaping Plan provides details for retention and replanting and regenerating of native species and communities and habitats for native fauna.
- At least two (2) microbat nest boxes are to be installed on site.
- No significant impact on endangered ecological communities or threatened species due to proposed works.
- Ongoing maintenance of environmental and ecological actions is required.

Table of Contents

1 Introduction

Ecological Consultants Australia (ECA) has been contracted by CLARON CONSULTING PTY LTD, to provide an "Assessment of Significance" to assess potential direct and indirect impacts on the fauna and vegetation communities present within the site as per section 5A of the Environmental Planning & Assessment Act 1979. The 'Assessment of Significance' has been undertaken in accordance with the NSW Department of Environment & Climate Change 'Threatened species assessment guidelines'.

It is understood that this report is to form part of a Development Application for a proposed subdivision of the current lot into four separate lots.

1.1 Legislation and policy

The implications for the proposal were assessed in relation to key biodiversity legislation and policy including:

- *Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*
- *Environmental Planning and Assessment Act 1979 (EP&A Act).*
- *Threatened Species Conservation Act 1995 (TSC Act).*
- *Fisheries Management Act 1994 (FM Act).*
- *National Parks & Wildlife Act 1974 (NP&W Act).*
- *Noxious Weeds Act 1993 (NW Act).*

1.2 Scope of works

ECA has accepted to provide ecological report and advice associated with the DA for the new dwellings and associated works. This includes the following.

1) Flora and Fauna Impact Assessment – including test of significance for threatened species;

The objectives of this Flora and Fauna Impact Assessment are to:

- Identify any native vegetation communities, significant species or significant habitat features present within the study area.
- Identify any known or potential habitat for threatened species.
- Review the implications of relevant biodiversity legislation and policy.
- Identify potential impacts on significant ecological communities, species or habitats from the proposed development and provide recommendations to assist with the mitigation of those potential impacts during the construction and operation stages.
- Recommend any further assessments of the site that may be required (such as targeted searches for significant species within inaccessible parts of the study area or considered to be at a low level of detectability at the time of the surveys).

All reporting will be done in communication with the Architect and any other background reports. These reports will be consistent with Liverpool City Council's requirements.

Works include a site survey/assessment, review of project design and review of available literature to produce site specific ecological and environmental effects report. ECA will review arborist assessments and any additional reports. In addition, works will require liaison with the architect and landscape architect to ensure both comprehensive and consistent documentation and Liverpool City Council if required.

1.1 Limitations of the Study

The purpose of the flora and fauna work is to assess the sites ecological value, particularly listed species, communities and population. An impact assessment and associated Tests of Significance (7-part tests) have been conducted.

Limitations of the study may arise where certain cryptic species of plants may occur as soil-stored seed or as subterranean vegetative structures. Some species are identifiable above-ground only after particular environmental circumstances related to factors such as periodic fire frequency, intensity or seasonality, soil moisture regime, grazing pressure, biological life-cycle patterns as in the case of small plants such as species of orchids etc. No specific invertebrate surveys were conducted.

Surveys at one time of the year cannot be expected to detect the presence of all species occurring, or likely to occur, in the study area. This is because some species may (a) occur seasonally, (b) utilise different areas periodically (as a component of a more extensive home range), or (c) become dormant during specific periods of the year. Rather, the survey provides the opportunity to sample the area, search specifically for species likely to be encountered within the available time frame and assess the suitability of habitat for particular species.

Considering the site and habitat availability ECA are confident that this survey is representative of the likely species and vegetation community and that future studies at other times would not change the conclusions in this report.

NB: this is not a full flora and fauna survey however specific searches were made for species listed on the Threatened Species lists of TSC Act and EPBC Act.

1.2 Site Location

The site is a rural block of land identified as Lot 4, DP 611519 located at 55 Martin Rd Badgerys Creek NSW 2555, NSW, in the Liverpool City Council LGA. The property is located on the western side of Martin Rd and is boarded by Lawson Rd to the west. The site is located 40 kilometres west of the Sydney CBD. See Figure 1 for aerial photograph of site location.

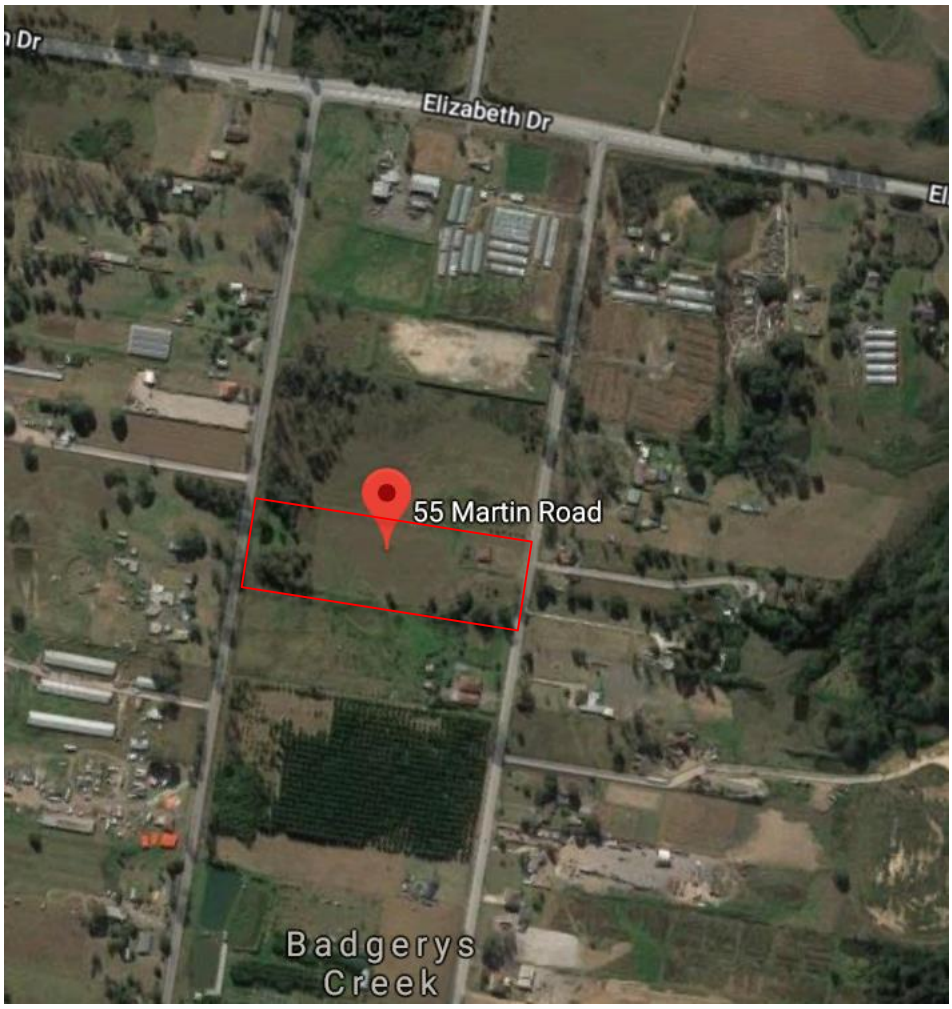


Figure 1. Site location with approximate property boundaries. Source: GoogleMaps, February 2018.

1.3 Ecology of the site

The site offers a range of ecological values and functions given to the wider ecological community. In accordance with Badgerys Creek Biodiversity Report prepared by SMEC, the area has two specific vegetation types: shale plains woodland and shale hills woodland, both components of Cumberland Plain Woodland. Additionally, shale gravel transition forest has also been identified in the area. This site has the potential for developing mature tree hollows for an array of animals to occupy.

2 Proposed Actions

The proposed actions involve the instalment of a waste resource and recovery facility, associated parking and retaining the existing dwelling. The plans show the proposed actions will have an impact on several trees in the property. The Arboricultural Report assessed seventeen individual trees plus a cluster of six closely aligned specimens, from which eight trees have been proposed for removal by the Arborist. This has primarily triggered the need for a Flora and Fauna Impact Assessment report to meet DA Council conditions.

The site currently has four (4) distinct areas which will be referred in this report as: Shale Plains Woodland area, Shale/Gravel Transition Forest area, Shale Hills Woodland area and Proposed Development area (see Figure 2 below).

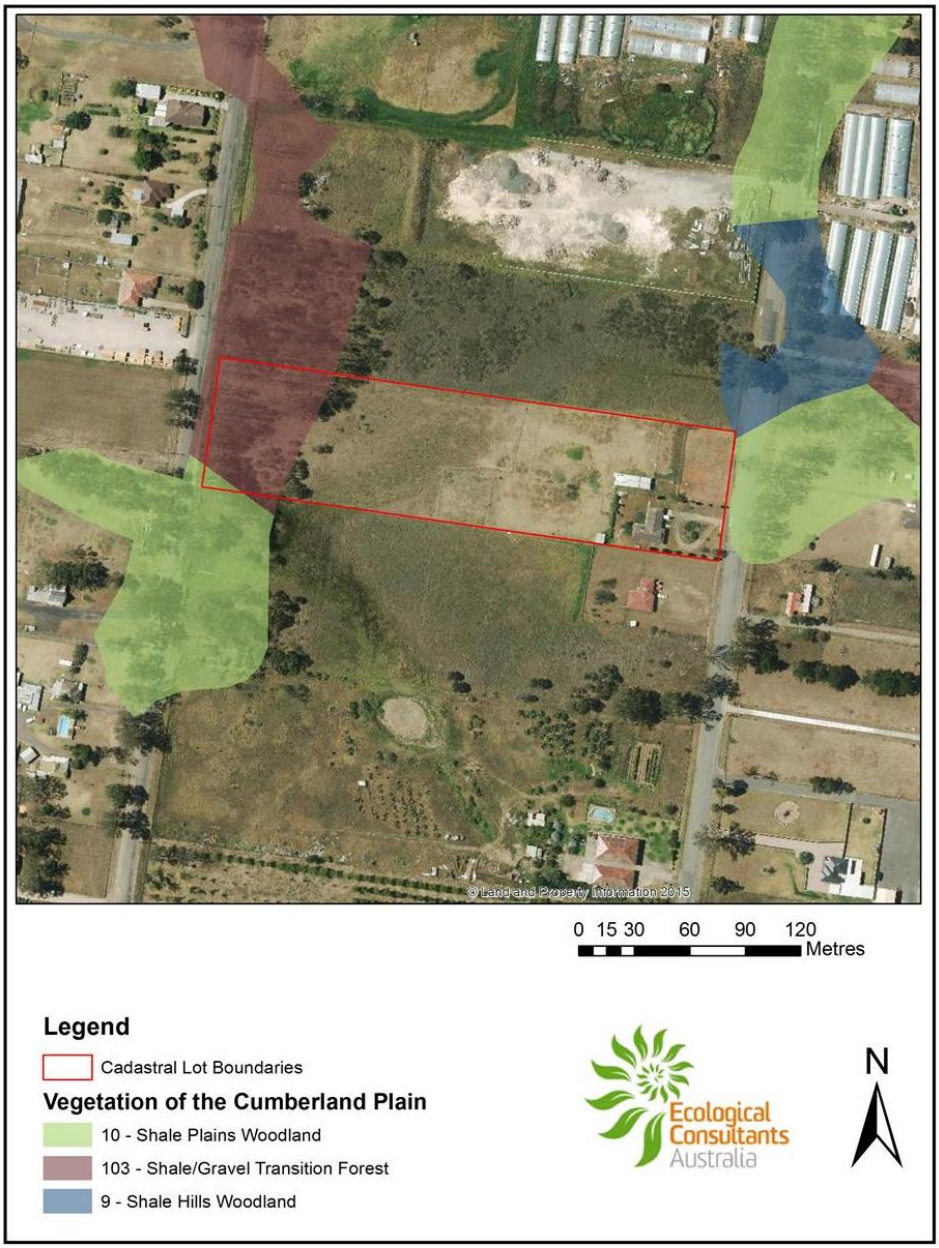


Figure 2. Habitat Map. Source: SixMaps October 2017.

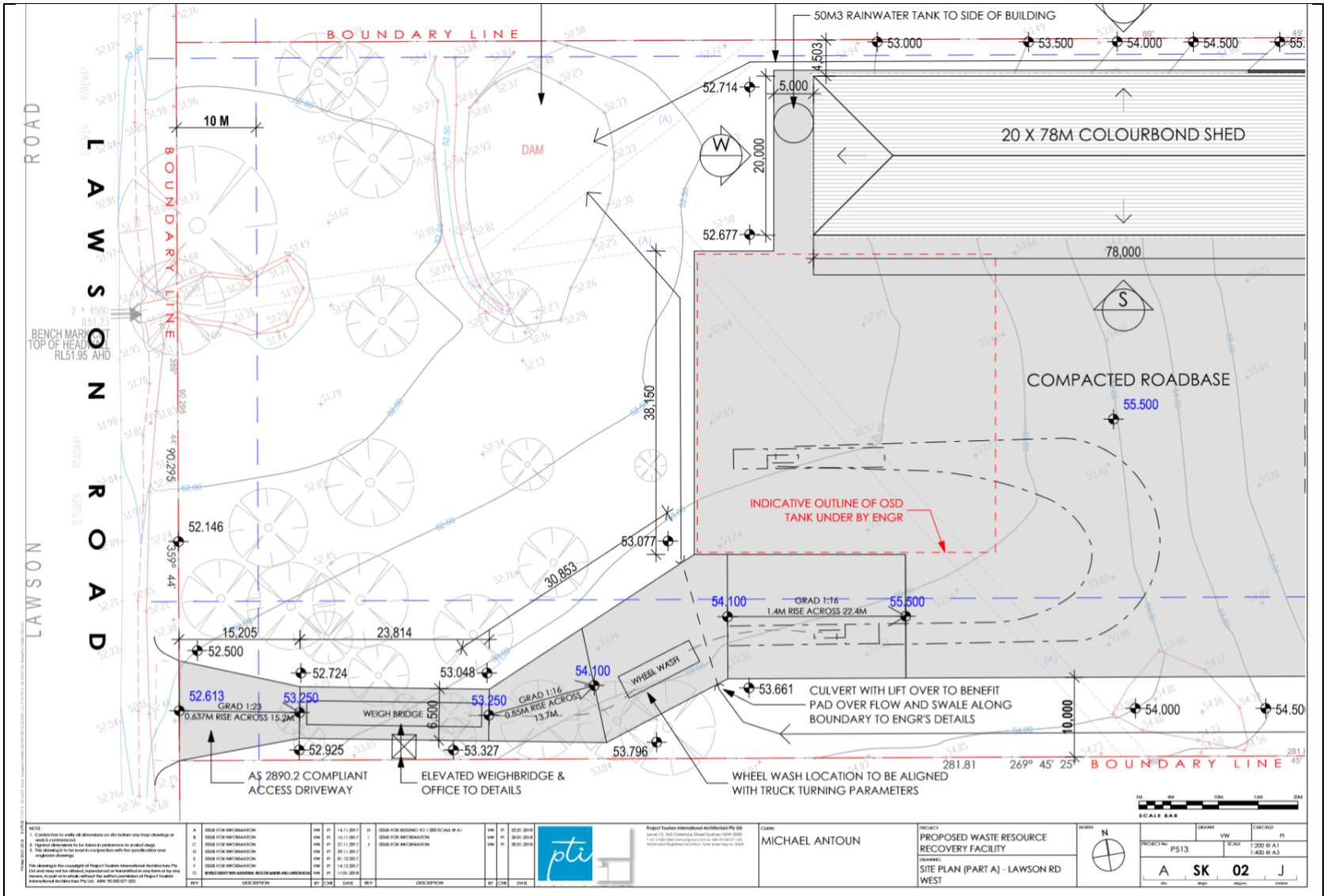


Figure 3a. Diagram of proposed works as supplied by the client Part A. 2017.

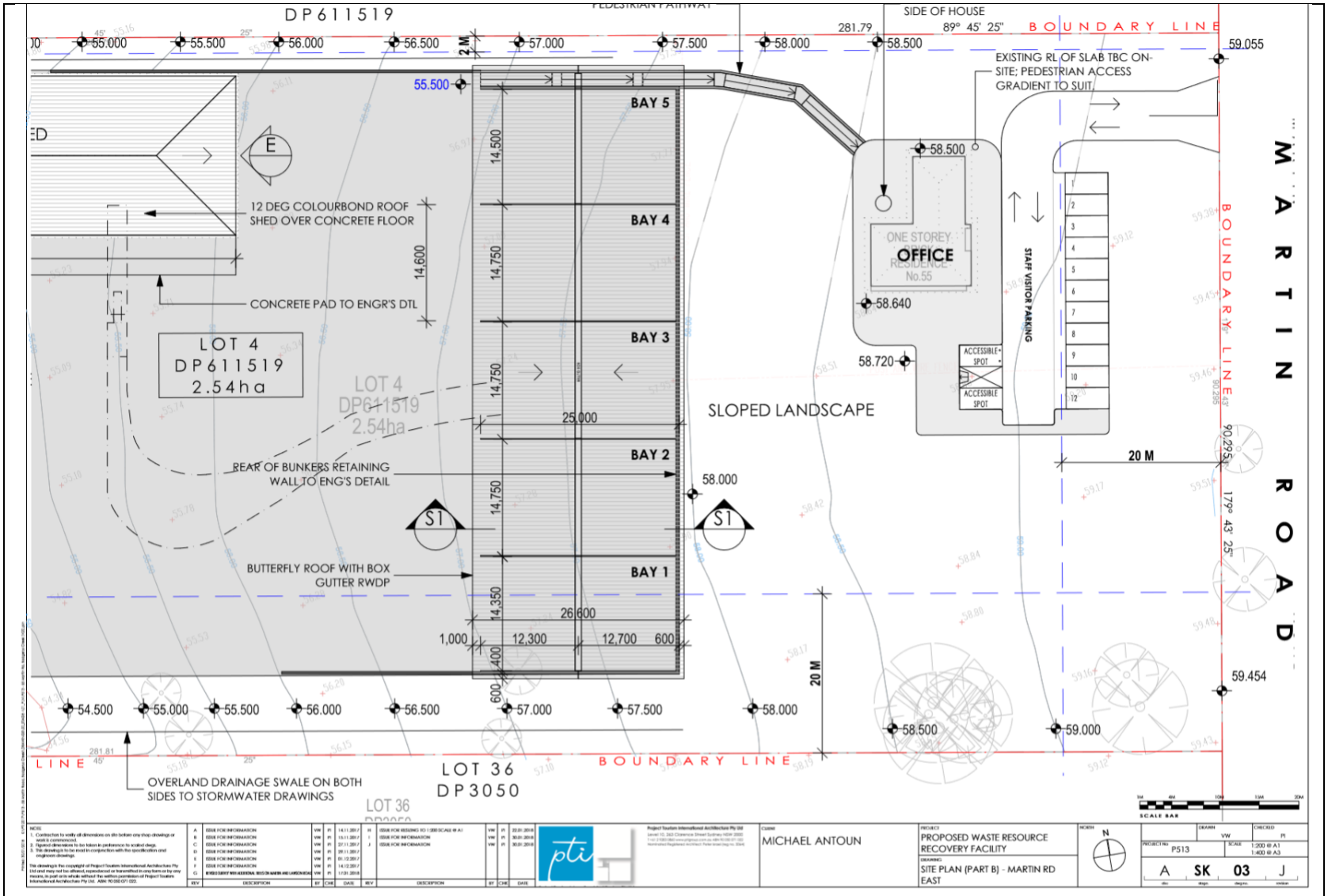


Figure 3b. Diagram of proposed works as supplied by the client Part B. 2017.

3 Methods

3.1 Site Inspections

Nicholas Yu assessed the site on the 27th of October 2017 at 10am-11am and on the 23rd of November 2017 from 4pm. Weather was fine and sunny during time of visit. During site visits, notes and photos were taken of the important vegetation types, flora and fauna present. Due to the small area of proposed impacts, detailed or systematic surveys were not performed. Surveys were general and opportunistic in nature and were performed by traversing the site. Surveys included a single vegetation survey and a general habitat survey in which fauna habitat resources were identified.

3.2 Previous studies

Bionet, previous studies and the author's knowledge of the local area, were used to determine the possible occurrence of endangered ecological communities and threatened plant species on-site. The Bionet records accessed cover a 10km^2 area extending from the site and include recordings from 1993 to the present day.

Records from the following databases were collated and reviewed:

- Atlas of NSW Wildlife (Bionet). New South Wales, Office of Environment and Heritage (OEH).
- NSW Threatened Species Information (OEH).
- PlantNET (The Royal Botanic Gardens and Domain Trust 2014).
- Protected Matters Search Tool of the Australian Government Department of the Environment (DoE) for matters protected by the Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Other sources of biodiversity information:

- Relevant vegetation mapping, including:
    - Vegetation Information System, VIS Mapping (OEH).
    - Native Vegetation of the Sydney Metropolitan CMA Area, Sydney Metropolitan (CMA, 2009).

The following reports were also reviewed:

- Glenyss Laws 2018, Arboriculture Impact Assessment Report for 55 Martin Road, Arborist report by Glenyss Laws, Beecroft NSW 2119.
- Liverpool City Council, website and records.
- Office of Environment and Heritage and National Parks & Wildlife Service documents and mapping were also consulted.

3.2.1 Arborist report findings

Summary from Glenyss Laws Arborist Report:

Seventeen (17) individual and a closely aligned group of six (6) trees were assessed in preparing the preliminary report.

- Trees 1 & 2 the two trees fall within the footprint of the proposed driveway and weighbridge. The specimens are over mature with a short useful life expectancy, their removal should not be a constraint to the proposal.
- Trees 3, 4 & 5 are setback sufficiently that no encroachment of the TPZ is proposed.
- Tree 6 has a calculated TPZ of 5.3m. The proposed weighbridge is an elevated prefab unit which sits above ground, is offset at 1.5m and within the 2.4m SRZ. Compaction will be required to provide a solid base for the structure, soil compaction is one of the most damaging effects upon a trees root system. The proposal constitutes a major encroachment and will significantly shorten the trees life expectancy.
- Trees 7, 8, 9 & 10 are allocated a high retention value, the proposed wheel wash and driveway falls within the footprint of the four trees.
- Tree 11 a 5.4m TPZ and 2.6m SRZ applies. The specimen is offset 1.5m to the proposed wheel wash and equates to a major encroachment of approximately 32% of the TPZ.
- Tree 12a a 6.6m TPZ is estimated, the specimen is setback 5.5m to the proposed driveway of compacted road base. The proposal is a minor an acceptable encroachment under Clause 3.3.2 of AS4970, at approximately 3.5% of the TPZ.
- Trees 12 – 14 appear to be setback sufficiently that no encroachment of the TPZ is proposed.
- Tree 15 is allocated a high retention value, a 9.2m TPZ applies. The staff visitor parking area is setback at approximately 10.5m subsequently no incursion of the TPZ occurs. Tree 15 can be retained and protected.
- Tree 16 is allocated a high retention value, a 9.8m TPZ applies. The proposed staff visitor carpark is setback at approximately 8.5m and equates to a minor and acceptable encroachment under Clause 3.3.2 of AS4970 of approximately 3.5%. Tree 16 can be retained and protected.
- Tree 17 is a closely aligned cluster of six remnant trees allocated a high retention value, the six trees are located within a horse paddock bounded by electrified fencing, as access was restricted DBH and DRB were estimated. The proposed staff visitor parking area falls within the footprint of one specimen and within the SRZ of the remaining five trees. The proposal is a major encroachment upon the six trees. To bring the design to an acceptable tolerance it will be necessary to redesign the staff visitor parking area and maintain a minimum 8.4m offset to the most northern tree in the cluster identified as T17F.

The trees on the northern boundary adjoining the existing dam did not form part of the onsite brief/meeting. It is expected a change to the groundwater regime will be created with the removal of the dam and installation of an overland drainage swale. The works will potentially impact the ground water flow within the rootzone of the group of remnant trees on the northern corner of the Lawson Rd frontage.

Figure 4. Canopy Cover south-western boundary. Source: Glenyss Laws Consulting Arborist

Figure 5. Trees 15-17 on Martin Rd frontage. Source: Glenyss Laws Consulting Arborist.

See Arborist report for complete list of trees surveyed on site in Appendix I.

Table 1. Trees proposed for Removal. Source: Glenyss Laws January 2018.

Tree No.	Species Name	Common Name	Comments
1	*Eucalyptus moluccana*	Grey Box	To accommodate wheel wash and Driveway. Modifications to the initial proposal for the wheel wash and visitor parking have been made in order to retain other trees.
2	*Eucalyptus tereticornis*	Forest Red Gum	
6	*Eucalyptus tereticornis*	Forest Red Gum	
7	*Eucalyptus tereticornis*	Forest Red Gum	
8	*Eucalyptus tereticornis*	Forest Red Gum	
9	*Eucalyptus tereticornis*	Forest Red Gum	
10	*Eucalyptus tereticornis*	Forest Red Gum	
11	*Eucalyptus species*		

4 Flora

The purpose of the flora work was an investigation to determine the flora composition of the site, particularly vulnerable and endangered species. It also included an assessment of the flora as habitat. Furthermore, an assessment of potential impact of the development with a determination of native ground and shrub was conducted.

4.1 Methods

Nicholas Yu assessed the site on the 27th of October 2017 at 10am-12am and on the 23rd of November 2017 from 4pm. Weather was fine and sunny during time of visit. During site visits, notes and photos were taken of the important flora. Bionet was also used to determine the threatened fauna and endangered populations, which have been recorded within 10km of the site since 1993.

4.2 Threatened Plant Species

A total of 970 flora species have been recorded within 10km of the study site according to BioNet records. Of these, 10 species are listed as vulnerable or endangered under state and/or commonwealth legislation (see Table 3 below). The vulnerable and endangered species that were focused on during site assessments, and within the surrounding bushland are shown in Table 3 below.

Table 2. Threatened Plant Species observed in previous ecological surveys within a 10km radius since 1993. Source: NSW OEH Bionet 2018.

Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Apocynaceae	*Marsdenia viridiflora subsp. viridiflora*		E2		18
Fabaceae (Faboideae)	*Dillwynia tenuifolia*	Dillwynia tenuifolia, Kemps Creek	E2,V,P		43
Fabaceae (Faboideae)	*Dillwynia tenuifolia*		V,P		437
Fabaceae (Faboideae)	*Pultenaea parviflora*		E1,P	V	40
Fabaceae (Mimosoideae)	*Acacia pubescens*	Downy Wattle	V,P	V	9
Lobeliaceae	*Hypsela sessiliflora*		P,3	X	7
Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	V,P,3		1
Proteaceae	*Grevillea juniperina subsp. juniperina*	Juniper-leaved Grevillea	V,P		111
Proteaceae	*Grevillea parviflora subsp. parviflora*	Small-flower Grevillea	V,P	V	12
Proteaceae	*Persoonia nutans*	Nodding Geebung	E1,P	E	7
Thymelaeaceae	*Pimelea spicata*	Spiked Rice-flower	E1,P	E	4

Note: E = Endangered, V = Vulnerable, P = Protected, and * = Possibly occurring but not definitive.

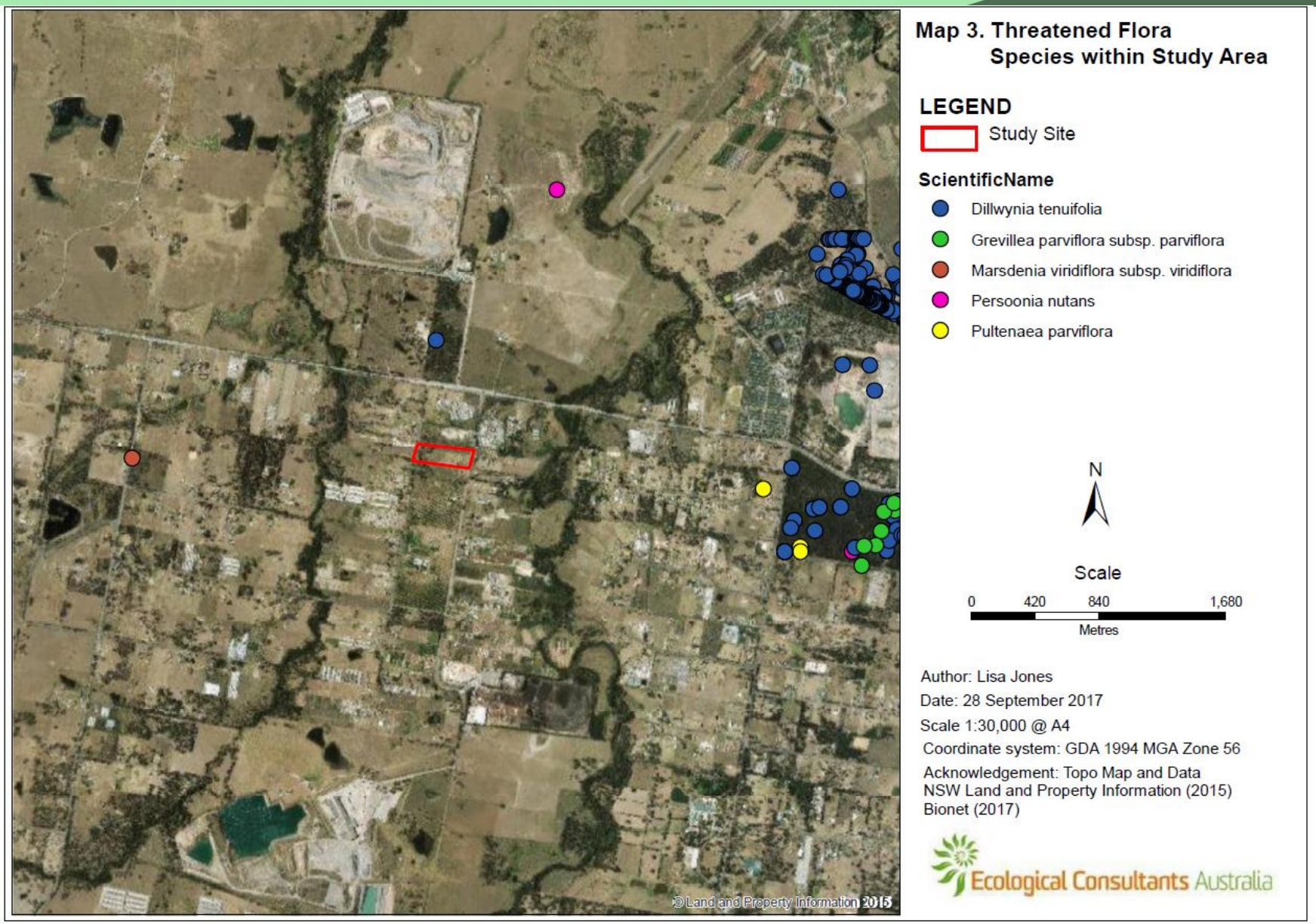


Figure 6. Bionet Mapping

Likelihood of occurrence

The habitat suitability is a broad categorisation used to indicate the potential for a species to occur within the study area. It is based on expert opinion and implies the relative value of a study area for a particular species. See Appendix II for rationale of likelihood of occurrence.

4.2.1 Threatened plant species findings

No threatened plant species were found during site assessments.

4.3 Ecological Endangered Communities

4.3.1 CEEC and EEC findings

As outlined in Figure 2 and via the two site visits, the vegetation at the western end of the site is indicative of Shale Plains Woodland, also Identified as Cumberland Plain Woodland a Critically Endangered Ecological Community (CEEC) under the BC Act 2016 and Critically Endangered under the EPBC Act 1999.

4.4 Flora Findings from Site Investigations

4.4.1 Observed Flora

A list of native flora was compiled for flora in the proposed development area and surrounding remnant bushland. See Table 4 for native species in these areas.

Table 3. Native flora recorded on site.

Scientific Name	Common Name	NSW status	Comm. status
Bursaria spinosa	Native Blackthorn	*	*
Einadia hastata	Berry Saltbush	*	*
Eucalyptus moluccana	Grey Box	*	*
Eucalyptus tereticornis	Forest Red Gum	*	*
Juncus usitatus	Common Rush	*	*
Typha orientalis	Broad-leaved Cumbungi	*	*

Note: *P = Protected, E=Endangered. * = this plant does not have a NSW or Commonwealth status. Individually, these species are not Endangered or Protected, but they are part of an Ecological Community, Shale Gravel Transition Forest, which has a conservation status in NSW of Endangered and a Commonwealth status of Critically Endangered.*

The following species (in Table 5 below) have been identified to be currently occurring within the site and have potential to spread to construction work areas or areas of disturbed soils. Construction areas and disturbed soils should be monitored during and post works for the spread of other small herbaceous and grassy weeds.

Current and future disturbance to the site may create environments favourable for weeds. Thus, it is important that bush regeneration takes place within the site to offset damages from construction related disturbance and the associated risk of weed growth and invasion and to maintain SPGF EEC diversity of flora and fauna habitat.

Table 4. Non-native Plant Species recorded on site and legislative grading.

Scientific Name	Common Name	WoNS	Legal Requirements*
Araujia sericifera	Moth Vine		
Bromus catharticus	Praire Grass		
Chloris gayana	Rhodes Grass		
Conyza bonariensis	Flaxleaf Fleabane		
Lonicera japonica	Japanese Honeysuckle		
Lycium ferocissimum	African Boxthorn	**Yes**	**Prohibited on Dealings** Must not imported into the State or sold
Onopordum acanthium subsp. acanthium	Scotch Thistle		
Opuntia stricta	Common Prickly Pear	**Yes**	**Prohibited on Dealings** Must not imported into the State or sold
Passiflora edulis	Common Passionfruit		
Pennisetum clandestinum	Kikuyu Grass		
Rumex obtusifolius	Broadleaf Dock		
Sida rhombifolia	Paddy's Lucerne		
Sonchus oleraceus	Common Sowthistle		
Taraxacum officinale	Dandelion		
Verbena bonariensis	Purpletop		

Note: Noxious Weeds Act 1993 was repealed by the Biosecurity Act 2015 as of 2017. As such there are no weed classifications, instead:

All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is practicable.

Additional legal requirements are outlined in table 5.
Weeds classed as WoNS (Weeds of National Significance) have been agreed by Australian governments based on an assessment process that prioritised these weeds based on their invasiveness, potential for spread and environmental, social and economic impacts. Two weeds on site were categorized as a WoSN.

Weeds listed as a Noxious weed and WoNS should be managed on site to preserve the ecological value and function on PSGF EEC.

See Recommendations and Appendix III for removal techniques for key weeds.

4.4.1 Vegetation communities

Flora vegetation such as canopy species *Eucalyptus moluccana* and *Eucalyptus tereticornis* are within the boundaries of the site. This indicates that CEEC Shale Gravel Transition Forest (western side of the site near Lawson Road) and a small area (<30m^2) of Shale Plain Woodland (SPW), also considered to be CPW, is present. The mid-storey and groundcover species are absent, and these strata are dominated by exotic vegetation. A Test of Significance (7-Part test) has been conducted to assess the impacts of proposed works on this community.

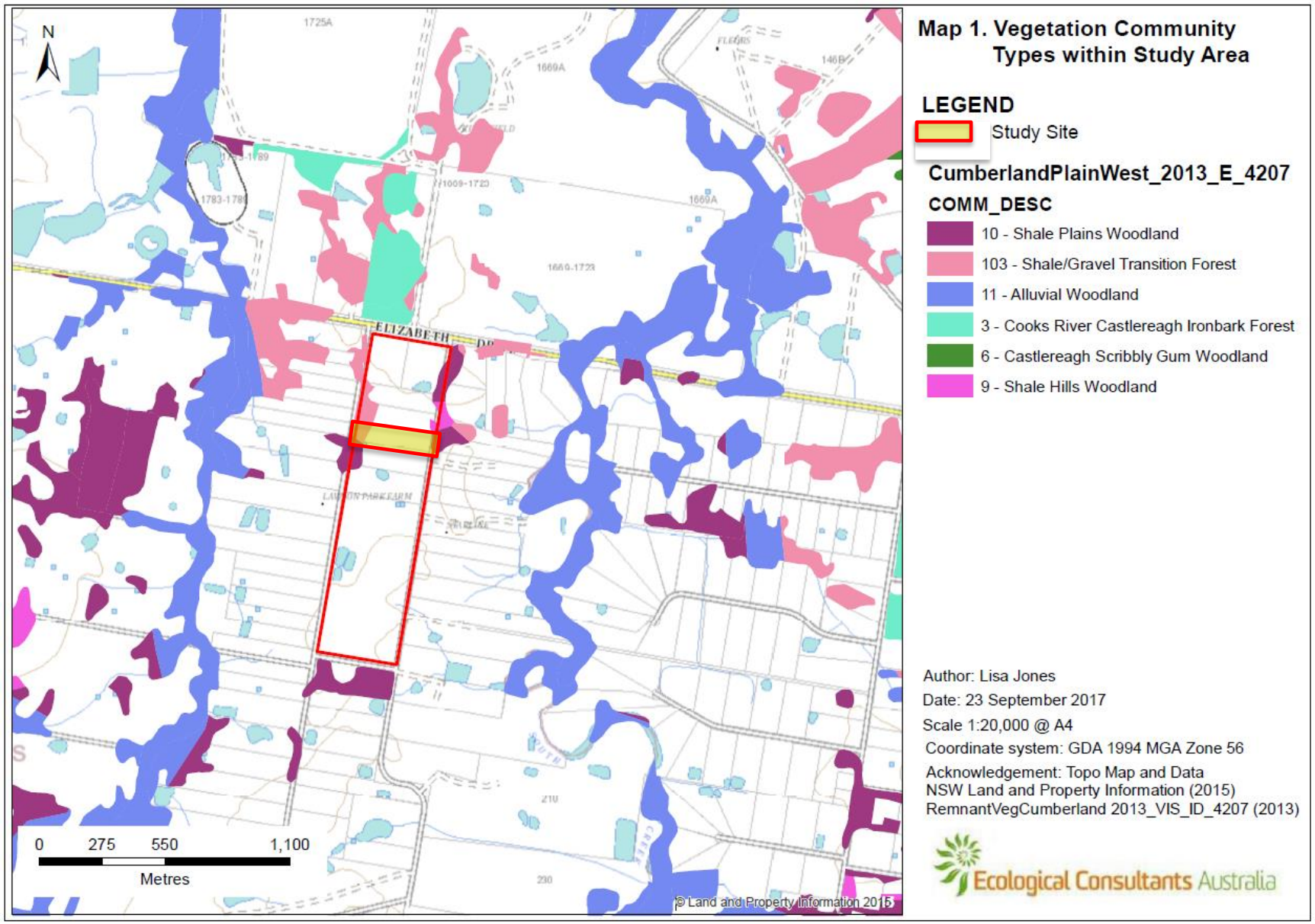


Figure 7. Bionet Mapping

4.4.2 Disturbances to Flora

Remnant Bushland zone

Remnant Bushland on-site is restricted to a group of canopy trees on the western end of the site and these are regrowth from prior clearing. This vegetation community is often present, however, as soil seed stock and appropriate management can bring back a diversity of CP species. Hence the cluster of trees to be retained on the western boundary is being considered as bushland as are trees within 10m of this patch. Work in similar areas has shown that thermal weeding (flame weeding) stimulates the regrowth of native species. Thermal weeding can be done in a safe manner and has been used successfully in other parts of western Sydney in CPW.

Currently the vegetation of the remnant bushland zone is in poor condition due to the high ratio of exotic species to native species and the relatively low native species richness – and this being restricted to canopy species.

Dominant weeds in this area include African Boxthorn and Kikuyu Grass. Other ground layer exotics include Purpletop and Rhodes Grass.

Notable weeds

Two exotic species are listed as WoNS under the EPBC Act 1999:

- African Boxthorn
- Common Prickly Pear

Other environmental weeds found on-site include:

- Moth Vine
- Praire Grass
- Rhodes Grass
- Flaxleaf Fleabane
- Japanese Honeysuckle
- Scotch Thistle
- Common Passionfruit
- Kikuyu Grass
- Broadleaf Dock
- Paddy's Lucerne
- Common Sowthistle
- Dandelion
- Purpletop

The growth and spread of these species must be managed in accordance with measures specified in local management plans (as per Biosecurity Act).

Tree Removal

Eight trees are proposed for removal to accommodate the wheel wash and driveway (T1, T2, T7, T8, T9 and T10). These consist of two Grey Box (*Eucalyptus moluccana)* and four Forest Red Gums (*Eucalyptus tereticornis*). The canopy on-site is already sparse, and the proposed removal will result in less canopy. Proposed planting however will, within ~ 15 years, result in more canopy on-site than that being removed. Figure 8 show the trees to be removed on the western and eastern sides of the site.

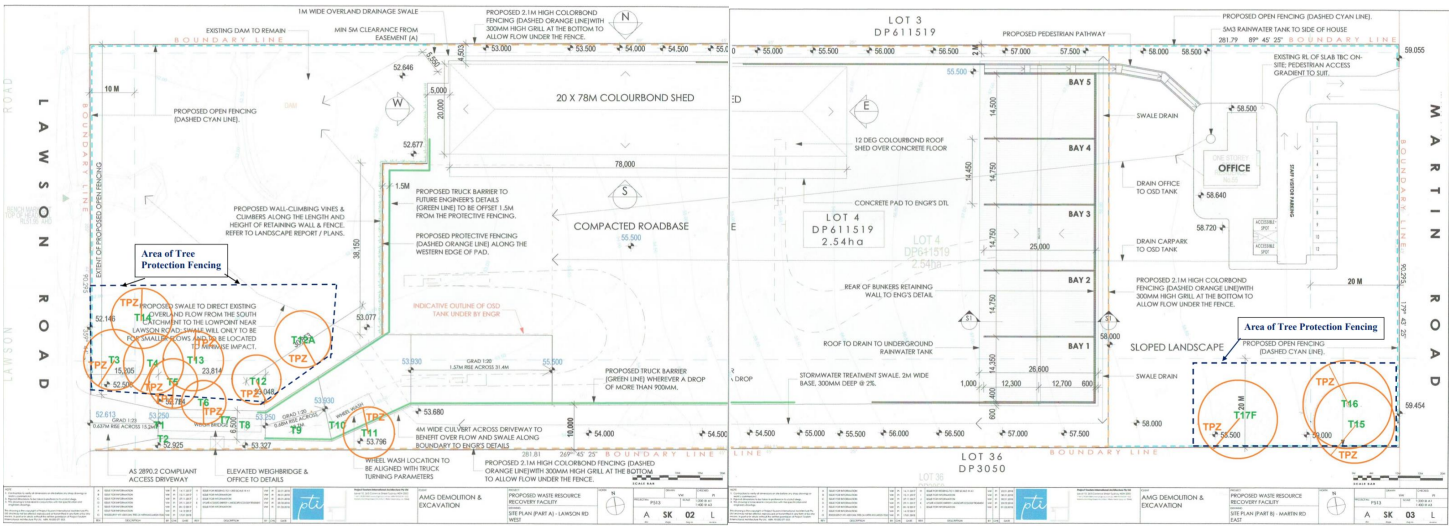


Figure 8. Arborist Survey. Source: Arborist Glenyss Laws, March 2018.

5 Fauna

5.1 Methods

Nicholas Yu assessed the site on the 27th of October 2017 morning and on the 23rd of November 2017 at from 4pm. Weather was fine and sunny during time of visit. During site visits, notes and photos were taken of the important fauna and fauna habitat present. Bionet was also used to determine the threatened fauna and endangered populations, which have been recorded within 10km of the site since 1993. Anabat recordings were conducted in the surrounding area and data used as reference for this assessment.

5.2 Threatened fauna

A total of 274 fauna species have been recorded within 10km of the study site according to BioNet records. Of these, 17 species are currently listed as vulnerable or endangered under state and/or commonwealth legislation (see Table 5). The vulnerable and endangered species to focus on-site searches for can be seen in Table 5 below highlighted in bold. This is based on likelihood of occurrence.

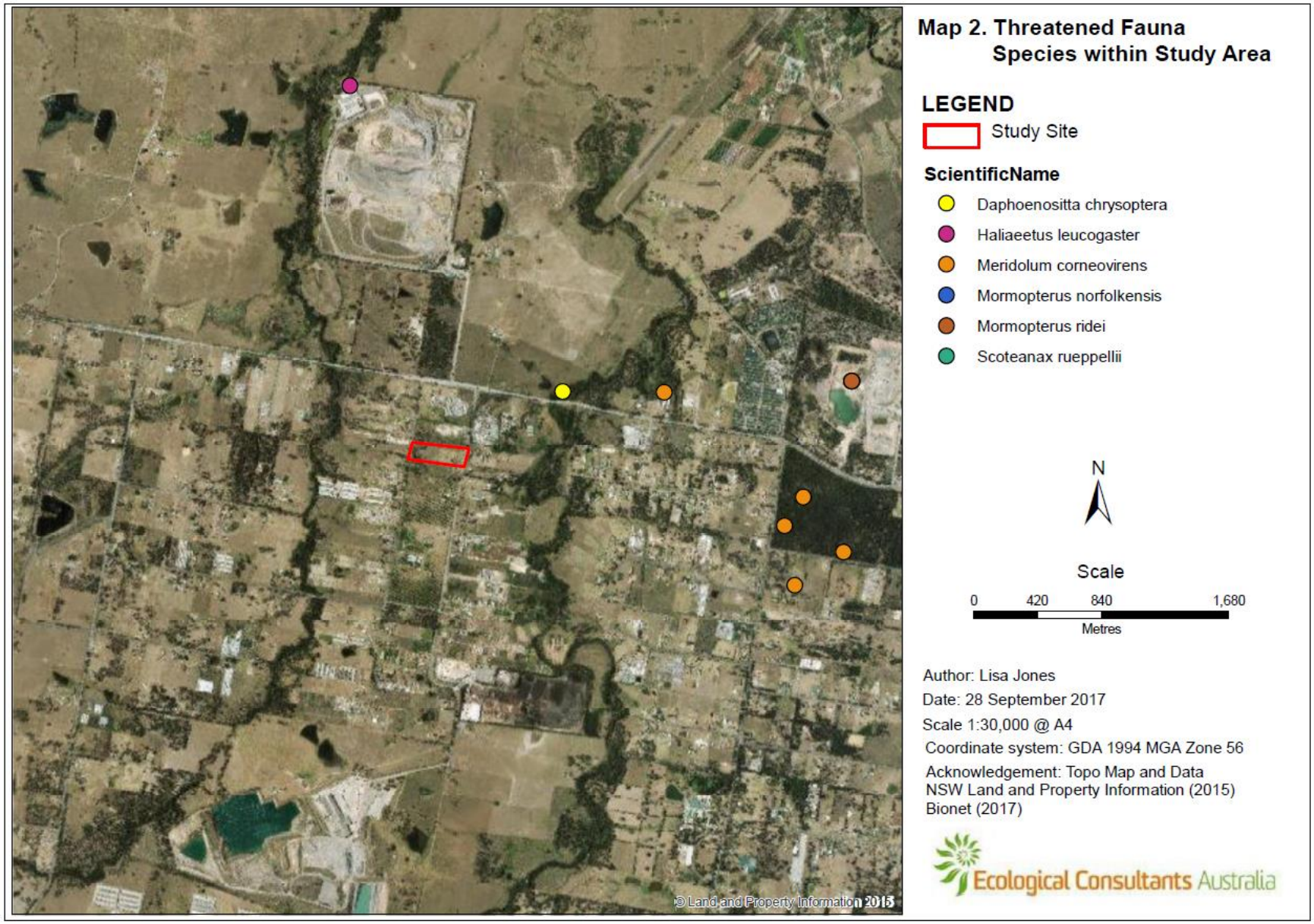
NB: species whose habitat doesn't occur on site have been omitted from this list – those with marginal habitat have been retained on the list.

Table 5. Threatened fauna observed in previous ecological surveys within a 10km radius since 1980. Source: NSW OEH Bionet 2017.

Class	Scientific Name	Common Name	NSW status	Comm. status	Records
Gastropoda	*Meridolum corneovirens*	Cumberland Plain Land Snail	E1		174
Aves	*Lathamus discolor*	Swift Parrot	E1,P,3	CE	1
Aves	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P	C	2
Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		9
Aves	*Daphoenositta chrysoptera*	Varied Sittella	V,P		5
Aves	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		9
Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	20
Mammalia	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		1
Mammalia	***Mormopterus norfolkensis***	**Eastern Freetail-bat**	**V,P**		**9**
Mammalia	***Falsistrellus tasmaniensis***	**Eastern False Pipistrelle**	**V,P**		**6**
Mammalia	***Miniopterus schreibersii oceanensis***	**Eastern Bentwing-bat**	**V,P**		**13**
Mammalia	***Myotis macropus***	**Southern Myotis**	**V,P**		**9**
Mammalia	***Scoteanax rueppellii***	**Greater Broad-nosed Bat**	**V,P**		**5**
Aves	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V,P,3		1
Aves	*Ninox strenua*	Powerful Owl	V,P,3		1

Note: E = Endangered, V = Vulnerable, P = Protected. Species in **bold** have been identified as having appropriate habitat present on-site.

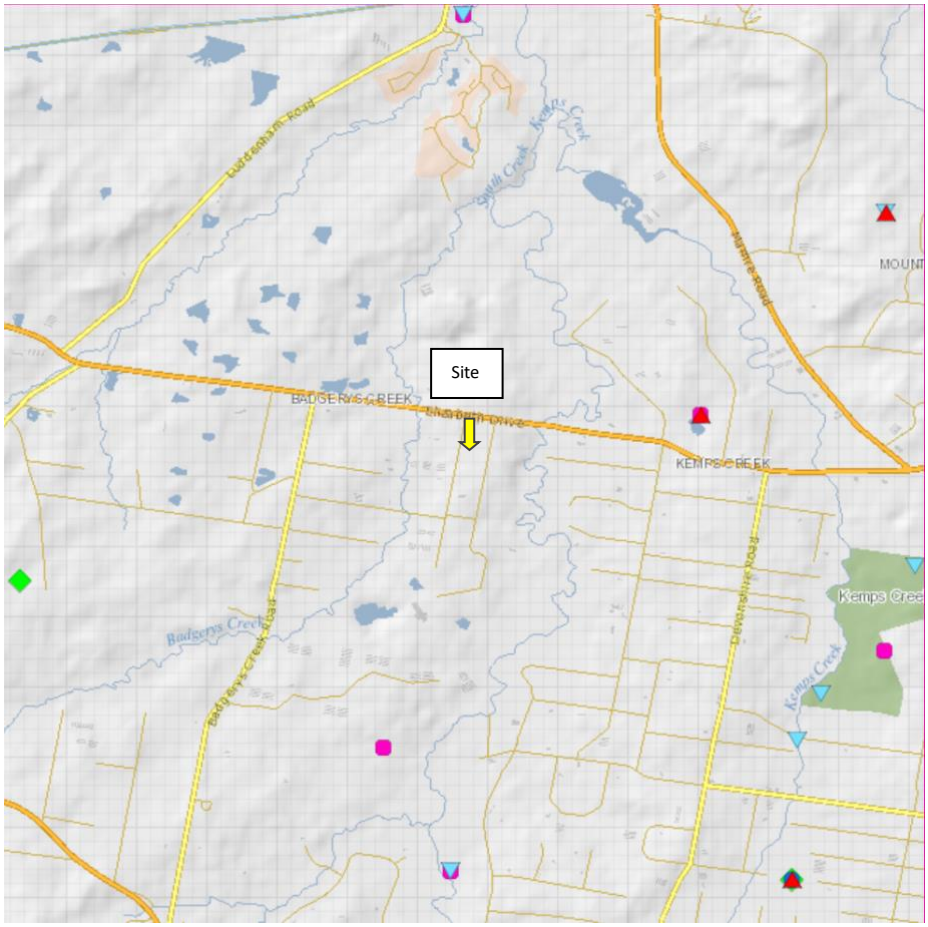
Figure 8. Bionet Mapping



Likelihood of occurrence

The habitat suitability is a broad categorisation used by ECA to indicate the potential for a species to occur within the study area. It is based on expert opinion and implies the relative value of a study area for a particular species.

During the survey, none of the above threatened species were observed on-site. However, other habitat types including foraging habitat and refugee habitat was present on the site for Microbat species. Threatened Grey-headed Flying-foxes and Eagles have been recorded within 10km and the site (and surrounding open area) provides for Little Eagles to get prey (rabbits). Sea Eagles are less likely to take prey from the land. No nesting trees were located on-site or near-by.



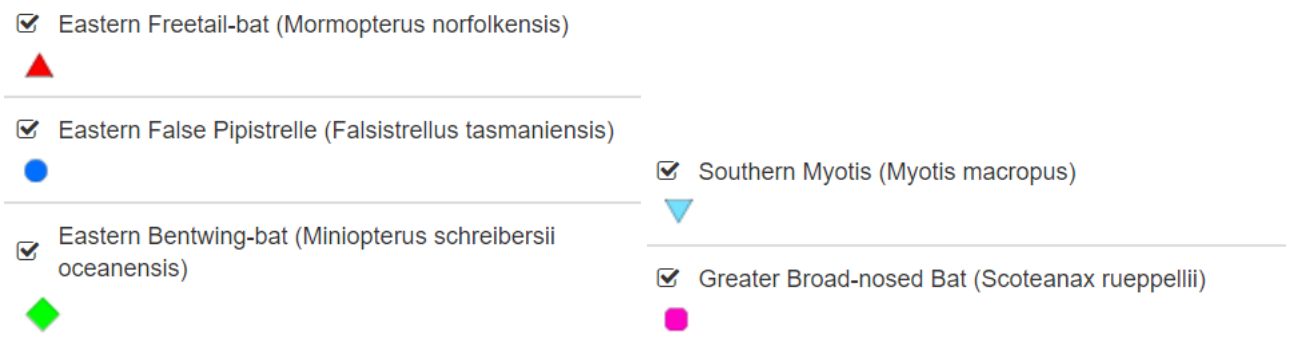


Figure 9. Endangered microbat sightings on Bionet in relation to site location. Source OEH 2018.

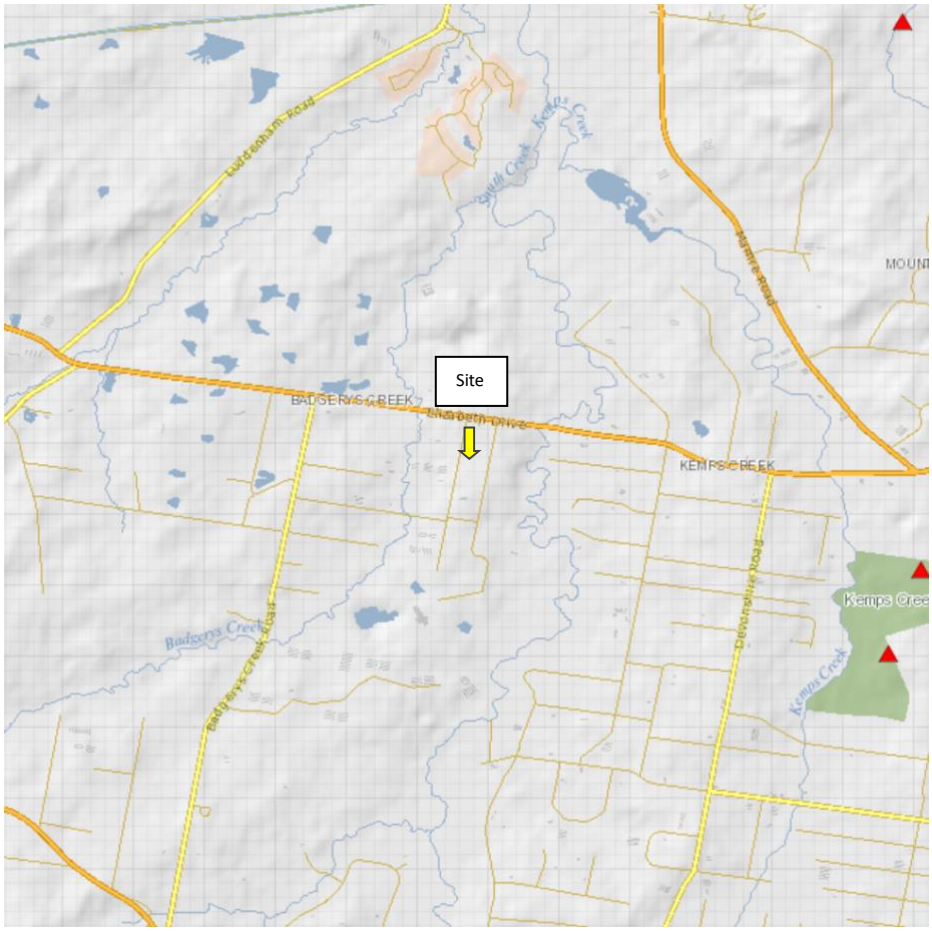


Figure 10. Endangered Grey-headed Flying-fox sightings on Bionet in relation to site location. Source OEH 2018.

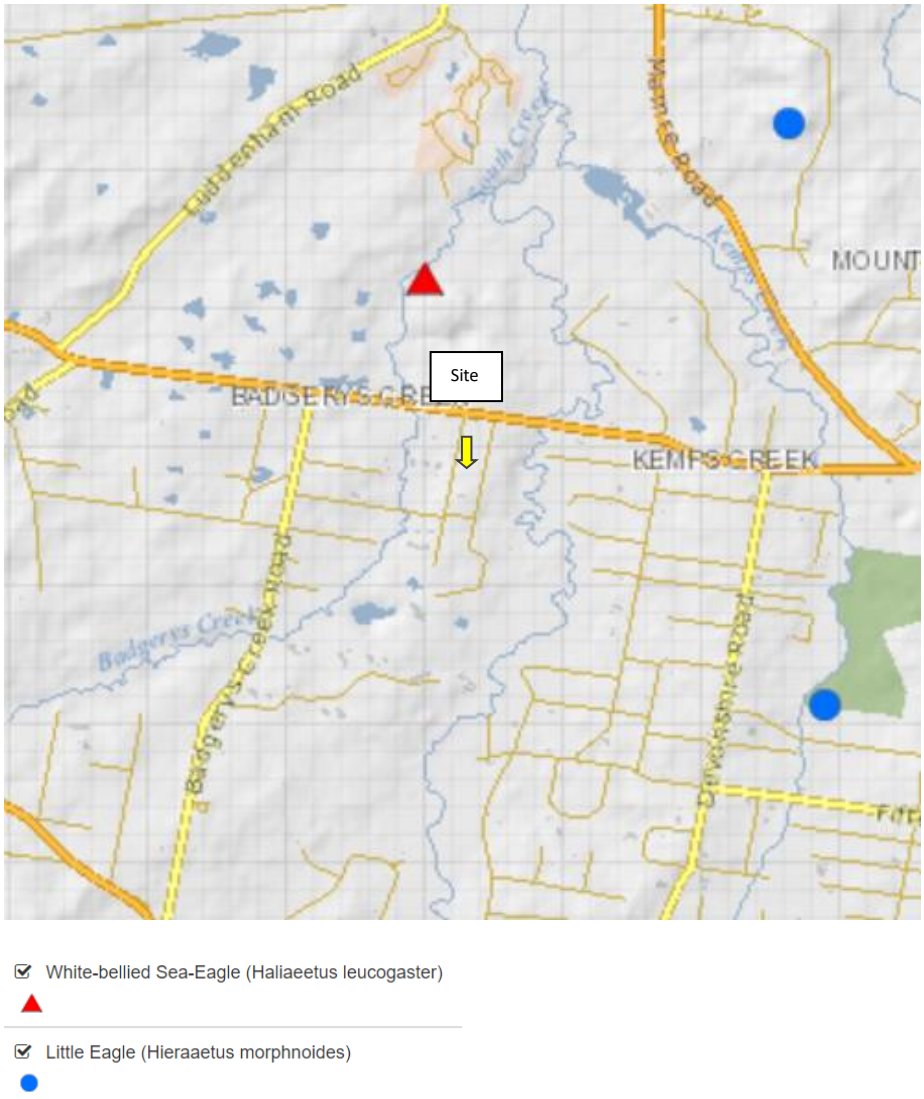


Figure 11. Endangered fauna sightings on Bionet in relation to site location. Source OEH 2018.

5.3 Endangered populations

Two endangered populations have been recorded to occur within 10km of the site since 1993. Table 6 outlines these populations.

Table 6. Endangered Populations in the LGA. Source NSW OEH Bionet 2018.

Endangered Population	Scientific Name	NSW Status	Comth. Status	No. of records
Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas.	*Marsdenia viridiflora subsp. viridiflora*	E2		18

Dillwynia tenuifolia, Kemps Creek	*Dillwynia tenuifolia*	E2,V,P		43

These species were not present on site despite being in nearby bushland. A 7-Part Test is not required. However, the inclusion of threatened species in landscaping will be considered in conjunction with input from OEH.

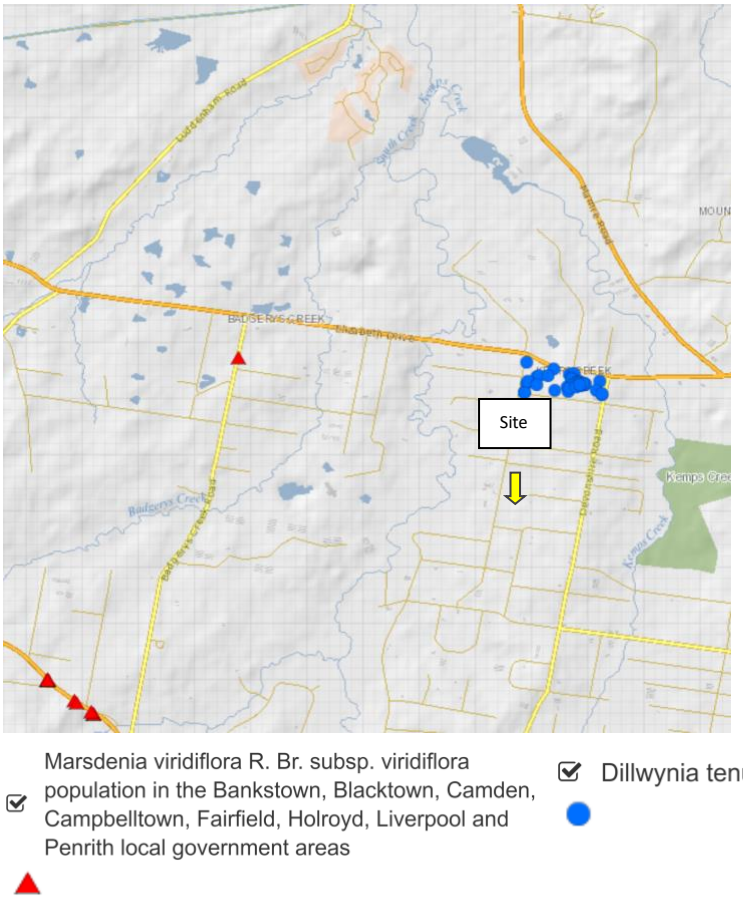


Figure 12. *Marsdenia viridiflora* and *Dillwynia tenuifolia* sightings on Bionet. Source OEH 2017.

5.4 Fauna findings from site assessment

Results of the fauna survey include the following findings. No amphibians or mammals were observed during site visits. No threatened species were recorded on site.

5.4.1 Fauna sightings

A number of fauna were observed during the site assessment, including:

Birds: Noisy Miner (*Manorina melanocephala*), Crested Pigeon (*Ocyphaps lophotes*), and Australian Raven (*Corvus coronoides*).

5.4.2 Fauna habitat

A number of potential habitat features were identified on site during the site assessment.

Flowering Eucalypts

The site contains canopy trees potentially providing foraging resources for the threatened Grey Headed Flying Fox and the Little Lorikeet. Due to the scattered nature of resources (trees) the likelihood of the trees being key habitat is low however could be a stopping point between the vegetation in the two waterways.

5.5 Habitat Corridors

Study of aerial imagery of the site and the surrounding landscape shows vegetation on-site is not directly connected with other vegetation. It could however be part of a dis-continuous corridor for aerial species (see Figure 13). Riparian zones are the closest corridors.

Figure 13. Green Corridor Connectivity in the wider area. Source: SixMaps 2018.

6 Impacts

6.1 Direct Impacts

6.1.1 Vegetation disturbance and loss

Development of a waste resource and recovery facility with associated parking and the retaining of the existing dwelling are expected to result in minor direct impacts to vegetation:

- Vegetation will be cleared from areas within the footprints of driveways and building envelopes. Native vegetation here is trees which will be offset by planting. Other vegetation (non-native) occurring in zones for clearing include turf species and weeds.
- Trees will be cleared to make way for development causing minor canopy disturbance. This includes:

- *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum).

Aims for bush regeneration and replanting works for the site will offset any damages from vegetation clearing and tree removal. Figure 14 below shows the trees on the southern-western boundary, Lawson Rd frontage where removal of eight trees will take place.

Figure 14. Canopy Cover south-western boundary. Source: Glenyss Laws Consulting Arborist.

6.1 Indirect Impacts

The proposed actions will result in the direct loss of 7 existing canopy trees – tree loss can result in indirect impacts affecting species or communities.

6.1.1 Loss of Breeding Opportunities

Works in the site may result in temporary-reduced breeding opportunities for locally occurring native species including amphibians, reptiles, birds, mammals and invertebrates due to site disturbance.

6.1.2 Soil disturbance and compaction

The removal of vegetation and trees can result in soil disturbance. Soil compaction could occur from machinery use. Soil compaction in non-built upon areas is to be avoided and not to occur within the trees to be retained (see also Arborist Report).

6.1.3 Weed growth and invasion

Weed species may arise within the direct works zone and surrounding remnant bushland through soil disturbance or by being brought in as seed on work machinery, tools, equipment and worker clothes (e.g. boots). Soil disturbance combined with the elevated nutrients and increased light exposure may result in increased weed growth, aggravated by the high abundance of weeds present pre-works.

6.1.4 Introduction of pathogens

The introduction of pathogens may occur into the site, and surrounding remnant bushland, via machinery, tools, equipment and worker clothing (e.g. boots). Diseases to watch out for include Phytophthora (also known as Root Rot – type of water mold) and Myrtle Rust (*Puccinia psidii* – type of fungus). See Appendix for methods to control selected pathogens.

6.1.5 Construction Noise

The proposed actions may result in a large amount of construction noise which may result in minor disturbance to sensitive fauna in the local canopy and adjacent bushland nearby. Construction disturbance may also result in fewer aerial fauna species frequenting the site for the duration of works.

6.2 Assessment of Significance (7-part tests) Summary

See Appendix V for full 7-Part Tests.

Cumbeland Plain Woodland
Cumberland Plain Woodland endangered ecological community was identified onsite. The Proposal involves the clearing of five scattered remnant trees, however overall, there will be a net increase in ground midstory and canopy species from this endangered ecological community.

Cumberland Plain Land Snail
The Cumberland Plain Land Snail occupies dry woodlands and forests that occur on the Cumberland Plain, sheltering under leaf litter, logs, urban refuse and decaying matter. Where possible this snail will burrow into loose soil. The Cumberland Plain Land Snail is a detritus feeder and is often found feeding on fungi. Breeding is related to climatic conditions, this species being dependent on precipitation for breeding opportunities. Even though the Cumberland Plain Land Snail has not been identified onsite, any possible habitat should be retained and proposed works in the bush regeneration area should include enhancement of this habitat.

Mircobats

Threatened Microbat species (Eastern Freetail-bat, Eastern False Pipistrelle, Eastern Broad-nosed Bat, Eastern Bentwing-bat and Southern Myotis) were identified as having potential foraging and roosting habitat within the site. Proposed trees to be removed do not contain hollows, but they do contain flaking bark used as roosting habitat for microbat species. These trees may contain marginal foraging habitat for species which feed on insects in or above the canopy. This habitat may be disturbed during proposed works. Two microbat nest boxes are to be installed within the site.

Grey-headed Flying-Fox

The threatened Grey-headed Flying-Fox (*Pteropus poliocephalus*) was identified as having potential marginal habitat within the site, although insignificant impact due to actions of removal of Grey Box (*Eucalyptus moluccana)* and Forest Red Gums (*Eucalyptus tereticornis*) trees, since these would only be considered to be used as marginal and not foraging habitat.

7 Recommendations

7.1 Mitigation Measures

7.1.1 Delineation of work areas

During construction, impacts to the site and adjacent vegetation should be minimised by the delineation of works zones. Access to the site would be best restricted to small passageways avoiding native vegetation to prevent soil disturbance in general and in particular damage to native vegetation. Access will be restricted to disturbed open areas and in accordance to Arborist report in a line with tree protection measures.

7.1.2 Vegetation clearing control measures

Most of the vegetation planned for clearing (areas within the footprints of driveways and building envelopes) are trees, turf and weeds. In this case, no vegetation clearing control measures are necessary other than tree removal. Refer to Arborist report.

7.1.3 Tree Protection

Tree protection will be consistent with the Arborist report by Glenyss Laws January 2018. Main trees to be managed are trees within close proximity to building works NB: see final arborist report for details of works and tree numbers.

7.1.4 Landscaping, bush regeneration and planting

Bush regeneration and landscaping will occur within the designated areas shown below. See Landscaping Plan for specifics.

Figure 15. Proposed weed management, bush regeneration and landscaping zones. Source SixMaps 2018.

7.1.5 Weed Removal Techniques

Weed removal proposed for the site will consist of hand removal techniques, manual/mechanical removal using bush regenerator tools and thermal (flame) weeding. This approach will reduce the amount of herbicide used and reduce the amount of off-target damage through spot on application. Key targeted weed species will include those listed as 'Noxious' under Northern Beaches Council and exotic plants classed as an environmental weed.

Noxious weeds present on site should be controlled in accordance with the Noxious Weeds Act (1993).
Flame weeding will target annual weeds such as Fleabane (Conzya sp.) and perennial grasses such as *Paspalum dilatatum*.

Woody perennial weeds less than 2 metres in height will require cut and paint or scrape and paint bush regenerator techniques based on the germinating/epicormic behaviour of the plant (especially plants that tend to coppice or sucker).

It is recommended that seed heads are removed prior to commencement of primary works. This would be best performed carefully by hand with secateurs with the aim of avoiding the spread flowers or seeds into planting zones.

See Appendix III for further details.

7.1.6 Native Seed Collection

Any native trees or shrubs that is being removed for the construction works should be checked for seeds during removal works. If seeds are present, they should be collected and used on-site or donated to an appropriate group for reuse.

7.1.7 Fauna refuge zone

The area of vegetation in the remnant bushland should be treated as a fauna refuge zone with limitations to access by people, machinery and the storage or stockpiling of tools or materials for the duration of the works. A temporary visual barrier and/or signage could be installed to raise awareness of the existence of a fauna refuge zone.

7.1.8 Preservation of Habitat

It is recommended that habitat specified in Section 6.3.2 be maintained and preserved. This includes:

- Retention of logs and tree stumps should be kept to maintain refugee habitat values.
- Retention of aquatic habitat including seaweed for intertidal species should be kept to maintain estuary foreshore habitat.
- Retention of Eucalyptus species should be kept to maintain foraging resources for threatened Grey Headed Flying Fox and the Little Lorikeet.

7.1.9 Nest boxes

Image from: nestboxes.com.au

Although it is not critical, installation of two nest box designed for microbats should be added to the site to replace potential loss of roosting habitat.

7.1.10 Pathogen prevention

To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix V should be followed. The site is considered to be an area which may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to its moist soil and proximity to water. It is recommended that Bushland Hygiene Protocols be followed closely.

Phytophthora infected vegetation. (Image by Rasbak, licensed under the Creative Commons Attribution-Share Alike 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic license.)

Myrtle Rust generally infects new leaf growth. (Image by John Tann, licensed under the Creative Commons Attribution 2.0 Generic license.)

7.1.1 Vertebrate Pests

Vertebrate pests (cats, dogs, foxes) would not be considered to be a significant problem at the site and no actions are suggested for their control.

8 Monitoring and Project Reviews

Environmental monitoring should be carried out by a qualified Ecologist or Natural Area Specialist once per year for the first 2 years to determine whether environmental performance targets have been met. Site assessors should spend 2 hours at the site performing qualitative and opportunistic surveys to assess site condition. A brief report should then be prepared for submission within the following week.

The following criteria must be monitored at each site visit:

- **Weed ratio targets:** Weed biomass must not exceed 10% of total vegetation biomass in Zone 1 and 5% in Zone 2.
- **Noxious weeds presence:** No noxious weeds present onsite across any zone.
- **Retained Vegetation condition:** Areas of healthy bush are still in an undisturbed state with weed presence adhering to the ratios recommended above.
-

9 Conclusions

- Following the Landscaping Plan will see an increase in the Cumberland Plain Woodland endangered ecological community through planting and bush regeneration.
- Two microbat nest boxes to be installed onsite.
- No significant impact on endangered ecological communities or threatened species due to proposed works.
- Ongoing maintenance of environmental and ecological actions is required.

10 References

NSW Department of Primary Industries 2017, Weeds of National Significance, NSW WeedWise, viewed 3 May 2017, available online at:
http://weeds.dpi.nsw.gov.au/WeedListPublics/CategoryResults?showImages=True&categoryId=1&pageTitle=Weeds%20of%20National%20Significance

Office of Environment and Heritage 2016, *Little Lorikeet - profile*, site accessed on 20 April 2017, available online at: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20111

Office of Environment and Heritage 2016, *Superb Fruit-Dove (Ptilinopus superbus*), site accessed on 20 April 2017, available online at:
http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10709

Office of Environment and Heritage 2014, *Powerful Owl - profile*, site accessed on 20 April 2017, available online at: http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10562

Office of Environment and Heritage 2011, *Pittwater spotted gum forest - endangered ecological community listing*, NSW Scientific Committee - final determination, site accessed on 14 April 2017, available online at:
http://www.environment.nsw.gov.au/determinations/PittwaterSpottedGumForestEndComListing.htm

Office of Environment and Heritage 2001, *Grey-headed Flying-fox - profile*, site accessed on 20 April 2017, available online at:
http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10697

Sydney Metro Catchment Management Authority (SMCMA), 2009, Native Vegetation of the Sydney Metropolitan CMA Area, Sydney Metropolitan. Sydney Metropolitan Catchment Management, Sydney Metro Catchment Management Authority.

11 Appendix

11.1 **Appendix I – Arborist Tree Summary Table**

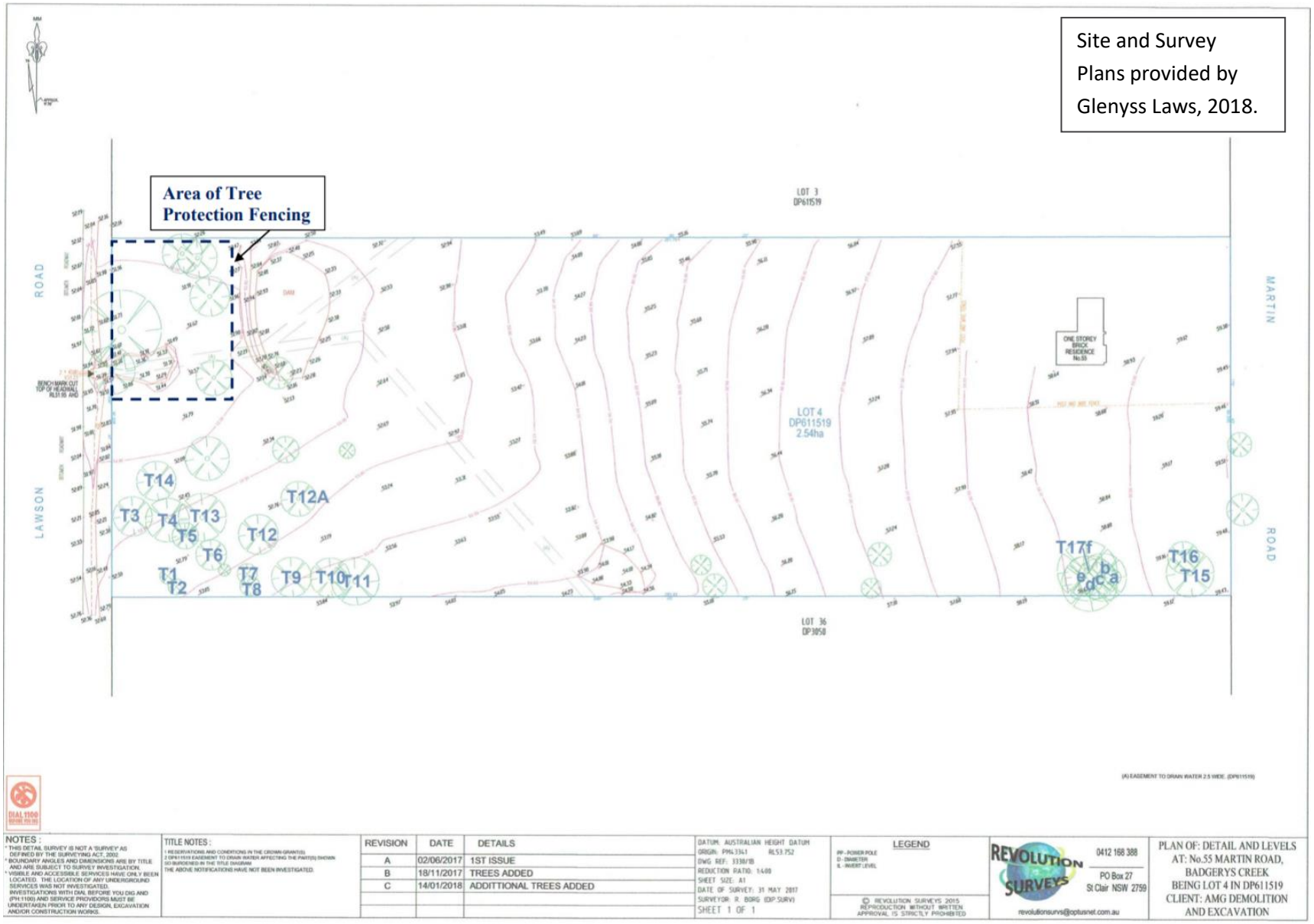
Tree Survey Notes

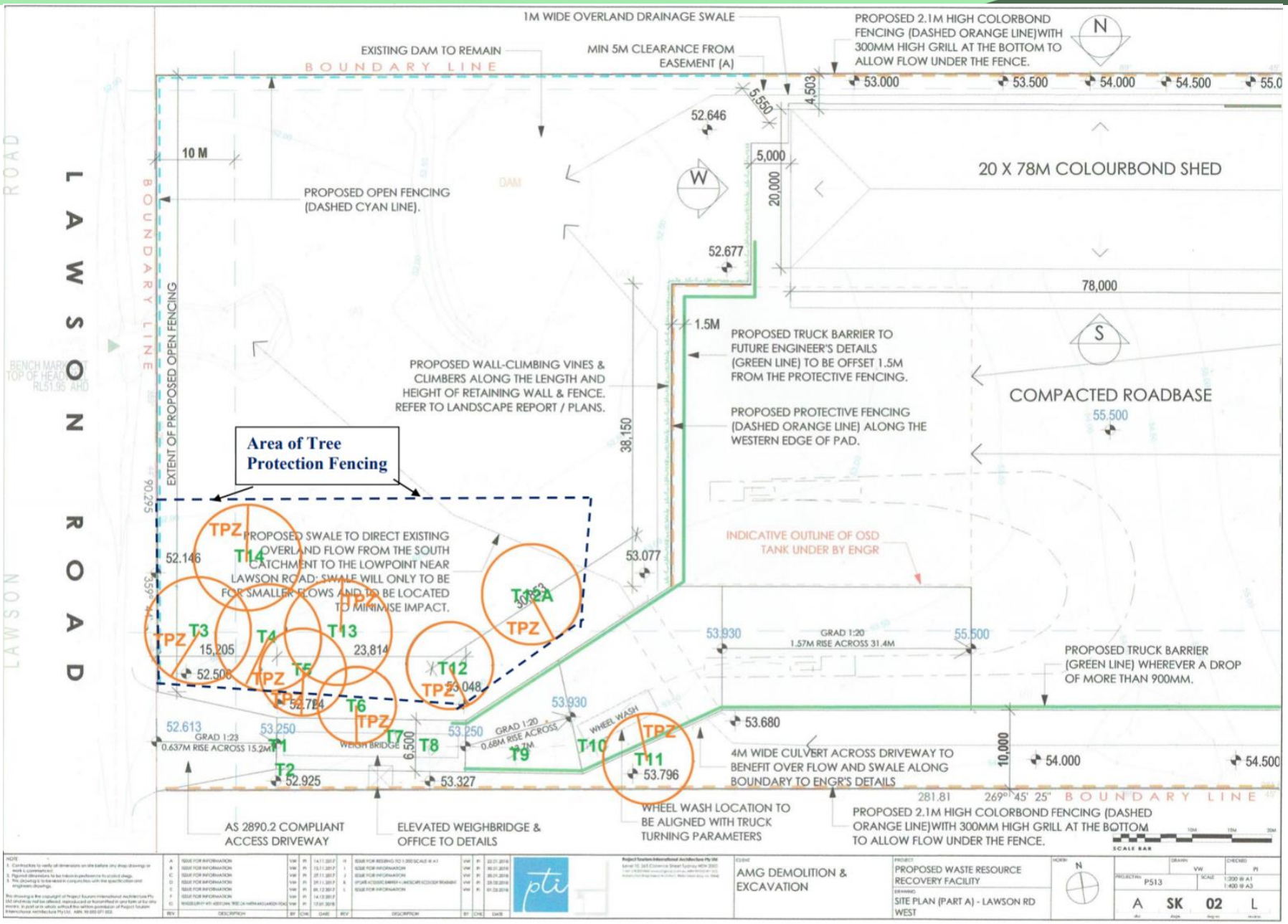
Tree No	Tree Species	Age Class	DBH (mm)	DRB (mm)	Tree Height (M)	Crown Width (M)	Crown Condition	Crown Class	STARS	ULE	Root Zone/ Defects/ Services	Comments
1	*Eucalyptus moluccana* (Grey Box)	O	230	290	10	5	2	D	1	3	Gr/-/-	Over mature specimen with short useful life expectancy.
2	*Eucalyptus moluccana (Grey Box)*	O	190	220	7	4	1	C	1	4	Gr/-/-	Declining canopy density with less than 20% live foliage. Over mature specimen with short useful life expectancy.
3	*Eucalyptus moluccana (Grey Box)*	O	540	540	15	11	2	C	1	3	Gr/-/-	Over mature specimen with short useful life expectancy.
4	*Eucalyptus tereticornis (Forest Red Gum)*	M	560	590	16	10	3	C	1	2	Gr/-/-	Exhibits fair vigour, good condition, free of major above ground defects.
5	*Eucalyptus tereticornis (Forest Red Gum)*	M	430	490	16	8	3	C	1	2	Gr/-/-	Exhibits fair vigour, good condition, free of major above ground defects.
6	*Eucalyptus tereticornis (Forest Red Gum)*	M	440	430	15	8	3	C	1	2	Gr/I/-	Forms 2 x leaders at 3.5m reaction wood evident within leader union.
7	*Eucalyptus tereticornis (Forest Red Gum)*	M	250	310	12	5	3	C	1	2	Gr/-/-	Exhibits fair vigour, good condition, free of major above ground defects.
8	*Eucalyptus tereticornis (Forest Red Gum)*	M	270	300	12	5	3	C	1	2	Gr/-/-	Free of major above ground defects.
9	*Eucalyptus tereticornis (Forest Red Gum)*	M	470	530	14	10	3	C	1	2	Gr/-/-	Free of major above ground defects
10	*Eucalyptus tereticornis (Forest Red Gum)*	M	540	590	14	10	3	C	1	2	Gr/-/-	

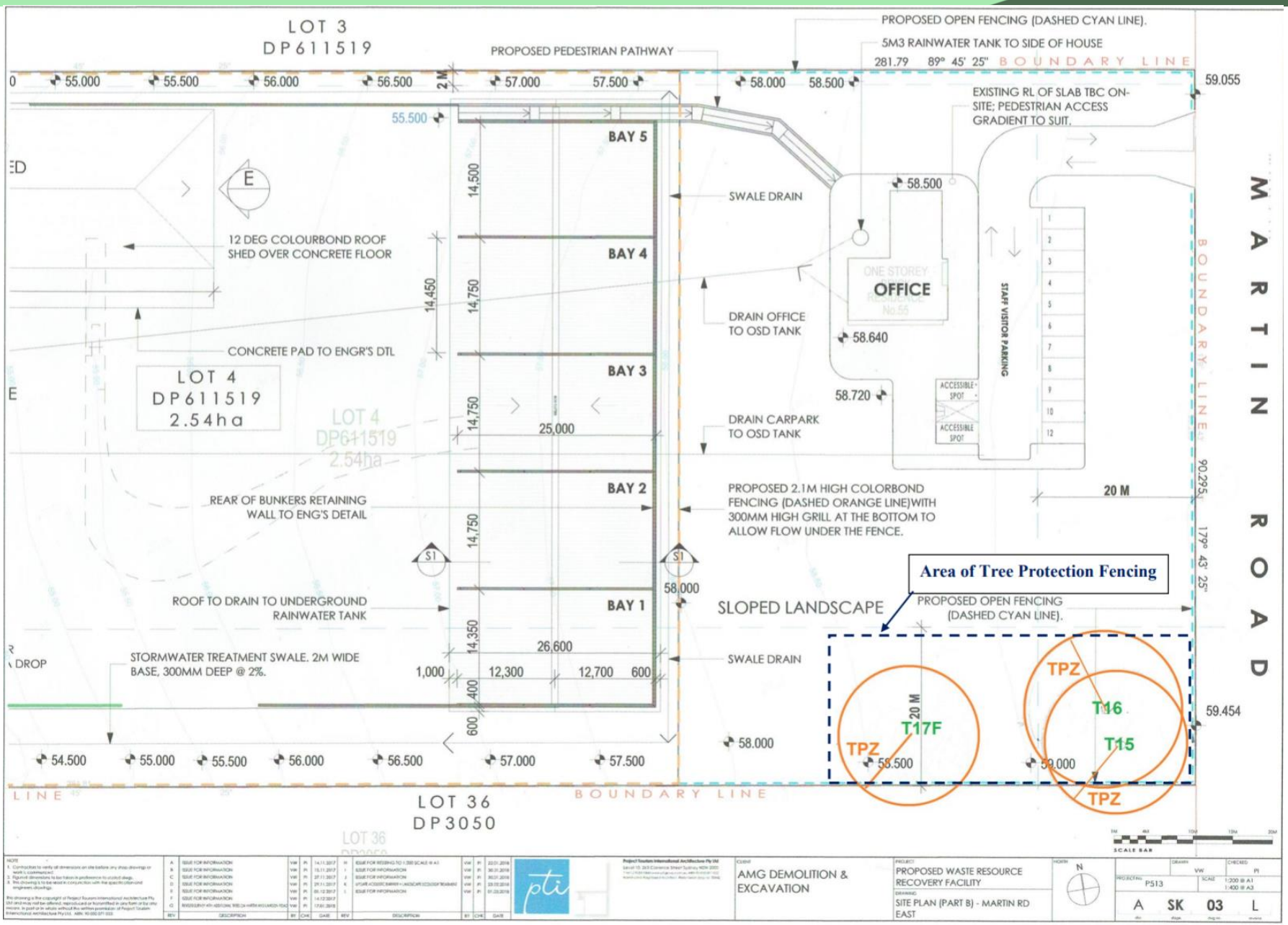
Tree No	Tree Species	Age Class	DBH (mm)	DRB (mm)	Tree Height (M)	Crown Width (M)	Crown Condition	Crown Class	STARS	ULE	Root Zone/ Defects/ Services	Comments
11	*Eucalyptus species*	M	Est 450	Est 550	10	9	3	C	1	2	Gr/-/-	Access hindered due lack of ground maintenance, dense thickets of weeds including blackberries. Dimensions estimated only.
12	*Eucalyptus tereticornis (Forest Red Gum)*	M	460	570	10	10	3	C	1	2	Gr/-/-	
12A	*Eucalyptus species*	M	300 & 450	650	12	12	3	C	1	2	Gr/-/-	Access hindered due lack of ground maintenance and dense weeds/blackberries. Dimensions estimated only.
13	*Eucalyptus tereticornis (Forest Red Gum)*	O	Est 550	Est 650	15	12	3	C	1	3	Gr/T/-	Access hindered due dense weeds including thickets of blackberries. Dimensions estimated only. 50-60% canopy density of fair to low vigour.
14	*Eucalyptus tereticornis (Forest Red Gum)*	M	Est 550	Est 650	14	14	3	C	1	2	Gr/-/-	
15	*Eucalyptus moluccana (Grey Box)*	M	770	920	24	14	Low 3	C	1	2	Gr/-/-	
16	*Eucalyptus tereticornis (Forest Red Gum)*	M	820	880	22	12	3	C	1	2	Gr/-/-	
17 x 6	*Group of 6 x Eucalyptus moluccana and Eucalyptus tereticornis*	M	Est 350-700		6 - 18	3 - 12	3	C	1	2 - 3	Gr/-/-	Access restricted due to electrified fencing. Dimensions estimated only.

Trees in Green assessed with a high landscape value coupled with a medium to long ULE are allocated a high priority for retention.
Trees in Blue are assessed as less critical for retention, their retention should be a priority with removal considered if all design options have been exhausted & adversely affecting the proposal.
Trees in Pink are of low retention value, nor require special works or design modifications to be implemented.
Tree in Orange are considered hazardous, in irreversible decline or environmental weed species and recommended for removal irrespective of development.

11.2 **Appendix II – Tree Survey**




1M WIDE OVERLAND DRAINAGE SWALE
EXISTING DAM TO REMAIN
BOUNDARY LINE
MIN 5M CLEARANCE FROM EASEMENT (A)
PROPOSED 2.1M HIGH COLORBOND FENCING (DASHED ORANGE LINE)WITH 300MM HIGH GRILL AT THE BOTTOM TO ALLOW FLOW UNDER THE FENCE.
N
53.000
53.500
54.000
54.500
55.0
4.503
5.550
52.646
10 M
5,000
20,000
20 X 78M COLOURBOND SHED
PROPOSED OPEN FENCING (DASHED CYAN LINE).
W
52.677
78,000
1.5M
PROPOSED TRUCK BARRIER TO FUTURE ENGINEER'S DETAILS (GREEN LINE) TO BE OFFSET 1.5M FROM THE PROTECTIVE FENCING.
S
COMPACTED ROADBASE
55.500
PROPOSED WALL-CLIMBING VINES & CLIMBERS ALONG THE LENGTH AND HEIGHT OF RETAINING WALL & FENCE. REFER TO LANDSCAPE REPORT / PLANS.
PROPOSED PROTECTIVE FENCING (DASHED ORANGE LINE) ALONG THE WESTERN EDGE OF PAD.
38,150
EXTENT OF PROPOSED OPEN FENCING
Area of Tree Protection Fencing
INDICATIVE OUTLINE OF OSD TANK UNDER BY ENGR
53.077
PROPOSED SWALE TO DIRECT EXISTING OVERLAND FLOW FROM THE SOUTH CATCHMENT TO THE LOWPOINT NEAR LAWSON ROAD: SWALE WILL ONLY TO BE FOR SMALLER FLOWS AND TO BE LOCATED TO MINIMISE IMPACT.
TPZ
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T12A
T13
T14
52.146
15,205
52.500
23,814
52.724
53.048
53.930
GRAD 1:20
1.57M RISE ACROSS 31.4M
55.500
PROPOSED TRUCK BARRIER (GREEN LINE) WHEREVER A DROP OF MORE THAN 900MM.
52.613
GRAD 1:23
0.637M RISE ACROSS 15.2M
53.250
WEIGH BRIDGE
6.500
GRAD 1:20
0.68M RISE ACROSS 11.7M
WHEEL WASH
53.680
4M WIDE CULVERT ACROSS DRIVEWAY TO BENEFIT OVER FLOW AND SWALE ALONG BOUNDARY TO ENGR'S DETAILS
10,000
54.000
54.500
52.925
53.327
53.796
281.81
269° 45' 25"
BOUNDARY LINE
AS 2890.2 COMPLIANT ACCESS DRIVEWAY
ELEVATED WEIGHBRIDGE & OFFICE TO DETAILS
WHEEL WASH LOCATION TO BE ALIGNED WITH TRUCK TURNING PARAMETERS
PROPOSED 2.1M HIGH COLORBOND FENCING (DASHED ORANGE LINE)WITH 300MM HIGH GRILL AT THE BOTTOM TO ALLOW FLOW UNDER THE FENCE.
SCALE BAR
LAWSON ROAD
BOUNDARY LINE
AMG DEMOLITION & EXCAVATION
PROPOSED WASTE RESOURCE RECOVERY FACILITY
SITE PLAN (PART A) - LAWSON RD WEST
P513
A SK 02 L


LOT 3
DP611519
PROPOSED PEDESTRIAN PATHWAY
PROPOSED OPEN FENCING (DASHED CYAN LINE).
5M3 RAINWATER TANK TO SIDE OF HOUSE
281.79 89° 45' 25" BOUNDARY LINE
EXISTING RL OF SLAB TBC ON-SITE; PEDESTRIAN ACCESS GRADIENT TO SUIT.
59.055
BAY 5
BAY 4
BAY 3
BAY 2
BAY 1
SWALE DRAIN
12 DEG COLOURBOND ROOF SHED OVER CONCRETE FLOOR
CONCRETE PAD TO ENGR'S DTL
LOT 4
DP611519
2.54ha
ONE STOREY OFFICE
DRAIN OFFICE TO OSD TANK
DRAIN CARPARK TO OSD TANK
STAFF VISITOR PARKING
ACCESSIBLE SPOT
REAR OF BUNKERS RETAINING WALL TO ENG'S DETAIL
PROPOSED 2.1M HIGH COLORBOND FENCING (DASHED ORANGE LINE)WITH 300MM HIGH GRILL AT THE BOTTOM TO ALLOW FLOW UNDER THE FENCE.
20 M
Area of Tree Protection Fencing
ROOF TO DRAIN TO UNDERGROUND RAINWATER TANK
SLOPED LANDSCAPE
PROPOSED OPEN FENCING (DASHED CYAN LINE).
STORMWATER TREATMENT SWALE. 2M WIDE BASE, 300MM DEEP @ 2%.
TPZ
T16
T17F
T15
20 M
59.454
MARTIN ROAD
BOUNDARY LINE
90.295
179° 43' 25"
LOT 36
DP3050
AMG DEMOLITION & EXCAVATION
PROPOSED WASTE RESOURCE RECOVERY FACILITY
SITE PLAN (PART B) - MARTIN RD EAST
P513
A SK 03 L

11.3 Appendix III – Key Weed Removal Methods

Physical removal

Technique	Method	Equipment
Hand Removal 	Seedlings and smaller weed species where appropriate will be pulled out by hand, without risk of injury to workers. The size that this can occur varies throughout the treatment area. Generally, it ranges from post seed to approximately 300mm in height. Rolling and raking is suitable for larger infestations of Wandering Jew. The weed can be raked and stems and plants parts rolled. The clump of weed material can then be bagged and removed from site.	Tools: Gloves, Rakes, Knife and Weed Bags
Crowning 	Plants that possess rhizomes or bulbs might not respond to various removal techniques and may need to be treated with crowning. A knife, mattock or trowel is to be driven into the soil surrounding the bulb or rhizome at an angle of approximately 45 degrees with surrounding soil, so as to cut any roots that may be running off. This is to occur in 360 degrees around the bulb/rhizome. The rhizome or bulb is to be bagged and removed from the site and disposed of at an appropriate waste recycling facility Soil disturbance is to be kept to a minimum when using this technique.	Tools: Knife, mattock, trowel, impervious gloves, and all other required P.P.E.
Cut and Paint Stems 	Weed species deemed unsuitable for hand removal shall be cut. Those that have persistent of vigorous growth will be cut and painted with Roundup® Biactive Herbicide or equivalent. Juvenile and smaller weed species will be cut with secateurs at base of plant, and herbicide applied via applicator bottle. Stem to be cut horizontally as close to the ground as possible, using secateurs, loppers or a pruning saw. Horizontal cuts to be made on top of stem to prevent the herbicide running off the stump. Apply herbicide to the cut stem immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Herbicide is not to reach sediment or surrounding non-targeting plants.	Tools: loppers, secateurs, pruning saw, herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide and all other required P.P.E.

Scrape and Painting 	More resilient weed species, where other techniques are less reliable are to be scraped with a knife or chisel and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current herbicide license. Weed species will be scraped with a knife or chisel up the length of the trunk, and herbicide applied via applicator bottle. Scrape the trunk from as close to the ground as possible to approximately ¾ of the plants height. Where trunk diameters exceed approximately 5 cm a second scrape shall be made on the other side of the trunk. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants. Follow up treatment may be required. If plants resprout, scrape and paint the shoots using the same method after sufficient regrowth has occurred.	Tools: knife, chisel, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.
Cut with a Chainsaw and Paint 	Larger size weed species, too large for cutting with hand tools, shall be cut with a chainsaw and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current chainsaw and herbicide license. Larger weed species will be cut with a chainsaw at base of plant, and herbicide applied via applicator bottle. Cut the stem horizontally as close to the ground as possible, using the chainsaw. Remove upper branches to reduce bulk of plant. If cutting at the base is impractical, cut higher to get rid of the bulk of the weed, then cut again at the base and apply herbicide. Make cuts horizontal to prevent the herbicide running off the stump. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Ensure there is no runoff of poison. All care must be taken by the contractor not to spill herbicide into water, onto sediment, or surrounding non-targeting plants. Follow up treatment will be required. If plants resprout, cut and paint the shoots using the same method.	Tools: chainsaw, ear muffs, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.

Spot Spraying	Spot spraying involves spraying non-seeding annuals and grasses, and for regrowth of weeds once an area has been cleared or brushcut. Works to be carried out by a contractor with a current herbicide license. Herbicide will be mixed up according to the manufacturer's directions for the particular weed species being targeted. Mixed herbicide shall be applied to the targeted weed species with a backpack sprayer. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants.	Tools: protective clothing, safety glasses, herbicide sprayer, impervious gloves, Herbicide, and all other required P.P.E.

Flame Weeding

Thermal (flame) weeding is a method where high temperatures are applied to weeds, causing the plant to die. Thermal weeding is particularly useful in situations where conservation or health considerations are high and weed density is low such as waterways where herbicide use is not permitted.
While flame weeding is not suited to most streetscapes due to the fire hazard nor can it be used on materials such as soft fall and similar playground equipment it is noted that 'flame' weeding in waterways allows weed management in areas where herbicides are not permitted.
Also, for native vegetation areas thermal weeding, with a flame weeder, has been shown to stimulate germination of native plants while killing the seeds of annual weeds such as Devils Pitchfork, *Bidens pilosa*. Flame weeding is also effective in killing persistent weeds like
Mother of Millions.
Best results are obtained when follow up weed control is undertaken 4-6 weeks after treatment. In addition, weed control should be conducted periodically after that for example to control weeds over a period of a year it is likely that between 3-5 applications will be necessary, depending on rainfall and the extent of the weed seed bank. This method is most effective on young annual weeds and least effective on older perennial weeds. In some cases, control of perennial weeds will be ineffective however this depends on the species present and its age.

Images provided by Dragonfly Environmental

Flame weeding should be undertaken outside of the fire seasons. Flame weeding allows for the mimicking of a burn in areas where a control burn could not be undertaken. See native plants regenerating after flame weeding.

11.4 Appendix IV – Bushland Hygiene Protocols for Phytophthora

- Always assume that the area you are about to work in is free of the disease and therefore needs to be protected against infection.
- And, always assume that the activity you are about to undertake has the potential to introduce the disease.
- Arrive at site with clean shoes, i.e.: no dirt encrusted on them.
- If you arrive with shoes that are encrusted with dirt, they will have to be completely soaked in metho or disinfectant and allow a few minutes to completely soak in. NEVER scrape untreated dirt off your shoes onto the ground.
- Before you move onto the site spray the bottom of your shoes with 70 % metho. Bleach solution (1% strength) or household/commercial disinfectant (as per label) are also suitable.
- Check all tools and equipment that comes in contact with soil are clean before entering the area (they should have been cleaned on site at the end of the previous work session). If there is any dirt on them, spray them with 70% metho.
- Clean all tools at the end of each work session while still on site ensuring this is done away from drainage lines and adjacent work areas. Knock or brush off encrusted dirt and completely spray with 70 % metho. Replace in storage/transport containers.
- Preferably compost all weed material on site.
- Never drag vegetation with exposed roots and soil through bushland.
- When removing weeds from site, remove as much soil as possible from them in the immediate work area and carefully place vegetative material into plastic bags.
- Try not to get the bag itself dirty; don’t put it on/in a muddy area.
- Always work from the lower part of a slope to the upper part.
- Always work in areas known to be free of the pathogen before working in infected areas.
- Minimise activities wherever possible when the soil is very wet.

- Vehicles should not be driven off track or into reserves (unless vehicle decontamination is carried out before and after entering a single work site)

- Only accredited supplies of plants/mulch to be used.

Kit should contain: 1 bucket, 1 scrubbing brush, 1 spray bottle (metho 70% solution), 1 bottle tap water, 1 bottle methylated spirits.

Contact Hornsby Bushcare if you require any refills or replacements of your Phytophthora Kits on 9484 3677 or bushcare@hornsby.nsw.gov.au

Facts about Phytophthora

Phytophthora cinnamomi (Phytophthora) is a microscopic, soil borne, water-mould that has been implicated in the death of remnant trees and other plants in Australian bushland. Phytophthora is not native to Australia. It is believed to have been introduced sometime after European settlement. Phytophthora is a national problem and is listed as a key threatening process under the Commonwealth's Environmental Protection and Biodiversity Conservation Act 1999.

Symptoms including Dieback

"Dieback" simply means dying or dead plants. There are many causes of dieback; Phytophthora is just one of them. Often dieback is the result of a combination of factors such as; changed drainage patterns and nutrient loads (e.g.: increased stormwater run-off) or changed soil conditions (e.g.: dumped fill or excavation of/near root zone). Plants that are stressed are more vulnerable to Phytophthora.

Initial symptoms of Phytophthora include; wilting, yellowing and retention of dried foliage, loss of canopy and dieback. Infected roots blacken and rot and are therefore unable to take-up water and nutrients. Severely infected plants will eventually die. Symptoms can be more obvious in summer when plants may be stressed by drought. If you suspect that Phytophthora is on your site, please contact the Bushcare team to collect a soil sample to be lab tested. This is usually done in the warmer months where conditions are optimum for the disease.

Infection

There is no way of visually telling if Phytophthora is present in the soil as its structures and spores are microscopic (invisible to the naked eye). Phytophthora requires moist soil conditions and warm temperatures for infection, growth and reproduction. Spores travel through moist soil and attach to plant roots. Once Phytophthora has infected a host plant it can grow inside plant root tissue independent of external soil moisture conditions. After infection, Phytophthora grows through the root destroying the tissue which is then unable to absorb water and nutrients.

11.5 Appendix V – Test of Significance

11.5.1 Cumberland Plain Woodland

Cumberland Plain Woodland was listed as an Endangered Ecological Community under the Threatened Species Conservation Act 1995 in June 1997 (NSW Scientific Committee 1997). Since this listing, a large volume of new data and analyses have become available. In addition, a nomination to change the status of Cumberland Woodland to Critically Endangered status has been received. This Determination addresses additional information now available in accordance with current listing criteria under the Threatened Species Conservation Regulation 2002. Cumberland Plain Woodland is the name given to the ecological community in the Sydney Basin bioregion associated with clay soils derived from Wianamatta Group geology, or more rarely alluvial substrates, on the Cumberland Plain, a rain shadow area to the west of Sydney's Central Business District.

"…Reduce the extent of an ecological community…"

Five scattered remnant trees will be removed, however overall, there will be a net increase in ground midstory and canopy species from this endangered ecological community.

"…Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines…"

The vegetation onsite is already fragmented and isolated, within the proposed works there will be a net increase in ground midstory and canopy species from this endangered ecological community.

"…adversely affect habitat critical to the survival of an ecological community…"

No habitats considered critical to CPW occur within, or in close proximity to the Study Area.

"…modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns…"

The construction will not have an impact on the remnant CPW within the Study Area. While there are no defined water courses onsite, there are naturally occurring wet spots after rain. These damp habitats are being retained and integrated with stormwater management.

"…cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting…"

The proposed works will not cause a substantial change in the species composition. Five scattered remnant trees will be removed, however overall, there will be a net increase in ground midstory and canopy species from this endangered ecological community.

"…cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:…"

> *"…assisting invasive species that are harmful to the listed ecological community, to become established…"*

The proposed works are not likely to assist invasive species that are harmful to the CPW, it is expected that the landscaping and bush regeneration works will contribute to clearing of weeds and increase in ground midstory and canopy species from this endangered ecological community.

"…causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhabit the growth of species in the ecological community…"

The proposed works are not expected to further increase the levels or mobilisation rates of any existing pollutants, fertilisers, or other chemicals.

"…interfere with the recovery of an ecological community…"

The Proposal involves the clearing of five scattered remnant trees, however overall, there will be a net increase in ground midstory and canopy species from this endangered ecological community. The action proposed will not interfere with any planned recovery actions of CPW vegetation by state or local government, nor are there any conservation agreements on the land.

11.5.2 Cumberland Plain Land Snail

The Cumberland Plain Land Snail occupies dry woodlands and forests that occur on the Cumberland Plain, sheltering under leaf litter, logs, urban refuse and decaying matter. Where possible this snail will burrow into loose soil. The Cumberland Plain Land Snail is a detritus feeder and is often found feeding on fungi. Breeding is related to climatic conditions, this species being dependent on precipitation for breeding opportunities.

The Cumberland Plain Land Snail does not require a large area to maintain a locally viable population. Surveys have found that, within very short distances (up to 2m), the populations are highly structured and after a distance of 350m the populations are random. Home range areas for this animal are therefore expected to be in the order of 5m to 10m. Little is known about the life cycle of this snail, but it is believed that this species lives for around two to three years, being sexually mature at the end of its first year Threats to the occurrence of this species include clearing of bush and urban expansion.

As areas of suitable habitat are cleared, the Cumberland Plain Land Snail continues to become displaced, isolated, fragmented and locally extinct. The Cumberland Plain Land Snail's current known distribution is in an area roughly bounded by Cattai (to the north), Picton (to the south), Prospect Reservoir (to the east) and Yarramundi (to the west).

Even though the Cumberland Plain Land Snail has not been identified onsite, any possible habitat should be retained and proposed works in the bush regeneration area should include enhancement of this habitat.

11.5.3 Microbats

Five species of microbat were assessed as having the potential to occur within the study area based on Bionet records. The following species have the potential to occur in the site or surrounding bushland:

- Eastern Freetail-bat (*Mormopterus norfolkensis)*
- Large-eared Pied Bat (*Chalinolobus dwyeri)*
- Little Bentwing-bat (*Miniopterus australis)*
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis)*
- Southern Myotis (*Myotis macropus)*

All of the recorded species are considered to be highly mobile and would be likely to be accessing the site occasionally or opportunistically as foraging habitat across a landscape of fragmented habitat. Although these species have differing habitat requirements, they have been assessed together as the trees to be removed would be considered marginal habitat for all five species.

7-Part Test

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

The trees that may need to be removed were not observed to be bearing hollows suitable for tree roosting microbat species including the Eastern Freetail-bat, although some of the trees proposed for removal do have folding bark which serves as roosting habitat during certain times of the year.

The proposed actions would be expected to have a lesser impact upon cave dwelling species including the Large-eared Pied Bat, Little Bentwing-bat, Eastern Bentwing-bat and the Southern Myotis. Trees do not comprise breeding habitat for these species and would not impact their life cycles. The Eastern Bentwing Bat, Little Bentwing-bat and the Southern Myotis have relatively higher recorded sightings within a 10km are surrounding the site (Bionet, 2018). This indicates that the site may be used frequently for foraging resources by these species and that the proposed actions would not impact the life-cycles of cave dwelling species.

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

There are no endangered populations of any of the five species in the surrounding areas. The proposed actions are likely to have little adverse effect on the life cycles or persistence of local populations.

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

N/A

(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

N/A

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 proposed actions involve the removal of native mature trees which do not contain hollows, although they do contain flaking bark used for marginal roosting habitat for microbat species. In that case, these trees may contain both marginal foraging and roosting habitat for species which feed on insects in or above the canopy. Having this in mind, it is recommended to install two (2) microbat boxes onsite.

(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

The proposal will not result in the creation of any barriers to the movement of these highly mobile, aerial species. The available habitat on site will be not become fragmented or isolated from other areas of habitat as a result of the proposed developments.

(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,

The habitat being removed or modified is not significant towards the long-term survival of the species as it is considered to be marginal habitat, only to be used occasionally or opportunistically.

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

Critical habitat has not yet been defined for the species in this area.

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

A recovery plan/threat abatement plan has not yet been prepared for microbat species. The Office of Environment and Heritage (OEH) have identified priority actions for species recovery (see www.environment.nsw.gov.au). The proposed action does not defy the objectives of the threat abatement plans of cave or tree-roosting species as it does not involve the removal of hollow bearing trees which are advised to be retained within the landscape.

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.

The proposed actions do not constitute part of a key threatening process and will not increase the impact of threatening processes in the foreseeable future.

Conclusion

Insignificant impact due to removal of trees, although there is potential for both marginal foraging and roosting habitat onsite, therefore it is recommended to install two (2) microbat boxes.

11.5.4 Grey-headed Flying-Fox (*Pteropus poliocephalus*)

Species Description

TSC-V

Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. Can travel up to 50 km to forage; commuting distances are more often <20 km. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.

7 Part-Test

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

Proposed developments are unlikely to have an adverse effect on the life cycle of this threatened species' viable population or bring it at risk of extinction. The trees that may need to be removed are Grey Box (*Eucalyptus moluccana)* and Forest Red Gums (*Eucalyptus tereticornis*) which may be providing temporary foraging resources. However, the removal of these trees is not likely to highly impact the life cycle of the species in a way that it could place the species 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

There are no endangered populations of this species in the surrounding areas. The proposed actions are likely to have little adverse effect on the life cycles or persistence of local populations.

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

N/A

(iii) 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

N/A

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 proposed actions involve the removal of Grey Box (*Eucalyptus moluccana)* and Forest Red Gums (*Eucalyptus tereticornis*) trees. These trees may contain marginal foraging habitat for species. Due to the lack of connectivity to denser vegetation, it would be unlikely that this species would frequently use the trees for foraging.

(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

The proposal will not result in the creation of any barriers to the movement of these highly mobile, aerial species. The available habitat on site will be not become fragmented or isolated from other areas of habitat as a result of the proposed developments.

(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,

The habitat being removed or modified is not significant towards the long-term survival of the species as it is considered to be marginal habitat, only to be used occasionally or opportunistically.

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

Critical habitat has not yet been defined for the species in this area. The Australian government is currently working to understand and define critical foraging habitat for these flying foxes

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

A Draft Recovery Plan has been prepared for this species (see http://www.environment.gov.au/). The proposed actions will work in accordance with the management objectives or actions of the recovery plan.

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.

The proposed actions do not constitute part of a key threatening process and will not increase the impact of threatening processes in the foreseeable future. Main key threatening processes for this species include habitat loss, disease, electrocution on power lines, climate change and heat stress.

Conclusion

Insignificant impact due to actions of removal of Grey Box (*Eucalyptus moluccana)* and Forest Red Gums (*Eucalyptus tereticornis*) trees, all of which would only be considered marginal habitat.

12 Expertise of authors

With over 20 years wetland and urban ecology experience, a great passion for what she does and extensive technical and on-ground knowledge make Mia a valuable contribution to any project.

Geraldene has over 8 years local government experience as manager of environment and education for Pittwater Council. Geraldene presented papers on the topic at the NSW Coastal Conference, Sydney CMA and Hawkesbury Nepean forums. Geraldene is a Technical Advisor Sydney Olympic Park Wetland Education and Training (WET) panel.

Geraldene has up to date knowledge of environmental policies and frequently provides input to such works. Geraldene was a key contributor to the recent set of Guidelines commissioned by South East Queensland Healthy Waterways Water Sensitive Urban Design Guidelines. Geraldene's role included significant contributions and review of the Guideline for Maintaining WSUD Assets and the Guideline for Rectifying WSUD Assets.

Geraldene is a frequent contributor to many community and professional workshops on ecological matters particularly relating to environmental management. She is an excellent Project Manager.

Geraldene is a joint author on the popular book Burnum Burnum's Wildthings published by Sainty and Associates. Author of the Saltmarsh Restoration Chapter Estuary Plants of East Coast Australia published by Sainty and Associates (2013). Geraldene's early work included 5 years with Wetland Expert Geoff Sainty of Sainty and Associates. Geraldene is an expert in creating and enhancing urban biodiversity habitat and linking People with Place.

Geraldene Dalby-Ball
DIRECTOR

SPECIALISATIONS

- Urban Ecology – and habitat rehabilitation and re-creation.
- Urban waterway management – assessing, designing and supervising rehabilitation works
- Saltmarsh and Wetland re-creation and restoration – assessment, design and monitoring
- Engaging others in the area of environmental care and connection
- Technical Advisor – environmental design, guidelines and policies
- Sound knowledge and practical application of experimental design and statistics
- Project management and supervision
- Grant writing and grant assessment
- Budget estimates and tender selection
- Expert witness in the Land and Environment Court

CAREER SUMMARY

- **Director and Ecologist**, Ecological Consultants Australia. 2014-*present*
- **Director and Ecologist**, Dragonfly Environmental. 1998-*present*
- **Manager** Natural Resources and Education, Pittwater Council 2002-2010
- **Wetland Ecologist** Sainty and Associates 1995-2002

QUALIFICATIONS AND MEMBERSHIPS

- **Bachelor of Science with 1st Class Honours**, Sydney University
- WorkCover WHS General Induction of Construction Industry NSW White Card.
- Senior First Aid Certificate.
- **Practicing member and vice president** Ecological Consultants Association of NSW

Laura Conde-Barona

ENVIRONMENTAL ENGINEER INTERN

Laura has great passion about the natural environment, sustainable development and biodiversity conservation. Laura is in her last semester of her double degree of Environmental Engineering and Science at the University of New South Wales.

Laura has valuable on-ground experience working with conservation organisations in different parts of the world, as well as contributing to environmental educational projects. Laura has participated in educational talks focused on ecological and sustainability matters and currently volunteers for organisations around the globe to help raise awareness, promote sustainable living and natural protection.

Laura has attended fundamental courses and workshops such as Sustainability in Construction; Environmental Frameworks, Law and Economics; Applied Geotechnics and Engineering Geology; and Contaminant Transport. Laura participated as one of the leading members of the Environmental Committee at her University in Colombia organising various campaigns promoting environmental awareness.

Laura has also prepared two theses, one on Orica's Botany Industrial Park Groundwater Clean-up Plan based on remediation technologies for contaminated land and

SPECIALISATIONS

- Creative and sustainable solutions in environmental engineering, particularly in waterways and wetlands, sustainable design and development.
- Engineering and environmental project management focusing on creating environmental and social outcomes.
- Engaging others in environmental protection and sustainability.

CAREER SUMMARY

- **Environmental Consulting Internship,** Ecological Consultants Australia, 2018 present
- **Marine Turtle Internship Program,** Conflict Island's Conservation Initiative, 2017

QUALIFICATIONS AND MEMBERSHIPS

- **Bachelor of Environmental Engineering and Marine Science**, University of New South Wales (Expected June 2018)
- **Study Abroad Program in Science,** University of New South Wales (2015)
- **Initiated Bachelor's Degree in Environmental Engineering and Biology,** Universidad de los Andes, Bogotá, Colombia (Transferred to UNSW in 2016)
- **Practicing member** Australian Herpetological Society
- Emergency First Response Certificate (2016)
- PADI Rescue Diver (2016)

Glenyss Laws
Consulting Arborist

Arboricultural Impact Assessment Report

Prepared for
AMJ Demolition and Excavation

Site
55 Martin Road
Badgerys Creek

Date
13 March 2018
Revision B

16 Cardinal Avenue
Beecroft NSW 2119
email glenyssl@bigpond.com

phone 02 9980 5826
mobile 0402 435 384
ABN 92 812 869 965

TABLE OF CONTENTS

1 Introduction

1.1 The following Arboricultural Impact Assessment report is prepared for AMJ Demolition and Construction and is an evaluation of seventeen individual and a closely aligned group of six trees within 55 Martin Rd, Badgerys Creek.

1.2 In preparation of the report the author is aware of and has taken into consideration the objectives of Liverpool Council's Tree Management Controls, Australian Standard 4970-2009 and The Threatened Species Conservation Act 1995 and Threatened Species under The Environment and Biodiversity Protection Act 1999.

1.3 The proposal includes retention of the existing dwelling on the Martin Rd frontage and construction of a waste resource recovery facility with vehicular access from the Lawson St frontage.

2 Methodology

2.1 The trees were visually inspected from ground level to determine crown condition, class, structural defects, decay, signs of stress, epicormic growth and dieback (refer Appendix A & B)

2.2 A Significance of a Tree Assessment Rating System (STARS) was determined. A STARS rating establishes the contribution of a tree to the overall landscape, amenity qualities or importance due to species, size, historical/cultural planting or significance to the site (refer Appendix C).

2.3 Useful Life Expectancy (ULE) was determined. A ULE rating provides an estimate of a tree's expected remaining life span and considers the age, life span of the species and considers the current condition, vigour and major defects (refer Appendix D).

2.4 No root exploration, internal probing or aerial inspection was performed.

2.5 Tree height was measured with a Nikon Forestry Pro. Canopy spread, and tree age were estimated, while Diameter at Breast Height (DBH) and Diameter Above Root Buttress (DRB) were measured. Where access within the site was hindered due to electric fencing and dense thickets of weeds including blackberries tree dimensions including DBH and DRB were estimated.

2.6 Only those trees highlighted during the onsite brief meeting dated 11 December 2017 with Brent Winning of Claron Consulting Pty Ltd were assessed.

2.7 The comments and recommendations in this report are based on findings from a site inspection on 11 December 2017.

2.8 The photographs included in this report were taken at the time of the inspection.

2.9 A list of literature used in the preparation of this report is provided in the bibliography section.

2.10 Plans sighted in the preparation of the report include;

- Detail and Level Survey Drawing Reference No 3330/1B Revision C dated 14/1/18 by Revolution Survey Drawing
- Site Plan Drawings SK02 Rev M dated 2/3/18 and SK03 Rev L dated 1/3/18 and Drawing No SK09 & SK10 Rev B dated 2/3/18 by PTI Pty Ltd and
- A Concept Stormwater Plan, Drawing No 17-040 Sheets D1 – D4 and S1 issue A dated 8/3/18 by TOP Consulting Group.

3 Observations

3.1 The Site

3.1.1 The subject site is a rural block of land identified as Lot 4, DP 611519, 55 Martin Rd, Badgerys Creek. The property is located on the western side of Martin Rd and is boarded by Lawson Rd to the west.

Figure 1. Location 55 Martin St, Badgerys Creek (Source Google Earth Aerial Image of 5/5/16)

3.2 The Trees

3.2.1 Seventeen (17) individual and a closely aligned group of six (6) trees were assessed in preparing the report. Details of the trees, their dimensions, condition, Useful Life Expectancy (ULE) and landscape significance (STARS) are attached in Appendix A.

4 Discussion

4.1 Tree Protection, Ecological and Heritage Significance

4.1.1 Tree Management Controls for Liverpool Council are in force under the Section 2 of Councils DCP 2008. The Management Controls protects all trees over 3.5 metres in height and/or with a spread of > 4m and/or with a diameter of > 400mm in diameter measured at 1.0m from ground level.

4.1.2 The NSW Government's Biodiversity Values Map identifies the Lawson St frontage of the property to be of biodiversity significance.
(refer https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap)

4.1.3 The trees assessed are recognized as the dominant canopy species which form part of the Cumberland Plain Woodland. Cumberland Plain Woodland is listed as a Critically Endangered Ecological Community under the Threatened Species Conservation Act and Environment Protection and Biodiversity Conservation Act.

4.1.4 All trees assessed are protected under the terms of Liverpool Councils DCP 2008.

4.2 Tree Retention Value and Landscape Significance

4.2.1 It is possible to determine a tree's significance and retention value based upon several factors including size, condition and maturity coupled with the methodologies STARS and ULE.

4.2.2 Generally trees identified as having a medium to long ULE and of high landscape value are given a high priority for retention in the design process.

Trees 4, 5, 6, 7, 8, 9, 10,11,14, 15, 16 17 x 6 meet this criteria

4.2.3 Trees of high landscape significance with a short ULE should not be given importance for preservation, as these trees are short term prospects only and are best replaced with advanced good quality stock.

Trees 1, 2, 3 & 13 meet this criteria

4.2.4 Trees identified with a medium landscape value together with a medium ULE should only be considered for removal where design options have been exhausted & are adversely affecting the proposal.

No trees meet this criteria

4.2.5 While trees assessed with a short ULE and a medium to low STARS are short term prospects at best and may be removed, however Council approval must be sought prior to tree removal.

No trees assessed within the property meet this criteria

4.3 AS4970-2009 Protection of trees on development sites

4.3.1 Australian Standard 4970-2009, Protection of trees on development sites, was established to provide appropriate guidelines to ensure the long-term viability and stability of trees to be retained on development sites.

4.3.2 Tree Protection Zones (TPZ) are based on the diameter of the tree measured at 1.4 metres above ground level x 12 (refer Table 1 for calculated TPZ's). The TPZ is measured from the centre of the tree's trunk to the proposed edge of excavation/development works. The recommended setback is declared a TPZ where construction, trenching, soil level changes and use of machinery should be excluded.

4.3.3 The Structural Root Zone (SRZ) is the area required for stability, a far larger area is necessary to maintain a viable tree. Therefore, **no** excavation or construction shall encroach within the SRZ (refer Table No 1 for calculated SRZ's). The SRZ is determined adopting the formula from AS4970-2009 where the SRZ radius = $(D \times 50)^{0.42} \times 0.64$. Where D = trunk diameter, in m, measured above the root buttress.

4.3.4 Under AS4970-2009 a minor encroachment of 10% of the area is allowable, provided this is compensated for elsewhere and contiguous to the TPZ.
Should more than a 10% encroachment occur then the Project Arborist must demonstrate the tree/palm can be protected and remain in a viable state.

Tree No	DBH (cm)	DRB (cm)	TPZ radius (m)	TPZ area (m^2)	SRZ radius (m)
1	23	29	2.8	24	2.0
2	19	22	2.3	16	1.8
3	54	54	6.5	132	2.6
4	56	59	6.7	142	2.7
5	43	49	5.2	84	2.5
6	44	43	5.3	88	2.4
7	25	31	3.0	28	2.1
8	27	30	3.2	33	2.0
9	47	53	5.6	100	2.6
10	54	59	6.5	132	2.7
11	45	55	5.4	92	2.6
12	46	57	5.5	96	2.7
12a	Est 300 & 450	Est 650	6.6	137	2.8
13	55	65	6.6	137	2.8
14	55	65	6.6	137	2.8
15	77	92	9.2	268	3.2
16	82	88	9.8	304	3.2
17F	Est 70	Est 80	8.4	222	3.1

Table 1. Calculated Tree Protection and Structural Root Zones

4.3.5 Under Clause 3.3.4 of AS4970 when determining the impacts of an encroachment into the TPZ, some consideration may be given to the following;

- The potential loss of root mass resulting from the encroachment determined by root mapping (number, size and percentage)
- Species tolerance to root disturbance
- Age and vigour of the trees
- or tree sensitive design construction such as pier and beam, suspended slab systems or discontinuous footings which may minimise the impact upon a tree's root system.

4.3.6 Tree sensitive construction must be adopted should a major encroachment into the TPZ be contemplated. A major encroachment is considered between 15 - 35% of the root zone impacted.

4.4 Proposed Development Impacts

4.4.1 **Trees 1 & 2** the two trees fall within the footprint of the proposed driveway and weighbridge. The specimens are over mature with a short useful life expectancy, their removal should not be seen as a constraint to the proposal.

4.4.2 **Trees 3, 4 & 5** are setback sufficiently that no encroachment of the TPZ is proposed. The trees can be retained, and their viability preserved. An Arboricultural Method Statement is contained within Section 6 of the report which specifics tree protection methods to be carried out during construction works.

4.4.3 **Tree 6** has a calculated TPZ of 5.3m. The proposed weighbridge is an elevated pre-fab unit which sits above ground, offset at 1.5m and within the 2.4m SRZ. Compaction will be required to provide a solid base for the structure, soil compaction is noted as one of the most damaging effects upon a trees root system. The proposal constitutes a major encroachment of approximately 33% of the TPZ and is beyond acceptable thresholds of maintaining a viable tree, the specimen cannot be retained under the current proposal.

4.4.4 **Trees 7, 8, 9 & 10** are allocated a high retention value, the proposed wheel wash and driveway falls within the footprint of the four trees. The trees cannot be retained as part of the design and are proposed for removal.

4.4.5 **Tree 11** a 5.4m TPZ and 2.6m SRZ applies. The specimen is offset 1.5m to the proposed wheel wash and within the footprint of the proposed stormwater drainage channel, the stability of the specimen cannot be retained under the design which equates to a major encroachment of > 35% of the TPZ.

4.4.6 **Trees 12 & 12a,** are allocated a medium to high retention value. The trees are adequately setback that no encroachment of the TPZ occurs. The trees can be retained and protected in accordance with the Arboricultural Method Statement contained in Section 6 of the report.

4.4.7 **Trees 13, 14, 15 & 16** are adequately setback that no encroachment of the TPZ occurs. The trees can be retained and protected during the course of development works.

4.4.8 **Tree 17** is a closely aligned group of six remnant trees allocated a high retention value. The visitor's car park has been redesigned to accommodate the trees, subsequently no encroachment of the TPZ is proposed. The group of trees can be retained and protected in accordance with the following Arboricultural Method Statement.

5 Conclusions/Recommendations

5.1 Seventeen (17) individual trees plus a cluster of six (6) closely aligned specimens were assessed as part of this report. The proposal seeks to install a waste resource and recovery facility, associated parking and retain the existing dwelling.

5.2 The property is shown to be of high biodiversity value within the NSW Biodiversity Values mapping system. The trees assessed are part of the dominant species associated with the vegetation group known as Cumberland Plain Woodland. The vegetation group is listed as a Critically Endangered Ecological Community under the Threatened Species Conservation Act and Environment Protection and Biodiversity Conservation Act.

5.3 The design indicates the proposal is a major encroachment and beyond acceptable thresholds of maintaining viability upon eight (8) trees protected under the terms of Council's Tree Management Controls. These include six (6) trees allocated a high retention value and two (2) trees allocated a low retention value.

High Retention	Medium Retention	Low Retention
6, 7, 8, 9, 10 & 11	-	1 & 2

Table 2. Encroachment beyond acceptable thresholds to be removed.

5.4 The design indicates the proposal is a minor and acceptable or no encroachment of the TPZ occurs upon fifteen (15) trees. These include thirteen (13) trees allocated a high retention value, and two (2) trees allocated a low retention value.

High Retention	Medium Retention	Low Retention
4, 5, 12, 12a, 14, 15, 16 & 17 x 6	-	3 & 13

Table 3. To be retained and protected.

5.5 The following Arboricultural Method Statement and location for Tree Protection Fencing is provided in Appendix F to ensure the retained trees are protected during the course of construction works.

6 Arboricultural Method Statement

6.1 Pre-commencement and Arboricultural Hold Points

6.1.1 Prior to demolition and construction works, a Project Arborist shall be appointed to supervise all tree protection procedures detailed in this statement. The Project Arborist shall have a minimum level 5 AQF qualification in Arboriculture.

6.1.2 A pre-commencement site meeting shall take place between the Site Supervisor and the Project Arborist, the meeting is to take place before any development activity to determine specific arboricultural inspections and required tree protection.

6.1.3 Development Stage, this stage is subject to site monitoring by the Project Arborist at intervals as agreed at the pre-commencement site meeting. These visits are to ensure the protection measures are maintained in good order and works within the Tree Protection Zone (TPZ) meet with this Arboricultural Method Statement and AS4970.

6.1.4 It is the responsibility of the developer/site supervisor to provide a minimum 3 days' notice to the Project Arborist for the pre-determined witness points.

6.1.5 Any breaches to the Arboricultural Method Statement shall be reported immediately.

6.1.6 The following pre-determined stages are hold points and requires the attendance of the Project Arborist to document the works and demonstrate an inspection has taken place.

Hold Point	Action	Project Arborist Supervision
Tree Protection	The Site Arborist shall inspect the Tree Protection Fencing and any necessary Ground Protection complies with Appendix A Tree Protection Zones and Figure 3, page 16 AS4970.	Inspected, documented & certified by Project Arborist
Machinery Access	An access route for machinery shall be determined prior to construction works. Any temporary ground protection within the Tree Protection Zones shall be undertaken as per Figure 4, page 17 of AS4970.	Inspected, documented & certified by Project Arborist
Earth Works	The Site Arborist to monitor any earthworks within the TPZ's. **Note** these works must be undertaken by hand or with an air knife.	Inspected, documented & certified by Project Arborist
Practical Completion	The Site Arborist to inspect and assess the trees condition and provide certification of tree protection at all the above-mentioned Hold Points.	Inspected, documented & certified by Project Arborist

Table 4. Hold Points for Project Arborist Inspections

6.2 Preliminary Tree Protection Methods

6.2.1 Ground Protection and Tree Protection Fencing shall be installed prior to commencement of works and be maintained in a good condition during the construction processes.

6.2.3 Tree Protection shall consist of a 1.8m high chain link temporary fencing erected at the distances nominated in Appendix F - Tree Protection Plan.

6.2.4 Weatherproof signage indicating the area is a Tree Protection Zone (TPZ) shall be displayed on the fence line at 10m intervals.

6.2.5 Signage shall be a minimum A4 and shall state No Access – Tree Protection Zone and include the contact details of the Site Foreman and Project Arborist.

6.2.6 Once erected, the TPF and ground protection shall be regarded as sacrosanct and shall not be removed or altered without prior agreement of the project arborist.

6.2.7 Attention shall be given to ensuring the TPZ remains rigid and complete and excludes all construction activity and storage of materials.

6.2.8 If works are to occur within the TPZ the Project Arborist shall determine if appropriate ground protection is required. Should ground protection be necessary then the ground surface within the TPZ shall be protected with a geotextile overlaying the existing mulch. Thick recycled railway ballast shall be placed over the geotextile in accordance with Figure 4 of AS4970.

6.3 Restricted Activities

6.3.1 The following activities are restricted within the Tree Protection Zone;

- Parking of vehicles or plant
- Installation of temporary site offices or amenities.
- Wash down areas
- No mechanical excavation
- Preparation of chemicals including paint, cement or mortar.
- Vehicular movement
- Pedestrian access
- Excavation, trenching or tunnelling unless under the supervision of the Project Arborist
- No ground level changes are permitted

6.4 Installation of Services

6.4.1 Where feasible, all underground services will be routed & installed beyond the identified TPZ's. Where it is impossible to divert services beyond the TPZ's, detailed plans showing the proposed routing will be drawn in conjunction with advice from an AQF Level 5 Arborist.

6.4.2 The method for trenching within a TPZ shall either be by hand methods e.g. hand digging with a spade or trowel or an air spade. Trenchless technology such as thrust boring may also be considered.

6.4.3 Topsoil and subsoil excavated from the trench shall be deposited into separate piles and kept apart and covered until required for backfilling.

6.4.4 No roots > 30mm in diameter are to be severed without prior agreement with the Project Arborist.

6.4.5 In cases of extreme heat or unless the trench is to be backfilled within the same day, all exposed roots > 30mm in diameter shall be wrapped with damp hessian to prevent drying out.

6.4.6 Where is it necessary to sever any woody roots, they shall be clean cut with secateurs or a pruning saw.

6.4.7 The underground services shall be positioned below the network of protected roots without causing damage to roots > 30mm in diameter. The hessian shall be removed prior to backfilling.

6.5 Back filling

6.5.1 Once works have been completed, backfilling shall be undertaken by hand using the subsoil first. The subsoil shall be filled into the trench in layers of no > 20cm and each layer shall be gently consolidated. Once the subsoil has reached the level of the existing subsoil, the topsoil shall be placed on top until the original levels are reached.

6.6 Construction of retaining walls

6.6.1 Where retaining walls are proposed, their foundations within TPZ's will comprise of piers with beams cantilevered above the ground or an alternative engineering solution which adopts tree root sensitive methods.

6.6.2 The footing for pier location will be determined by exploratory hand excavation to a depth of at least 600mm to determine the presence of any roots > 30mm in diameter. Exploratory trenching shall be under the supervision of the Project Arborist. Where the location is shown to be free of significant roots, or where the Project Arborist is satisfied the clean cutting of exposed roots will not be to the tree's detriment then this location shall be adopted.

6.6.3 All exploratory root excavation shall be documented by the Project Arborist.

6.6.4 In cases of extreme heat or unless the footing is to be backfilled within the same day, then the exposed roots shall be covered in damp hessian until back filling takes place.

6.6.5 Backfill shall be undertaken in accordance with section 6.5 of the method statement.

6.7 Soft and Hard Landscaping

6.7.1 Installation of soft or hard landscaping including paving, turf or plant material within the TPZ shall be undertaken by hand.

6.7.2 Planting holes are to be hand dug with a shovel or garden trowel.

6.8 Breach of tree protection

6.8.2 Any above or below ground damage (including soil compaction) to a protected tree shall be reported to the Project Arborist immediately.

6.8.3 Where activities occur which breach the tree protection measures, the Project Arborist shall be advised immediately and work within the TPZ be halted until an assessment has been made and any mitigation measures deemed necessary have been undertaken.

6.9 Post Construction

6.9.1 The Project Arborist shall make a final inspection to assess tree condition and produce written and photographic documentation of each site inspection including instructions issued for any remedial works required.

Any questions relating to this arborist report should be directed to Glenyss Laws.

Yours Sincerely

Glenyss Laws
Dip Arboriculture
Assoc Dip Landscape
ISA Qualified Tree Risk Assessor (TRAQ) 2014
Member I.A.C.A Member No 28
A.I.H & I.S.A .
Qualified and Practicing Arborist/Horticulturist.
Since 1996

Assumptions/Disclaimer

Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible. However, Glenyss Laws – Consulting Arborist can neither guarantee nor be responsible for the accuracy of information provided by others.

Unless stated otherwise:

- Information contained in this report covers only the trees that were examined and reflects the condition of the trees at the time of inspection: and
- The inspection was limited to visual examination of the subject trees without dissection, probing or coring.
- No risk assessment was commissioned or carried out as part of the investigation.
- Trees are living organisms whose health and condition can change rapidly. Any changes to the soil surrounds e.g. excavation or construction works or extreme weather events will invalidate this report.
- There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future.
- Any tree, whether it has a visible weakness or not, will fail if the forces applied exceed the strength of the tree or its parts.

BIBLIOGRAPHY/REFERENCES

Barrell (1995). 'Pre-development Tree Assessments', in Trees and Building Sites, Proceedings of an International Conference held in the Interest of Development a Scientific Basis for Managing Trees in Proximity to Buildings. International Society of Arboriculture, Illinois, USA pp132-142.

IACA (2010) IACA Significance of a Tree, Assessment Rating System (STARS). Institute of Australian Consulting Arboriculturists, Australia, www.iaca.org.au

Standards Australia (2007), AS4970-2009 Protection of trees on development sites.

APPENDIX A

Tree Survey Notes

Tree No	Tree Species	Age Class	DBH (mm)	DRB (mm)	Tree Height (M)	Crown Width (M)	Crown Condition	Crown Class	STARS	ULE	Root Zone/ Defects/ Services	Comments
1	*Eucalyptus moluccana* (Grey Box)	O	230	290	10	5	2	D	1	3	Gr/-/-	Over mature specimen with short useful life expectancy.
2	*Eucalyptus moluccana (Grey Box)*	O	190	220	7	4	1	C	1	4	Gr/-/-	Declining canopy density with less than 20% live foliage. Over mature specimen with short useful life expectancy.
3	*Eucalyptus moluccana (Grey Box)*	O	540	540	15	11	2	C	1	3	Gr/-/-	Over mature specimen with short useful life expectancy.
4	*Eucalyptus tereticornis (Forest Red Gum)*	M	560	590	16	10	3	C	1	2	Gr/-/-	Exhibits fair vigour, good condition, free of major above ground defects.
5	*Eucalyptus tereticornis (Forest Red Gum)*	M	430	490	16	8	3	C	1	2	Gr/-/-	Exhibits fair vigour, good condition, free of major above ground defects.
6	*Eucalyptus tereticornis (Forest Red Gum)*	M	440	430	15	8	3	C	1	2	Gr/I/-	Forms 2 x leaders at 3.5m reaction wood evident within leader union.
7	*Eucalyptus tereticornis (Forest Red Gum)*	M	250	310	12	5	3	C	1	2	Gr/-/-	Exhibits fair vigour, good condition, free of major above ground defects.
8	*Eucalyptus tereticornis (Forest Red Gum)*	M	270	300	12	5	3	C	1	2	Gr/-/-	Free of major above ground defects.
9	*Eucalyptus tereticornis (Forest Red Gum)*	M	470	530	14	10	3	C	1	2	Gr/-/-	Free of major above ground defects
10	*Eucalyptus tereticornis (Forest Red Gum)*	M	540	590	14	10	3	C	1	2	Gr/-/-	

Tree No	Tree Species	Age Class	DBH (mm)	DRB (mm)	Tree Height (M)	Crown Width (M)	Crown Condition	Crown Class	STARS	ULE	Root Zone/ Defects/ Services	Comments
11	*Eucalyptus species*	M	Est 450	Est 550	10	9	3	C	1	2	Gr/-/-	Access hindered due lack of ground maintenance, dense thickets of weeds including blackberries. Dimensions estimated only.
12	*Eucalyptus tereticornis (Forest Red Gum)*	M	460	570	10	10	3	C	1	2	Gr/-/-	
12A	*Eucalyptus species*	M	300 & 450	650	12	12	3	C	1	2	Gr/-/-	Access hindered due lack of ground maintenance and dense weeds/blackberries. Dimensions estimated only.
13	*Eucalyptus tereticornis (Forest Red Gum)*	O	Est 550	Est 650	15	12	3	C	1	3	Gr/T/-	Access hindered due dense weeds including thickets of blackberries. Dimensions estimated only. 50-60% canopy density of fair to low vigour.
14	*Eucalyptus tereticornis (Forest Red Gum)*	M	Est 550	Est 650	14	14	3	C	1	2	Gr/-/-	
15	*Eucalyptus moluccana (Grey Box)*	M	770	920	24	14	Low 3	C	1	2	Gr/-/-	
16	*Eucalyptus tereticornis (Forest Red Gum)*	M	820	880	22	12	3	C	1	2	Gr/-/-	
17 x 6	*Group of 6 x Eucalyptus moluccana and Eucalyptus tereticornis*	M	Est 350-700		6 - 18	3 - 12	3	C	1	2 - 3	Gr/-/-	Access restricted due to electrified fencing. Dimensions estimated only.

Trees in Green assessed with a high landscape value coupled with a medium to long ULE are allocated a high priority for retention.
Trees in Blue are assessed as less critical for retention, their retention should be a priority with removal considered if all design options have been exhausted & adversely affecting the proposal.
Trees in Pink are of low retention value, nor require special works or design modifications to be implemented.
Tree in Orange are considered hazardous, in irreversible decline or environmental weed species and recommended for removal irrespective of development.

APPENDIX B

Notes on tree inventory schedule.

Tree No: Relates to number on site diagram.

Species: Coded to tree species schedule

Age Class:

Y	Young- recently planted
S	Semi mature- <20% of life expectancy
M	Mature- 20-80% of life expectancy
O	Over mature- >80% of life expectancy

Height: In metres

Crown Diameter: In metres

Crown Class:

D	Dominant	Crown extends above general canopy; not restricted by other trees.
C	Co-dominant	Crown forms the bulk of the general Canopy but crowded by other trees.
I	Intermediate	Crown extends into dominant/ codominant canopy but quite crowded on all sides.
S	Suppressed	Crown development restricted from Overgrowing trees.

Crown Condition: Overall vigour and vitality

0	Dead
1	Severe decline (<20% canopy density; major dead wood)
2	Declining (20-60% canopy density; twig and branch dieback)
3	Average/ low vigour (60-90% canopy density; twig dieback)
4	Good (90-100% canopy density; little or no dieback or other problems)
5	Excellent (100% canopy density; no deadwood or other problems)

Root Zone:

C	Compaction
D	Damaged/wounded roots
E	Exposed roots
Ga	Tree in garden bed
Gi	Girdled roots
Gr	Grass
K	Kerb close to tree
L+	Raised soil level
L-	Lowered soil level
M	Mulched
Pa	Paving/concrete/bitumen
Pr	Roots pruned
O	Other

Defects:

B	Borers
C	Cavity
D	Decay
F	Previous failures
I	Inclusions
L	Lopped
M	Mistletoe/parasites
S	Splits/Cracks
T	Termites
O	Other

Services adjacent structures:	Bs	Bus stop
	Bu	Building within 3 metres
	Hvo	High voltage open wire construction
	Hvb	High voltage bundled (ABC)
	Lvo	Low voltage open wire construction
	Lvb	Low voltage bundled (ABC)
	Na	No services above
	Nb	No services below
	Si	Signage
	Sl	Street light
	T	Transmission lines
	U	Underground services
	O	Other

STARS: Significance of a Tree Assessment Rating System (copyright Institute of Australian Consulting Arborists 2010)

ULE: Useful Life Expectancy after Barrell 2001

APPENDIX C
IACA Significance of a Tree, Assessment Rating System (STARS)© (IACA 2010)©

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High*, *Medium* and *Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined. An example of its use in an Arboricultural report is shown as Appendix A.

Tree Significance - Assessment Criteria

1. High Significance in landscape

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa *in situ* - tree is appropriate to the site conditions.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

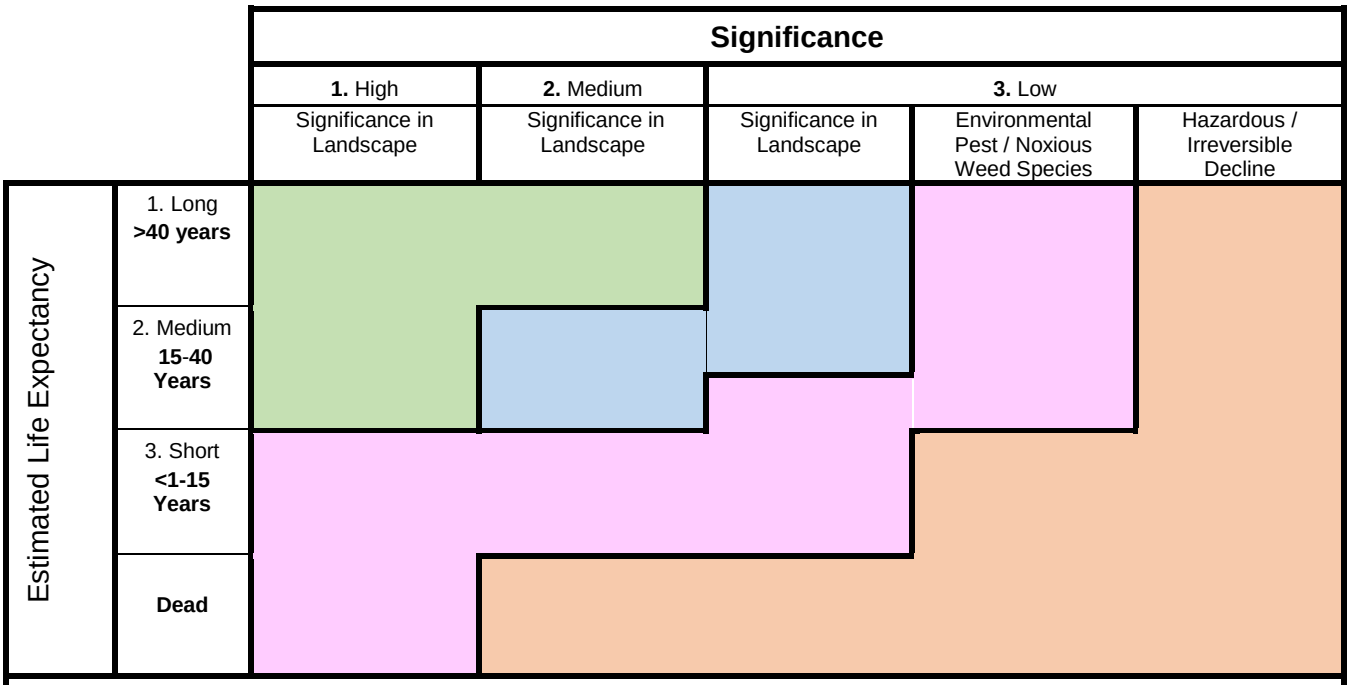
Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g. hedge.

Table 5.0 Tree Retention Value - Priority Matrix



Legend for Matrix Assessment

	Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 *Protection of trees on development sites*. Tree sensitive construction measures must be implemented e.g. pier and beam etc if works are to proceed within the Tree Protection Zone.
	Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however, their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	Consider for Removal (Low) - These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for Removal - These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

USE OF THIS DOCUMENT AND REFERENCING

The IACA Significance of a Tree, Assessment Rating System (STARS) is free to use, but only in its entirety and must be cited as follows:

IACA, 2010, *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arboriculturists, Australia, www.iaca.org.au

REFERENCES

Australia ICOMOS Inc. 1999, *The Burra Charter – The Australian ICOMOS Charter for Places of Cultural Significance*, International Council of Monuments and Sites, www.icomos.org/australia

Draper BD and Richards PA 2009, *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Footprint Green Pty Ltd 2001, *Footprint Green Tree Significance & Retention Value Matrix*, Avalon, NSW Australia, www.footprintgreen.com.au

APPENDIX D
ULE RATING ADAPTED FROM BARRELL (1/4/2001)

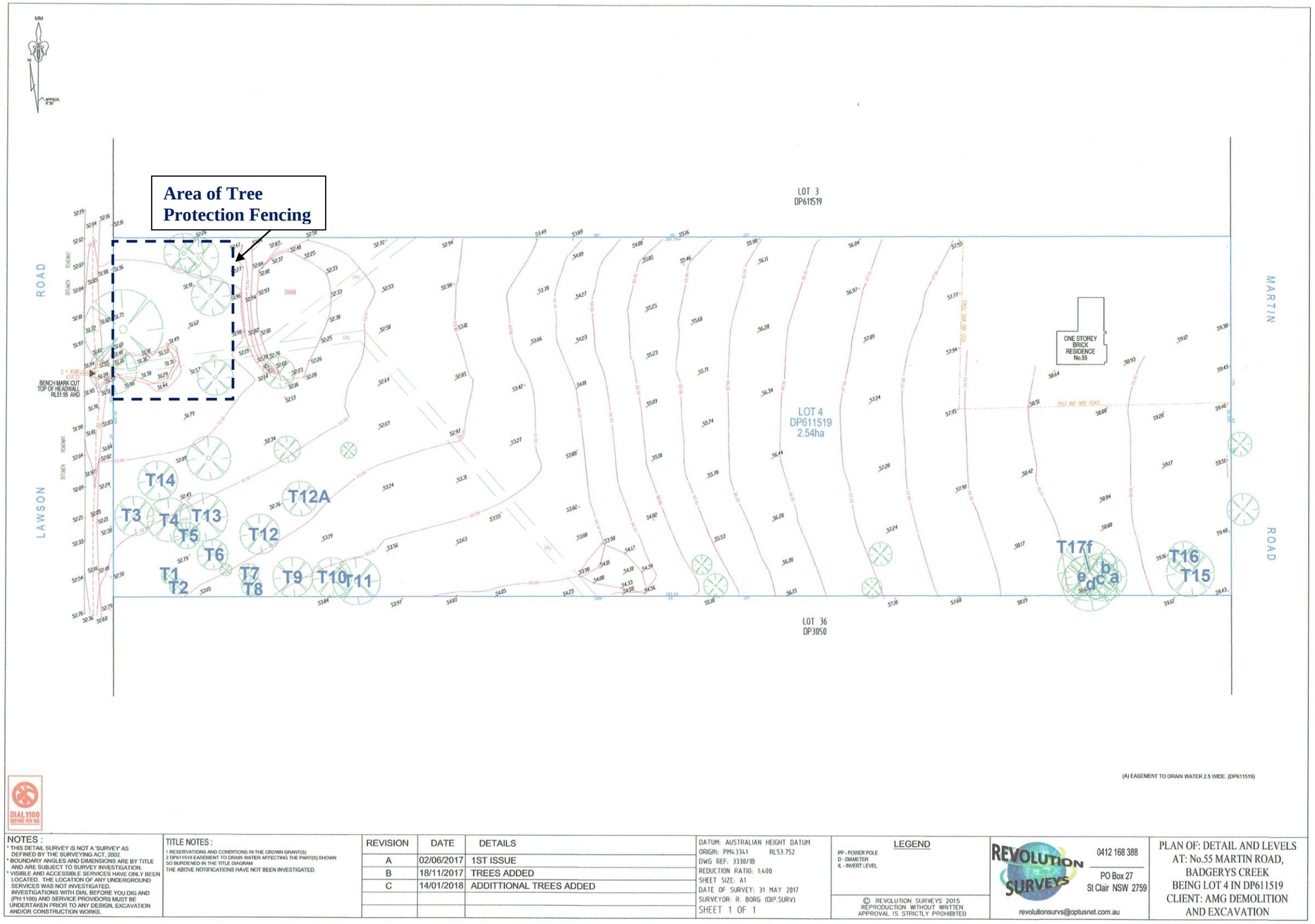
1	Long ULE	Trees that appear to be retainable at the time of assessment for more than 40 years with an acceptable level of risk
2	Medium ULE	Trees that appear to be retainable at the time of assessment for more than 15-40 years with an acceptable level of risk
3	Short ULE	Trees that appear to be retainable at the time of assessment for more than 5-15 years with an acceptable level of risk
4	Remove	Trees that should be removed within the next 5 years
5	Small, young or regularly pruned	Small trees less than 5 Metres in height or young trees less than 15 years old but over 5 metres in height.

APPENDIX E
Photographs

Figure 2. Trees on the south-western boundary, Lawson Rd frontage

Figure 3. Trees 15 - 17 on the Martin Rd, frontage

APPENDIX F
Site and Survey Plans



DIAL 1100 BEFORE YOU DIG

NOTES :
* THIS DETAIL SURVEY IS NOT A 'SURVEY' AS DEFINED BY THE SURVEYING ACT, 2002.
* BOUNDARY ANGLES AND DIMENSIONS ARE BY TITLE AND ARE SUBJECT TO SURVEY INVESTIGATION.
* VISIBLE AND ACCESSIBLE SERVICES HAVE ONLY BEEN LOCATED. THE LOCATION OF ANY UNDERGROUND SERVICES WAS NOT INVESTIGATED. INVESTIGATIONS WITH DIAL BEFORE YOU DIG AND (PH:1100) AND SERVICE PROVIDORS MUST BE UNDERTAKEN PRIOR TO ANY DESIGN, EXCAVATION AND/OR CONSTRUCTION WORKS.

TITLE NOTES :
1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2 DP611519 EASEMENT TO DRAIN WATER AFFECTING THE PART(S) SHOWN SO BURDENED IN THE TITLE DIAGRAM
THE ABOVE NOTIFICATIONS HAVE NOT BEEN INVESTIGATED.

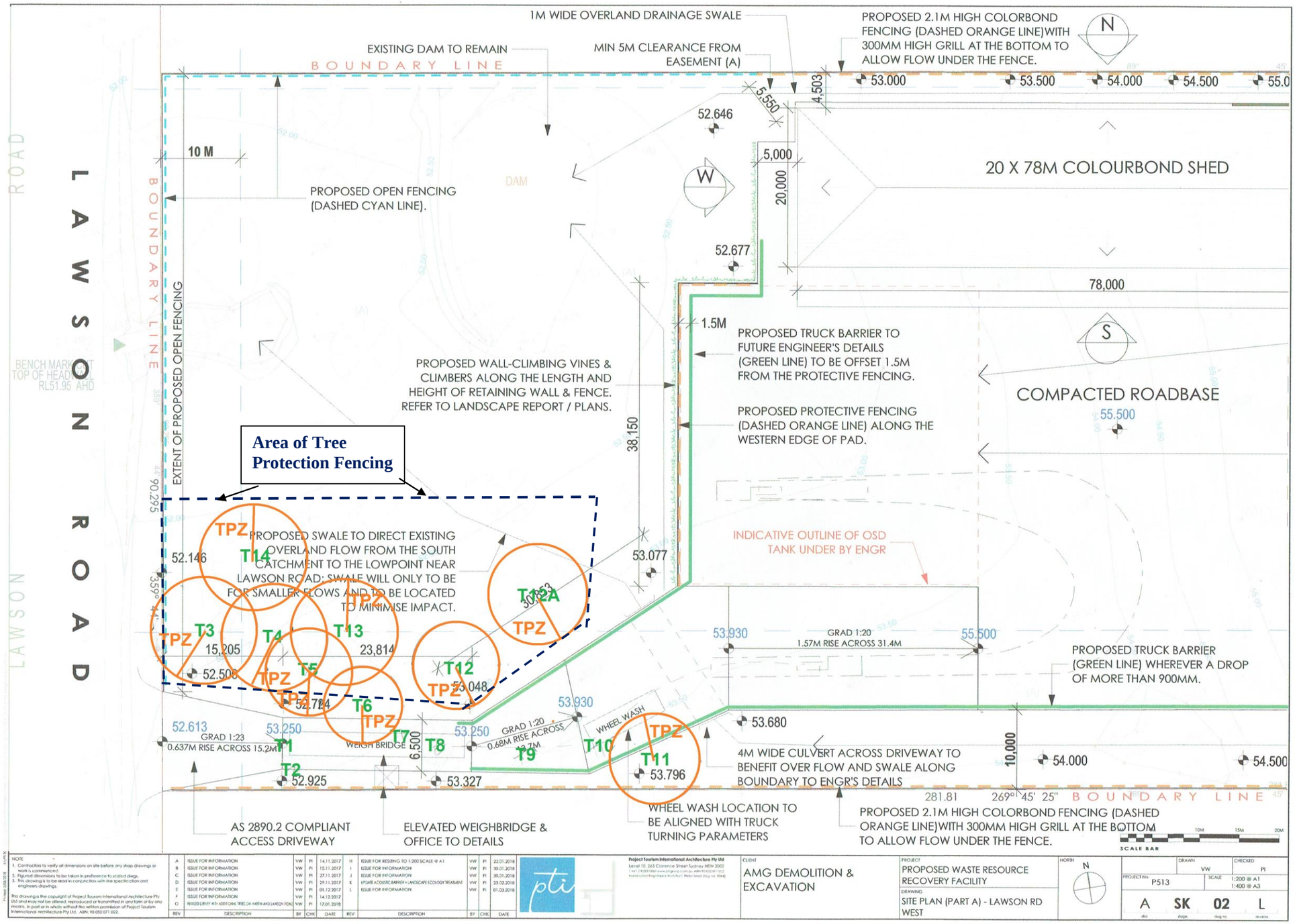
REVISION	DATE	DETAILS
A	02/06/2017	1ST ISSUE
B	18/11/2017	TREES ADDED
C	14/01/2018	ADDITTIONAL TREES ADDED

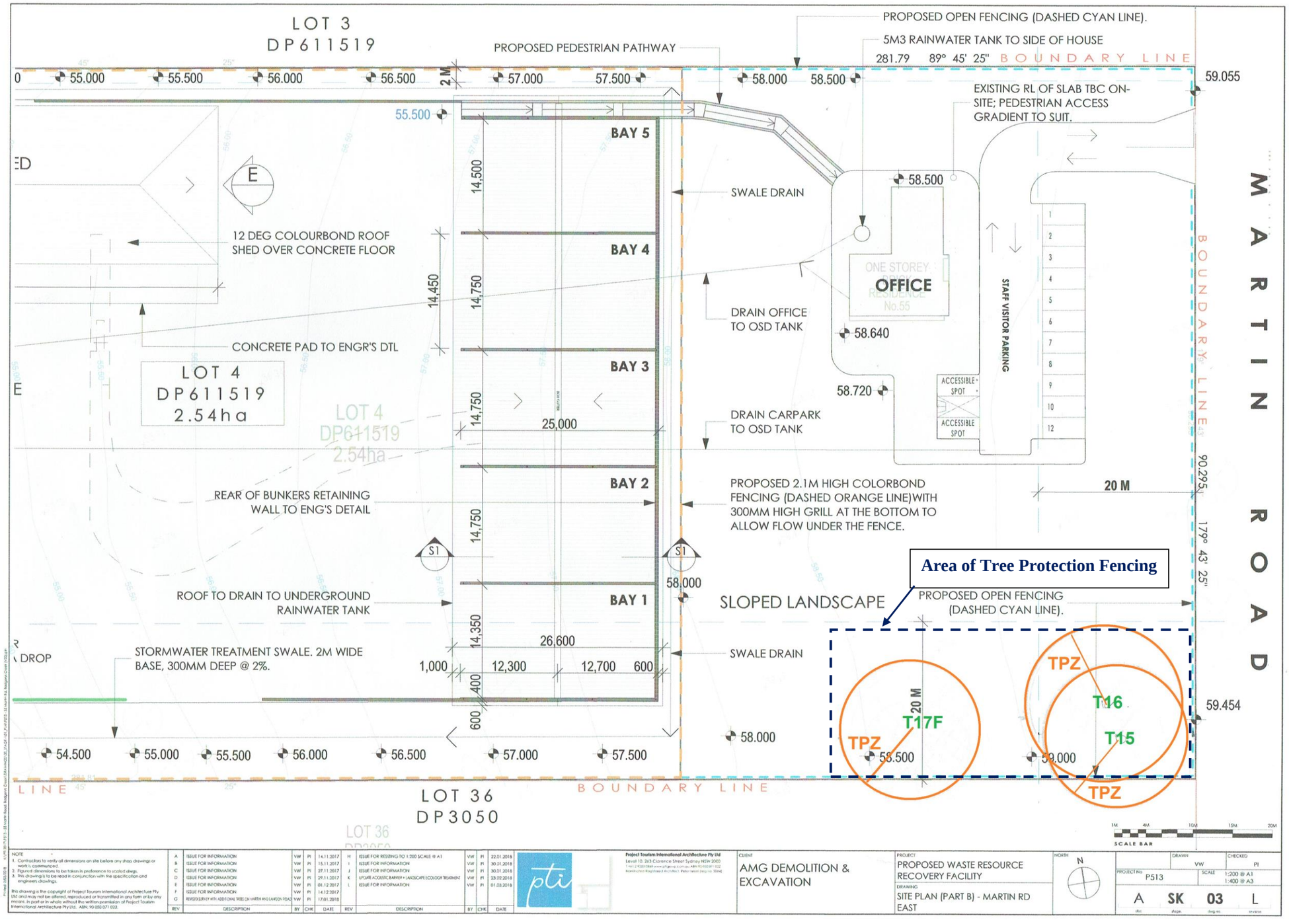
DATUM: AUSTRALIAN HEIGHT DATUM
ORIGIN: PM43341 RL53.752
DWG REF: 3330/1B
REDUCTION RATIO: 1:400
SHEET SIZE: A1
DATE OF SURVEY: 31 MAY 2017
SURVEYOR: R. BORG (DIP.SURV)
SHEET 1 OF 1

LEGEND
PP - POWER POLE
D - DIAMETER
IL - INVERT LEVEL

REVOLUTION SURVEYS
0412 168 388
PO Box 27
St Clair NSW 2759
revolutionsurvs@optusnet.com.au

PLAN OF: DETAIL AND LEVELS
AT: No.55 MARTIN ROAD, BADGERYS CREEK
BEING LOT 4 IN DP611519
CLIENT: AMG DEMOLITION AND EXCAVATION


1M WIDE OVERLAND DRAINAGE SWALE
EXISTING DAM TO REMAIN
BOUNDARY LINE
MIN 5M CLEARANCE FROM EASEMENT (A)
PROPOSED 2.1M HIGH COLORBOND FENCING (DASHED ORANGE LINE)WITH 300MM HIGH GRILL AT THE BOTTOM TO ALLOW FLOW UNDER THE FENCE.
N
53.000
53.500
54.000
54.500
55.0
4,503
3,550
52.646
10 M
PROPOSED OPEN FENCING (DASHED CYAN LINE).
DAM
W
5,000
20,000
20 X 78M COLOURBOND SHED
52.677
78,000
1.5M
PROPOSED TRUCK BARRIER TO FUTURE ENGINEER'S DETAILS (GREEN LINE) TO BE OFFSET 1.5M FROM THE PROTECTIVE FENCING.
S
COMPACTED ROADBASE
55.500
PROPOSED WALL-CLIMBING VINES & CLIMBERS ALONG THE LENGTH AND HEIGHT OF RETAINING WALL & FENCE. REFER TO LANDSCAPE REPORT / PLANS.
PROPOSED PROTECTIVE FENCING (DASHED ORANGE LINE) ALONG THE WESTERN EDGE OF PAD.
38,150
EXTENT OF PROPOSED OPEN FENCING
90.295
LAWSON ROAD
BENCH MARK
TOP OF HEAD
RL51.95 AHD
Area of Tree Protection Fencing
PROPOSED SWALE TO DIRECT EXISTING OVERLAND FLOW FROM THE SOUTH CATCHMENT TO THE LOWPOINT NEAR LAWSON ROAD: SWALE WILL ONLY TO BE FOR SMALLER FLOWS AND TO BE LOCATED TO MINIMISE IMPACT.
INDICATIVE OUTLINE OF OSD TANK UNDER BY ENGR
53.077
TPZ
T14
52.146
T3
15,205
52.500
T4
T5
T13
23,814
T12
53.048
T12A
30.153
52.784
T6
T7
T8
T9
T10
T11
53.796
T1
52.613
GRAD 1:23
0.637M RISE ACROSS 15.2M
T2
52.925
53.327
WEIGH BRIDGE
6,500
53.250
GRAD 1:20
0.68M RISE ACROSS 13.7M
53.930
WHEEL WASH
53.930
GRAD 1:20
1.57M RISE ACROSS 31.4M
55.500
PROPOSED TRUCK BARRIER (GREEN LINE) WHEREVER A DROP OF MORE THAN 900MM.
53.680
4M WIDE CULVERT ACROSS DRIVEWAY TO BENEFIT OVER FLOW AND SWALE ALONG BOUNDARY TO ENGR'S DETAILS
10,000
54.000
54.500
281.81
269° 45' 25"
BOUNDARY LINE
PROPOSED 2.1M HIGH COLORBOND FENCING (DASHED ORANGE LINE)WITH 300MM HIGH GRILL AT THE BOTTOM TO ALLOW FLOW UNDER THE FENCE.
AS 2890.2 COMPLIANT ACCESS DRIVEWAY
ELEVATED WEIGHBRIDGE & OFFICE TO DETAILS
WHEEL WASH LOCATION TO BE ALIGNED WITH TRUCK TURNING PARAMETERS
SCALE BAR
AMG DEMOLITION & EXCAVATION
PROPOSED WASTE RESOURCE RECOVERY FACILITY
SITE PLAN (PART A) - LAWSON RD WEST
P513
1:200 @ A1
1:400 @ A3
A SK 02 L


LOT 3
DP611519
PROPOSED PEDESTRIAN PATHWAY
PROPOSED OPEN FENCING (DASHED CYAN LINE).
5M3 RAINWATER TANK TO SIDE OF HOUSE
281.79 89° 45' 25" BOUNDARY LINE
EXISTING RL OF SLAB TBC ON-SITE; PEDESTRIAN ACCESS GRADIENT TO SUIT.
59.055
BAY 5
BAY 4
BAY 3
BAY 2
BAY 1
SWALE DRAIN
12 DEG COLOURBOND ROOF SHED OVER CONCRETE FLOOR
CONCRETE PAD TO ENGR'S DTL
LOT 4
DP611519
2.54ha
ONE STOREY RESIDENCE No.55
OFFICE
STAFF VISITOR PARKING
ACCESSIBLE SPOT
DRAIN OFFICE TO OSD TANK
DRAIN CARPARK TO OSD TANK
REAR OF BUNKERS RETAINING WALL TO ENG'S DETAIL
PROPOSED 2.1M HIGH COLORBOND FENCING (DASHED ORANGE LINE)WITH 300MM HIGH GRILL AT THE BOTTOM TO ALLOW FLOW UNDER THE FENCE.
20 M
90.295
179° 43' 25"
MARTIN ROAD
ROOF TO DRAIN TO UNDERGROUND RAINWATER TANK
SLOPED LANDSCAPE
Area of Tree Protection Fencing
PROPOSED OPEN FENCING (DASHED CYAN LINE).
STORMWATER TREATMENT SWALE. 2M WIDE BASE, 300MM DEEP @ 2%.
SWALE DRAIN
TPZ
T17F
T16
T15
20 M
59.454
LOT 36
DP3050
BOUNDARY LINE
SCALE BAR
AMG DEMOLITION & EXCAVATION
PROPOSED WASTE RESOURCE RECOVERY FACILITY
SITE PLAN (PART B) - MARTIN RD EAST
P513
A SK 03 L