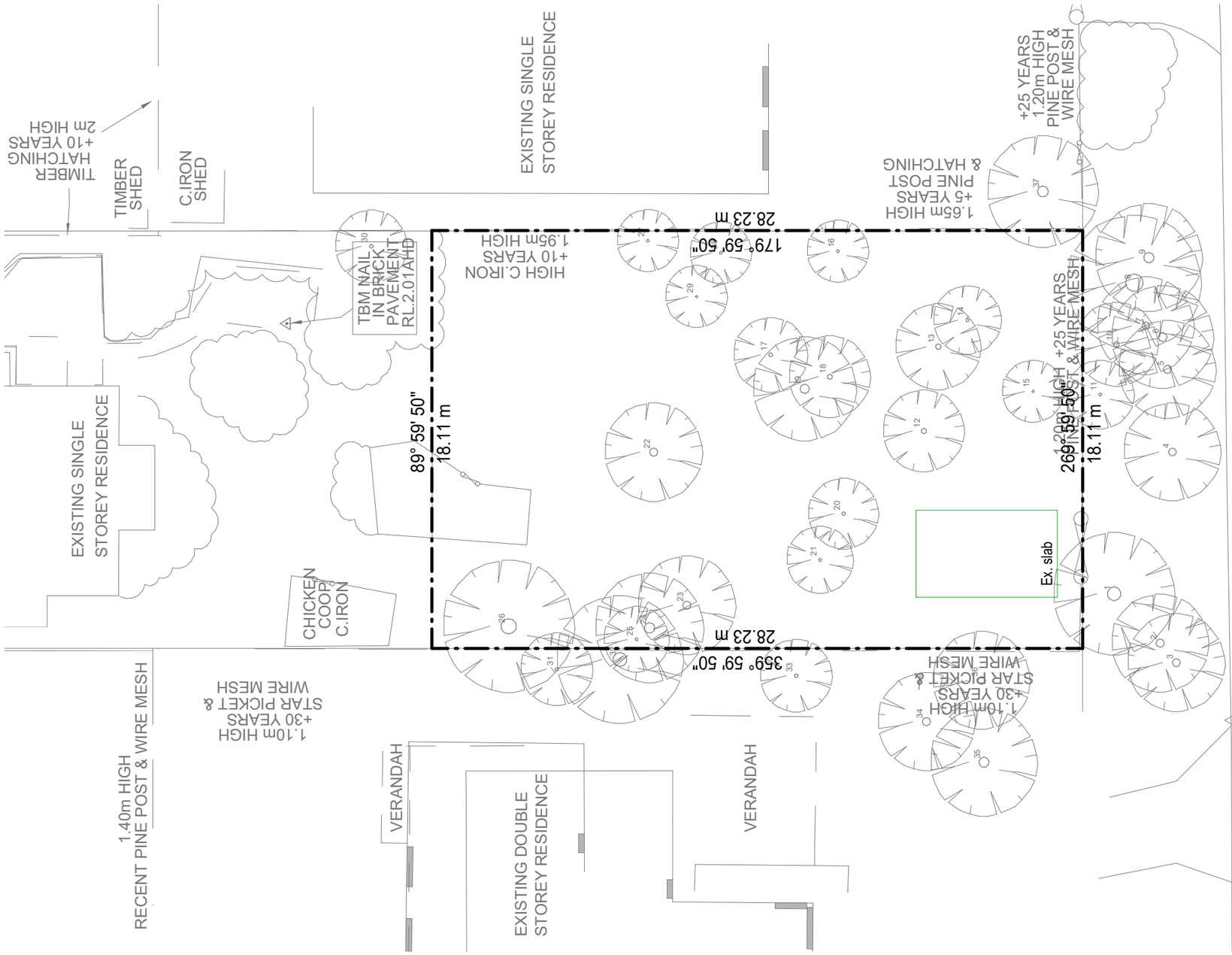


Site Area
511 m²

Existing Conditions Site Plan

P-01 — 1 : 200

COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

13/12/2021 11:30:05 AM

Issued For: PLANNING PERMIT

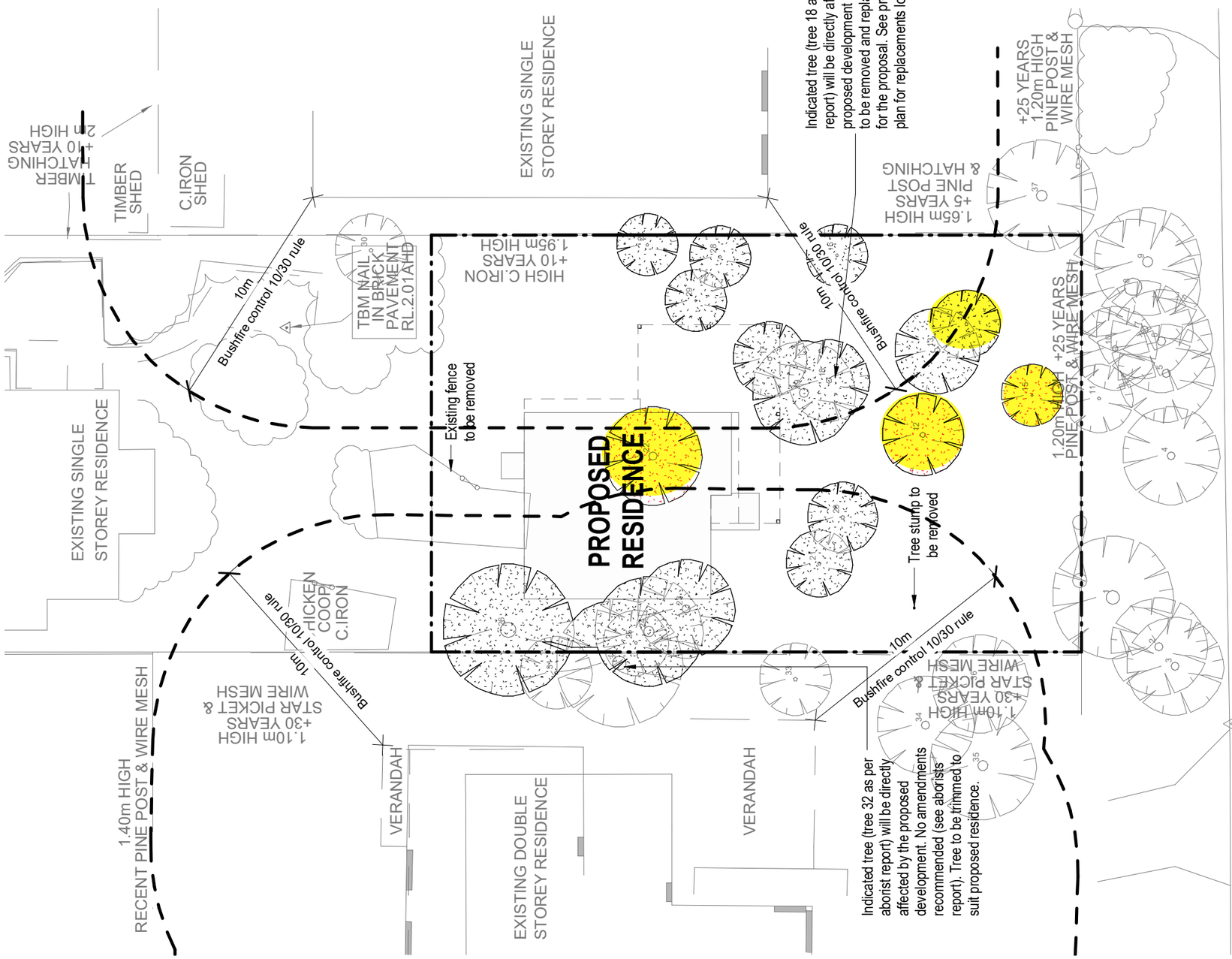
REV	DATE	DESCRIPTION	BY
C	13/12/21	Vegetation updated to match arborists report	Mitch
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3
Date: April 2021
Drawn: Mitch
Chk: Wal
Rev No. C
Job No. 21-021
Sheet Name: P-01
Sheet No: 1 of 7



Vegetation Removal Plan

1 : 200

P-02

= Marked trees denotes existing trees/vegetation to be removed as per bushfire control 10 / 30 rule & to allow septic wick trenches as per LCA report.

= Marked trees denotes existing trees/vegetation to be removed to allow installation of septic system, vehicle access to & construction of proposed residence.

Numbered trees refer to arborists report for 37 Bruce Road, Silverleaves 3922 by Bluegum

COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

13/12/2021 11:30:05 AM

Issued For: PLANNING PERMIT

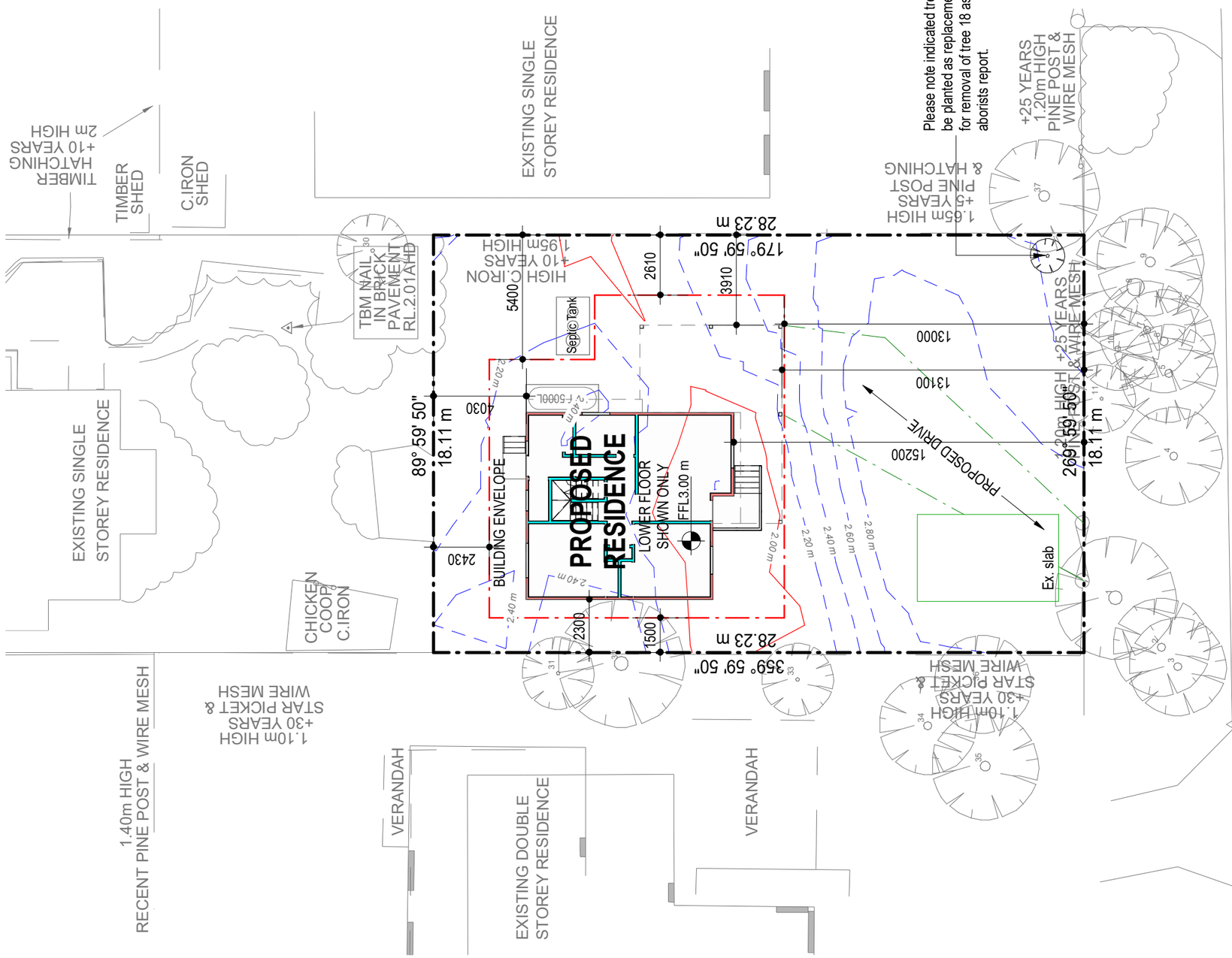
REV	DATE	DESCRIPTION	BY
C	13/12/21	Vegetation updated to match arborists report	Mitch
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client: PUNTERERE

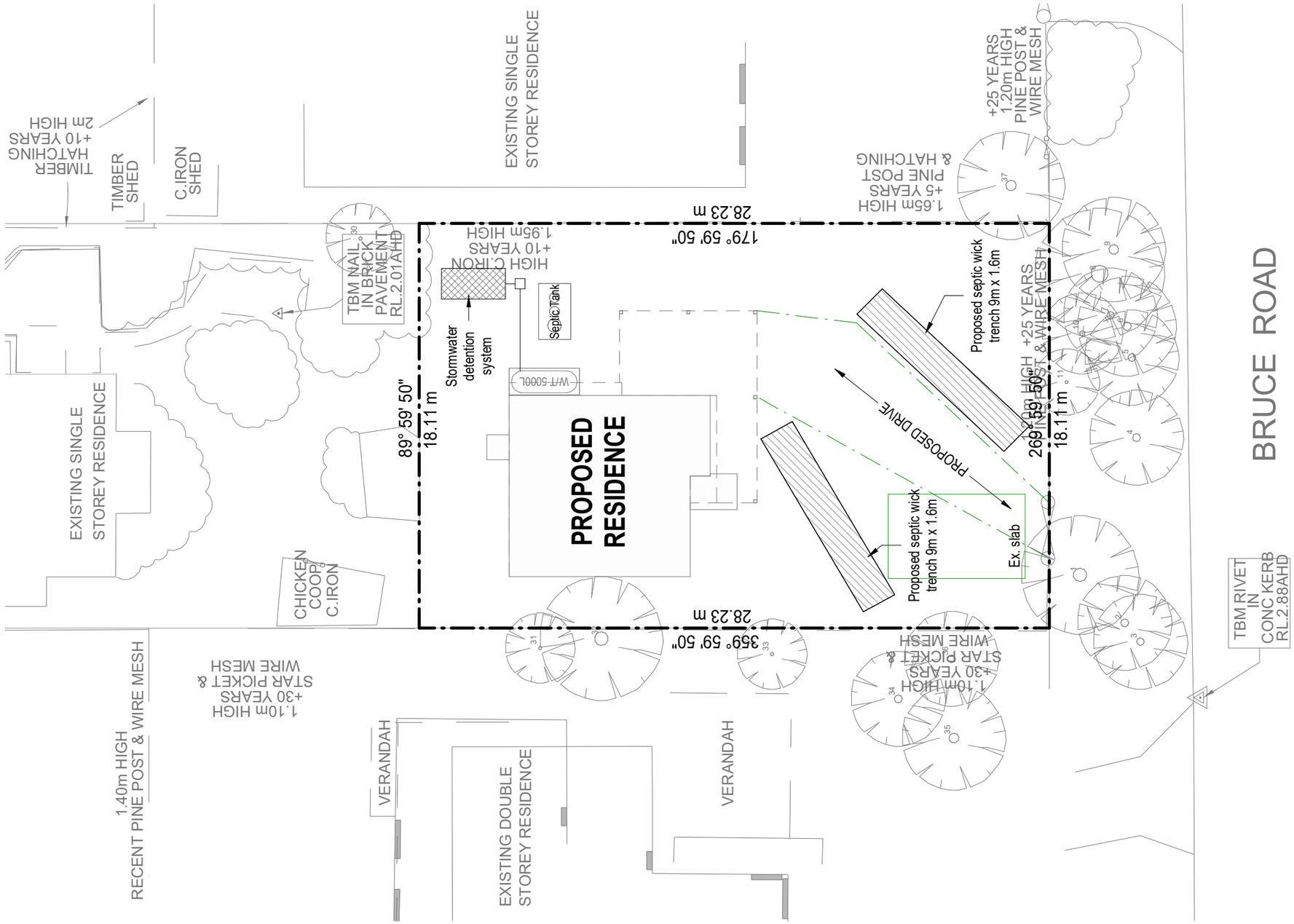
Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3
Date: April 2021
Drawn: Mitch
Chk: Wal
Rev No. C
Job No. 21-021
Sheet Name: P-02
Sheet No: 2 of 7



COLDON HOMES	Cape Paterson Road Wonthaggi 3995 Ph: 03 56 721 999 Fax: 03 56 722 979	(c Copyright All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken 13/12/2021 11:30:06 AM	Issued For: PLANNING PERMIT C 13/12/21 Vegetation updated to match arborists report Mitch B 03/09/21 Bushfire notation added to veg removal plan Mitch A 25/08/21 Planner's requests Mitch - 29/06/21 Planning plans Mitch REV DATE DESCRIPTION BY G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client:	PUNTERERE	Scale: As indicate @ A3	Date: April 2021
Project:	PROPOSED RESIDENCE AT Lot 1 No 37 Bruce Road, Silverleaves 3922	Drawn: Mitch	Chk: Wal
		Rev No. C	
		Job No. 21-021	Sheet Name: P-03
		Sheet No: 3 of 7	



Site Area
511 m²

Septic & Stormwater Plan
P-04 1 : 200

COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

13/12/2021 11:30:06 AM

Issued For: PLANNING PERMIT

REV	DATE	DESCRIPTION	BY
C	13/12/21	Vegetation updated to match arborists report	Mitch
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

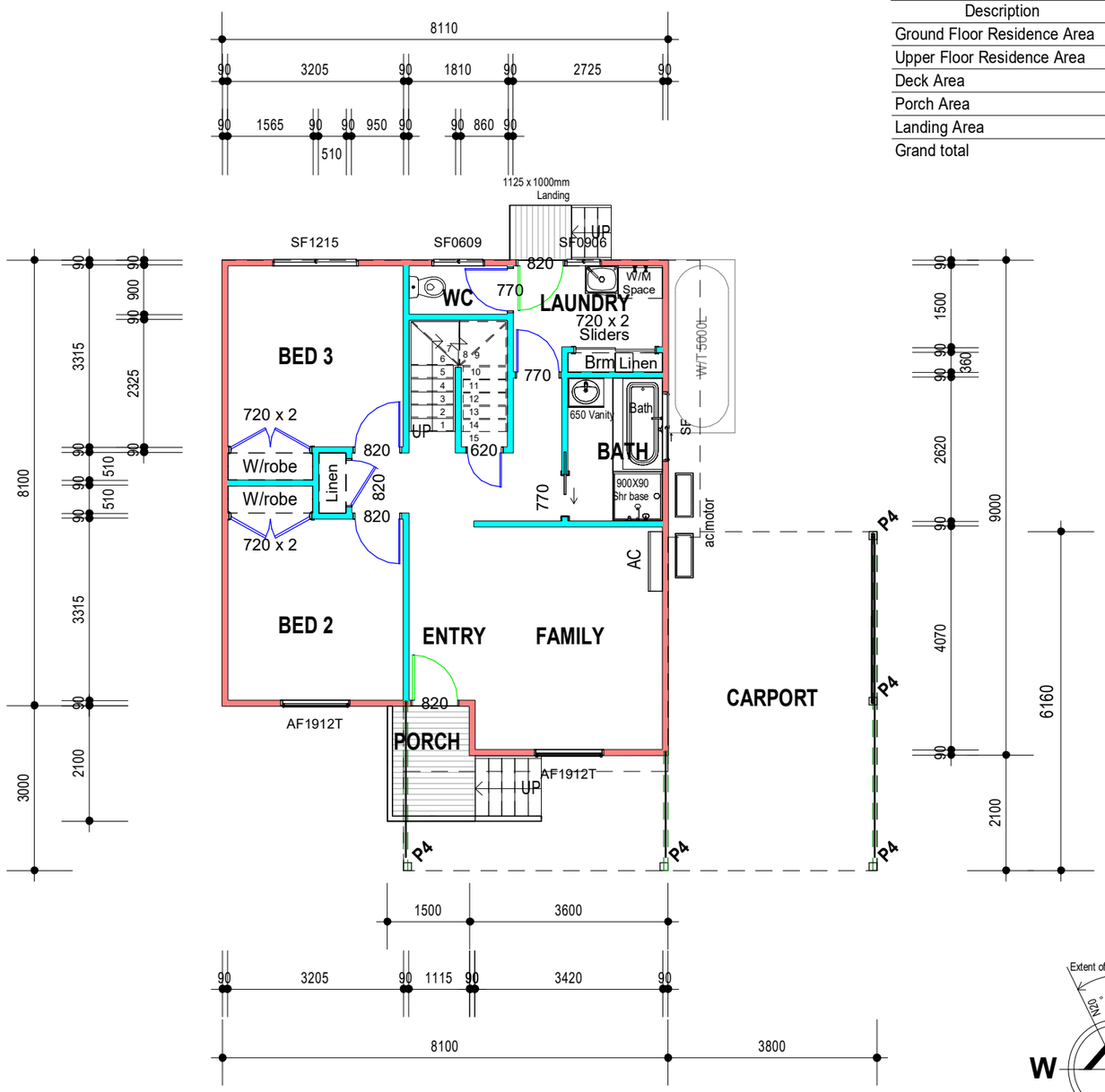
Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3
Date: April 2021
Drawn: Mitch
Chk: Wal
Rev No. C
Job No. 21-021
Sheet Name: P-04
Sheet No: 4 of 7

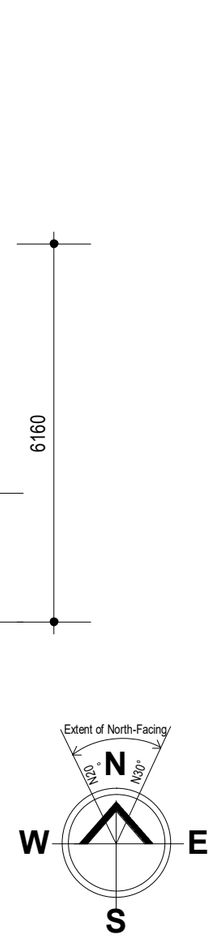
Proposed Building Area

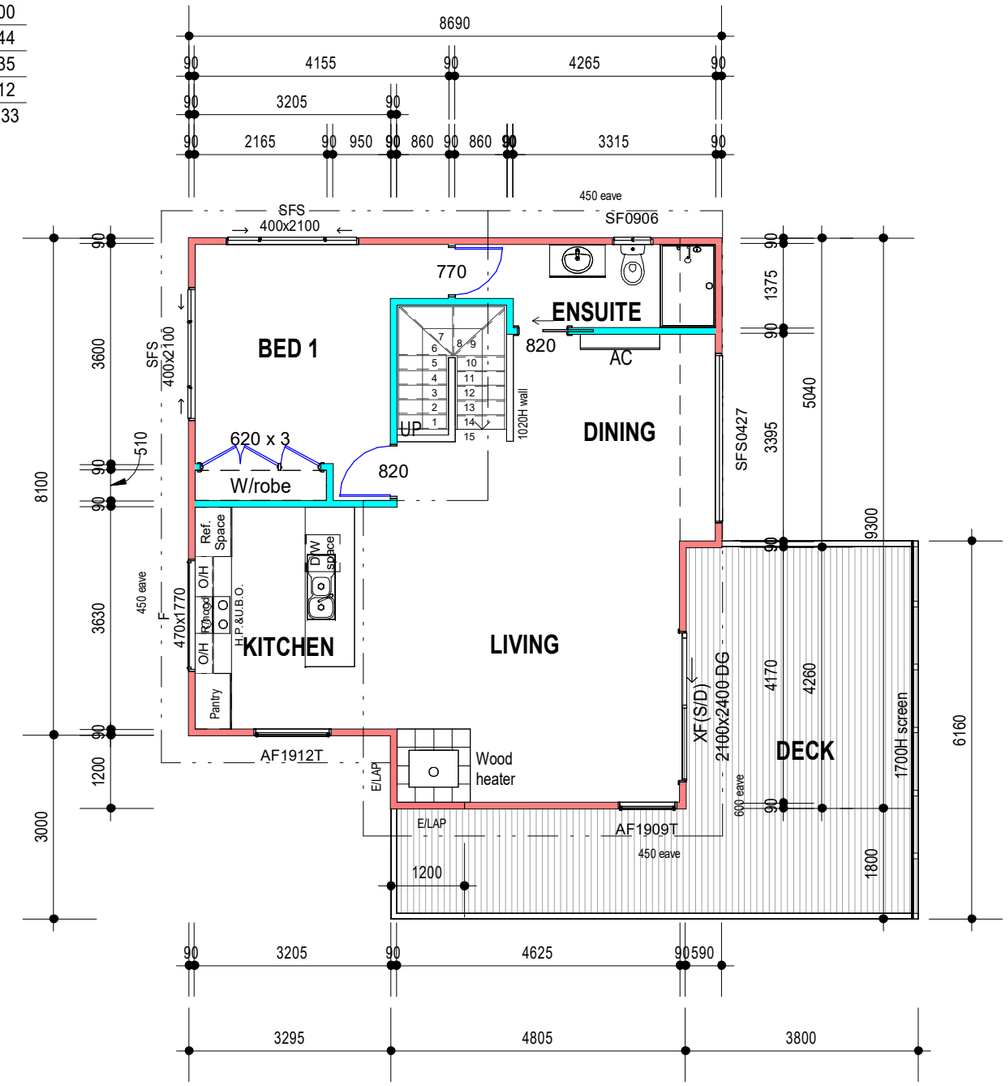
Description	Area (m2)	Sq.
Ground Floor Residence Area	68.85 m²	7.41
Upper Floor Residence Area	74.35 m²	8.00
Deck Area	32.00 m²	3.44
Porch Area	3.27 m²	0.35
Landing Area	1.13 m²	0.12
Grand total	179.59 m²	19.33



Ground Floor Layout

P-05 1 : 100





Upper Floor Layout

P-05 1 : 100

COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

13/12/2021 11:30:08 AM

Issued For: PLANNING PERMIT

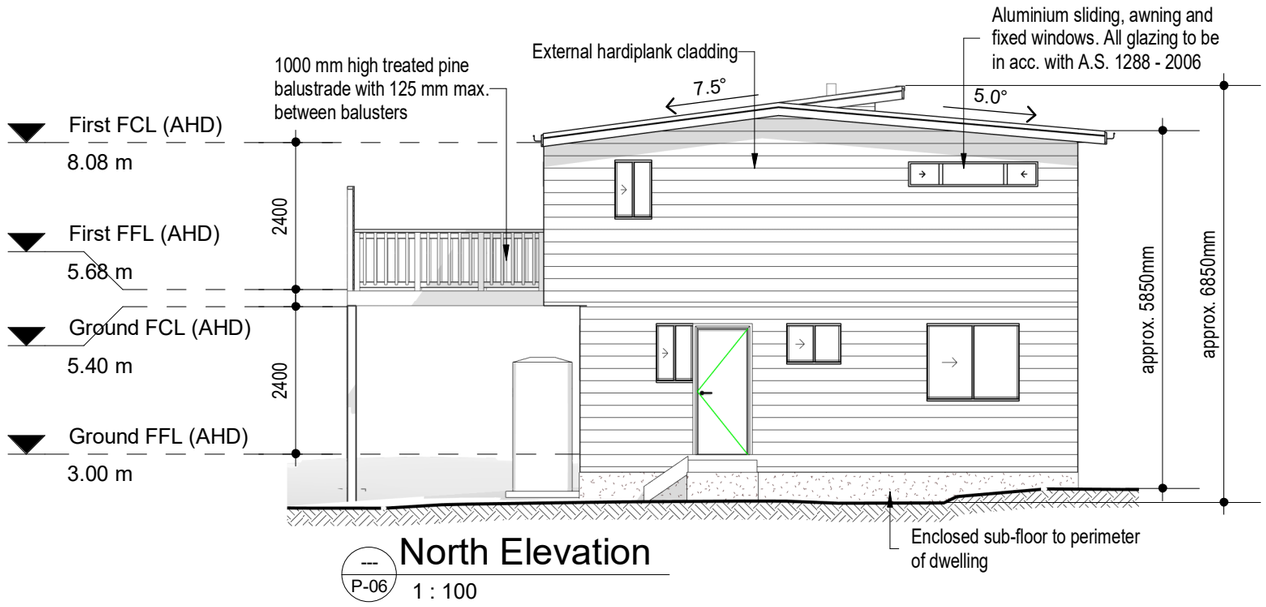
REV	DATE	DESCRIPTION	BY
C	13/12/21	Vegetation updated to match arborists report	Mitch
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

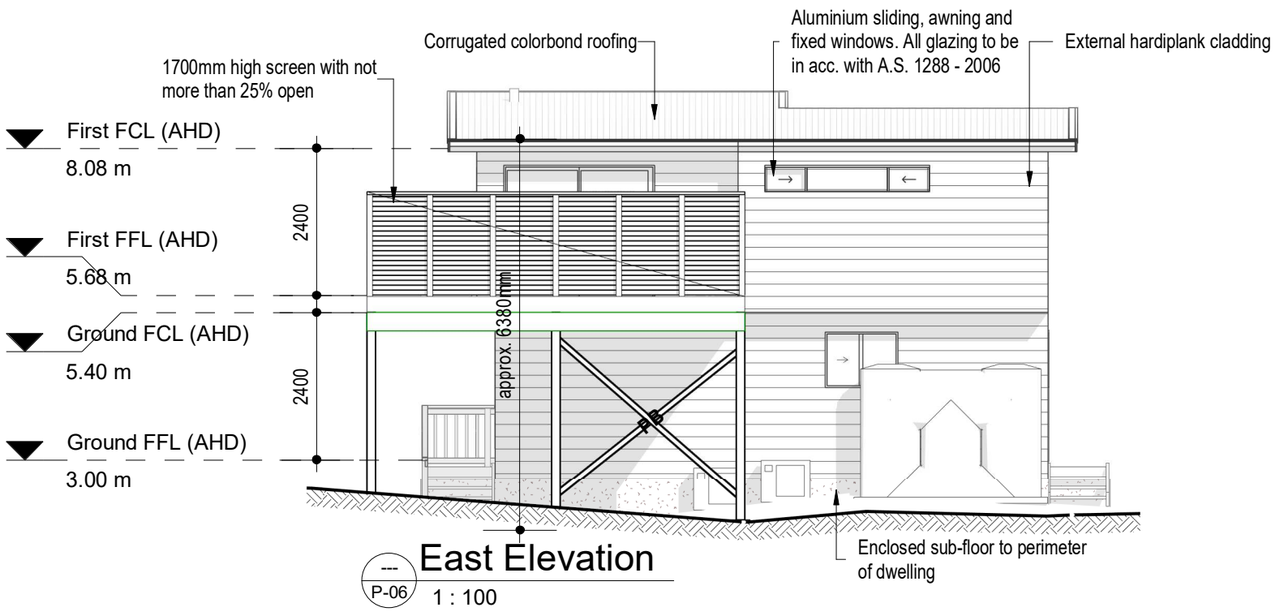
Scale: As indicate @ A3
Date: April 2021
Drawn: Mitch
Chk: Wal
Rev No. C
Job No. 21-021
Sheet Name: P-05
Sheet No: 5 of 7



North Elevation

P-06

1 : 100



East Elevation

P-06

1 : 100

Material Schedule

Type	Description	Color	Indicative Type Image
External Hardiplank Cladding Wall	Hardies Weatherboard Cladding	Wattyl - Colorbond Shale Grey	
Hardie Fine Texture Cladding Wall	Hardie Fine Texture Sheet	Wattyl - Colorbond Woodland Grey	
Roof	Colorbond Corrugated Roofting, Fascia & Guttering	Woodland Grey	
Windows/Sliding Door	Aluminum Sliding Windows	Woodland Grey	
Handrail	1000 mm high treated pine balustrade	Wattyl - Colorbond Surfmist	
Timber Screen	1700mm high screen with not more than 25% open	Wattyl - Colorbond Surfmist	
Posts	Cypress pine posts bolt to sub-floor with 1/M12 galv. bolt	Wattyl - Colorbond Surfmist	
Sub Floor Walls	Sub-Floor Perimeter	Wattyl - Colorbond Woodland Grey	

COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

13/12/2021 11:30:11 AM

Issued For: PLANNING PERMIT

REV	DATE	DESCRIPTION	BY
C	13/12/21	Vegetation updated to match arborists report	Mitch
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3

Date: April 2021

Drawn: Mitch

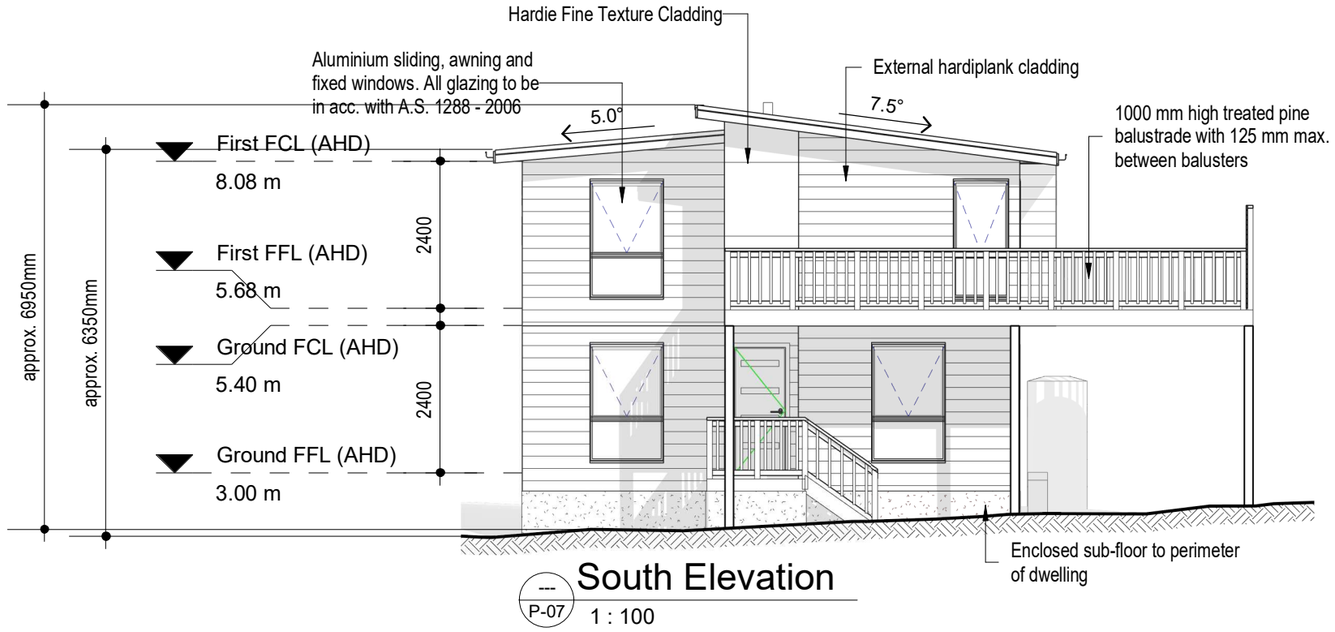
Chk: Wal

Rev No. C

Job No. 21-021

Sheet Name: P-06

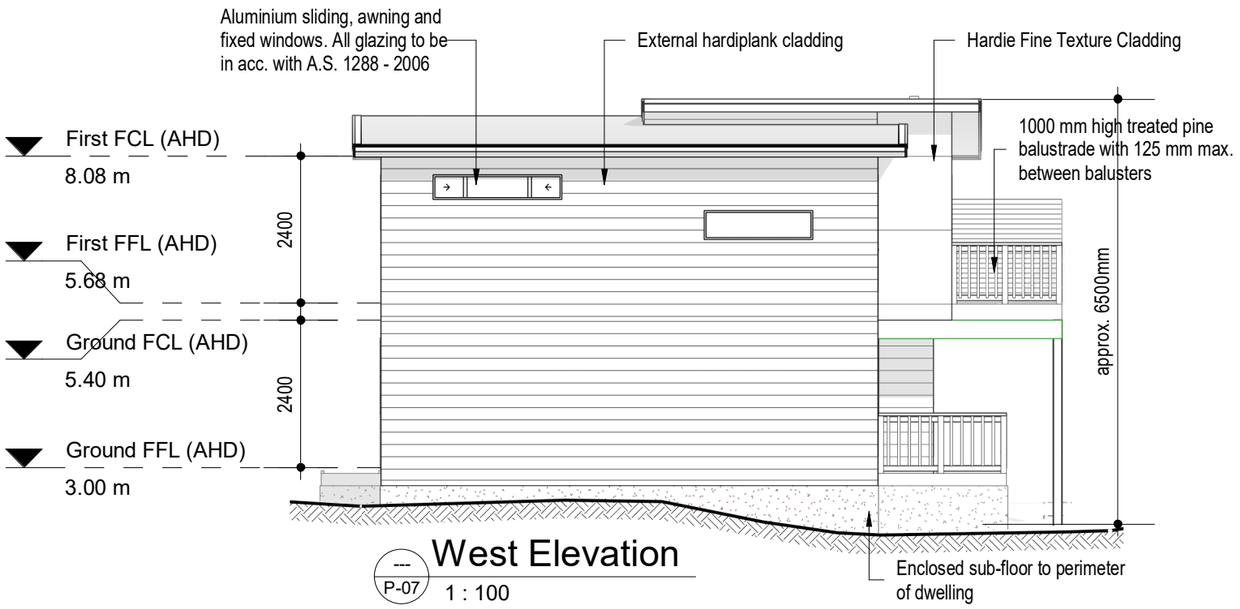
Sheet No: 6 of 7



South Elevation

P-07

1 : 100



West Elevation

P-07

1 : 100

Material Schedule

Type	Description	Color	Indicative Type Image
External Hardiplank Cladding Wall	Hardies Weatherboard Cladding	Wattyl - Colorbond Shale Grey	
Hardie Fine Texture Cladding Wall	Hardie Fine Texture Sheet	Wattyl - Colorbond Woodland Grey	
Roof	Colorbond Corrugated Roofting, Fascia & Guttering	Woodland Grey	
Windows/Sliding Door	Aluminum Sliding Windows	Woodland Grey	
Handrail	1000 mm high treated pine balustrade	Wattyl - Colorbond Surfmist	
Timber Screen	1700mm high screen with not more than 25% open	Wattyl - Colorbond Surfmist	
Posts	Cypress pine posts bolt to sub-floor with 1/M12 galv. bolt	Wattyl - Colorbond Surfmist	
Sub Floor Walls	Sub-Floor Perimeter	Wattyl - Colorbond Woodland Grey	

COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

13/12/2021 11:30:14 AM

Issued For: PLANNING PERMIT

REV	DATE	DESCRIPTION	BY
C	13/12/21	Vegetation updated to match arborists report	Mitch
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3

Date: April 2021

Drawn: Mitch

Chk: Wal

Rev No. C

Job No. 21-021

Sheet Name: P-07

Sheet No: 7 of 7

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

Arborist Report

37 Bruce Road, Silverleaves 3922

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

Client	Coldon Homes
Client Address	glenn@coldonhomes.com.au
Site Address	37 Bruce Road, Silverleaves 3922
Document Type	Arborist Report – Tree assessment & recommendations.
Date	12/12/2021

1. Contents

	Page
Sections	
1. Contents	2
2. Key Findings	3
3. Introduction	3
4. Methodology	4
5. Site Context	5
6. Discussion	6
7. Recommendations	12
8. Tree Protection Requirements	13
9. Suggested Replacement Species	15
10. References	17
Appendices	
1. Tree Assessment Criteria	18
2. S.U.L.E Rating Schedule	20
3. Assessment of Trees	21
4. Tree Images	24
5. Site Plan	30
6. Proposed site plan	31
Tables:	
1. Trees to be removed.	11
Figures:	
1. Assessment area	5
2. Trees 1, 12, 13 & 18 (figures 2-5)	6-9
6. Temporary protective fencing	14

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

2. Key findings

- This is a finalized arborist report, it includes an arboricultural impact assessment.
- Trees 1-11 are located on the rod reserve outside this property, these trees will not be directly affected by the proposed development.
- There are 18 trees located on this property, except for tree 18 these trees have low retention value and could be removed.
- Tree 18 has moderate retention value; this tree will be directly affected by the proposed development and will need to be removed and replaced.
- Trees 30-37 are in adjoining properties, except for tree 32 these trees will not be directly affected by the proposal.
- Tree 32 will be directly affected by the proposal; this is a major intrusion, based on the type and poor condition of this tree no amendment is required.

3. Introduction

I was contacted by Coldon Homes regarding providing an Arborist report for a proposed development at this address. The proposed development will affect 37 trees, most of these trees are in adjoining properties. As part of my assessment, I have reported on the health and condition of these trees and have provided recommendations based on my assessment.

The site is within the Shire of Bass Coast, it is located within a Township Zone (TZ1); the site is subject to a Vegetation Protection Overlay (VPO2). A permit is required to remove, destroy or lop any tree or shrub with a girth greater than 30 centimetres (when measured 30 centimetres above ground level) or a height of at least two metres. This does not apply to introduced species of ornamental shrubs or fruit trees or to species identified as being weeds; or to pruning. A permit is not required for:

- The pruning of vegetation for maintenance.
- The removal, destruction or lopping of dead vegetation.

Based on this a permit will be required to remove part of trees 12-28.

This report is a finalized arboricultural report and includes an arboricultural impact assessment. This considers the proposed development and evaluates the potential impact on any trees to be retained on the site as well as trees located on adjoining properties and street trees. The evaluation is based upon *AS4970-2009: Protection of trees on development sites* as well as considering basic tree information (particularly health, condition, and age) and species factors. Tree protection zones and structural root zones as outlined in *AS4970-2009: Protection of trees on development sites* are intended to be used as a guideline, generally tree roots do not develop in a uniform manner and vary greatly in their size, spread and depth dependent on soil characteristics, available resources, and species factors. The TPZ as defined by the standard

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

provides a quick and useful guideline for evaluating the potential impact from development on retained trees. Where there is a need to determine the size and spread of roots a non-invasive root investigation may be required, this will precisely determine the below ground impact of development on a tree's root system more accurately.

I have conducted a site visit on the 11/12/2021, and assessed the health, condition, and safety of the trees in question. Recommendations are outlined in section 5 of this report. A detailed list of the surveyed trees is provided in Appendix 2 of this report. A site plan is included which identifies and shows the location of the trees concerned, photographs of the trees have also been included.

4. Methodology

The trees were assessed using the standard Visual Tree Assessment technique (VTA). The trees were assessed from the ground for the purpose of this report. VTA is an internationally recognised practice in the visual assessment of trees as formulated by Mattheck & Breloer (1999).

A Yama 20m diameter tape was used to obtain the Diameter at breast height (DBH) at 1.4 metres above ground level. The height was measured using a Nikon Forestry Pro Laser Range Finder, the spread of the tree's canopy was paced out. Photographs were taken with a Canon 700D DSLR camera. Aerial photographs were taken from www.nearmap.com.au.

The report considers relevant sections of the Australian Standard: AS4970-2009: Protection of trees on development sites and uses this as the basis for determining tree protection and structural root zones.

This report includes all trees located on the subject site/s, trees in adjoining properties that may be impacted by the proposed development (within 5m of the property boundary unless requested otherwise) and council street trees located directly outside the subject property/s. For the purposes of this report the definition of a tree is based on AS4970, which states that a tree is a *'long lived woody perennial plant greater than (or usually greater than) 3 m in height with one or relatively few main stems or trunks (or as defined by the determining authority)'.*

The ULE rating system has been used as a guide to assist in determining the Useful Life Expectancy of the tree surveyed. Refer to Appendix 1 (Barrell 1993).

A scaled site plan has been prepared using ArborCAD software.

Reference was made to the Shire of Bass Coast Planning Scheme through DELWP maps and spatial data: https://www2.delwp.vic.gov.au/maps.

This report referred to the proposed site plan for 37 Bruce Road, Silverleaves prepared by Coldon Homes and dated 3/09/2021 Revision B.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

Bluegum consultancy has been engaged by the client to provide an arborist report for this project following the development of the proposed plans.

5. Site Context

This is an average sized property (480m^2) which is in a residential area; the site is sloping down from the road and has a north-south orientation with a southerly aspect. There are 37 trees included in this report.



Figure 1: Assessment area (Nearmap, 2021)

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

6. Discussion

Trees 1-11 are all located in the road reserve outside this property. These trees will not be directly affected by the proposed development at this address as the proposal will not intrude into their tree protection zone (TPZ). Provided that basic tree protection measures are implemented there should be no adverse impact on the health of these trees from the proposed development.



Figure 2: Tree 1 is in the road reserve outside this property. This tree will not be directly affected by the proposed development.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

The subject site is a vacant undeveloped property, trees 12-29 are all located on the subject site. The trees are mostly locally occurring species, there are a few Australian native species that have been planted on the property (#13, 17, 19, 21, 26-27 & 29). The trees are mostly small sized, and most are in average to poor health and or trunk and branch structure.

Except for tree 18 these trees have low retention value due to their small size, poor health and/or trunk and branch structure and low landscape value. These trees do not warrant being retained and incorporated into the proposed development and will be removed and replaced as part of the proposed development.



Figure 3: Tree 12 is a small sized, mature Leucopogon parviflorus (Coast Beard Heath), this is a locally occurring species. The tree has low retention value due to its small size and low landscape value. This tree will be removed and replaced as part of the proposed development.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811



Figure 4: Tree 13 is a small sized, early mature Eucalyptus cinerea (Argyle Apple), this is an Australian native species that has been planted on the site. The tree has low retention value due to its small size and low landscape value. This tree will be removed and replaced as part of the proposed development.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

Tree 18 is a medium sized, mature *Bursaria spinosa* (Bursaria), this tree is in good health and has average trunk and branch structure. This tree has moderate retention value. This tree will be directly affected by the proposed development and will be removed and replaced to allow for the proposal.

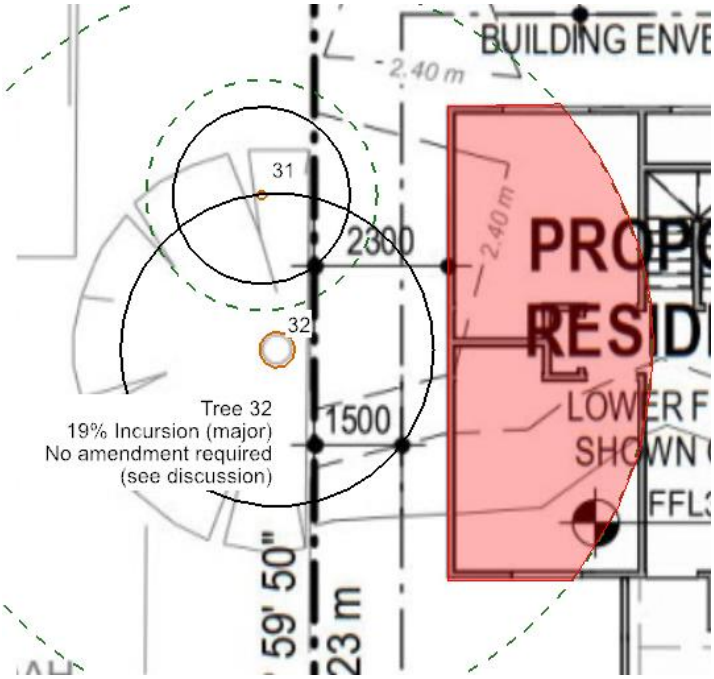


Figure 5: Tree 18 is a medium sized, mature Bursaria spinosa (Bursaria), this is a locally occurring species. The tree is in good to average health and condition and has moderate retention value. The tree will be directly affected by the proposal; and will need to be removed and replaced.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

Trees 30-37 are in adjoining properties, except for tree 32 these trees will not be directly affected by the proposed development as the proposal will not intrude into their TPZ. Provided that basic tree protection measures are implemented there should be no adverse impact on the health of these trees from the proposed development.

Tree 32 will be directly affected by the proposed development as the proposal will intrude into its TPZ. Based on AS4970: Protection of trees on development sites this is classified as a major intrusion (19%). The standard states that '*if the proposed encroachment is greater than 10% of the TPZ or inside the SRZ, the project arborist must demonstrate that the tree(s) would remain viable'*. The tree concerned is a medium to large sized, late mature *Leptospernum laevigatum* (Coastal Ti-Tree) that is in average health but has poor trunk and branch structure. The tree's structure and form is typical of the species, and it is on a large lean and at risk of failure, the tree has a short useful life expectancy as a result (0-5 years). The tree's poor condition will result in this tree needing to be removed within the next 0-5 years. Based on this I am not recommending that the proposal is amended as it affects this tree.



Tree 32
TPZ: 6.5m
Encroachment: 19%
Recommendation: Major intrusion, no amendment required.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

Table 1: Trees to be removed:

Tree #	*Common & Botanical names*	Origin	Age	ULE	Retention value	Comments	Recommendations	Permit required
12	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Mature	Medium (15-40 years)	Low		Remove & replace	Yes
13	*Eucalyptus cinerea (Argyle Apple)*	Australian native	Early mature	Medium (15-40 years)	Low		Remove & replace	Yes
14	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Mature	Medium (15-40 years)	Low	TGx2	Remove & replace	Yes
15	*Eucalypt kitsoniana (Gippsland Mallee)*	Locally occurring	Early mature	Medium (15-40 years)	Low		Remove & replace	Yes
16	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Mature	Medium (15-40 years)	Low		Remove & replace	Yes
17	*Banksia sp.*	Australian native	Early mature	Medium (15-40 years)	Low	Partially failed	Remove & replace	Yes
18	*Bursaria spinosa (Bursaria)*	Locally occurring	Mature	Medium (15-40 years)	Moderate		Remove & replace	Yes
19	*Allocasuarina torulosa (Forest Sheoak)*	Australian native	Early mature	Medium (15-40 years)	Low		Remove & replace	Yes
20	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Early mature	Medium (15-40 years)	Low	TGx4	Remove & replace	Yes
21	*Acacia podalyrifolia (Mt Morgan Silver Wattle)*	Australian native	Over-mature	Removal (0-5 years)	Remove		Remove & replace	Yes
22	*Bursaria spinosa (Bursaria)*	Locally occurring	Mature	Medium (15-40 years)	Low	Bifurcated main trunk	Remove & replace	Yes
23	*Allocasuarina littoralis (Black She-Oak)*	Locally occurring	Mature	Medium (15-40 years)	Low	Moderate lean, asymmetrical	Remove & replace	Yes
24	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Mature	Short (5-15 years)	Low	Moderate lean, asymmetrical	Remove & replace	Yes
25	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Mature	Medium (15-40 years)	Low		Remove & replace	Yes
26	*Agonis flexuosa (Willow leaf Myrtle)*	Australian native	Mature	Medium (15-40 years)	Low		Remove & replace	Yes
27	*Alogyne huegelii (Lilac Hybiscus)*	Australian native	Early mature	Medium (15-40 years)	Low		Remove & replace	Yes
28	*Bursaria spinosa (Bursaria)*	Locally occurring	Mature	Medium (15-40 years)	Low		Remove & replace	Yes
29	*Eucalypt sp. (Unknown Eucalypt)*	Australian native	Early mature	Medium (15-40 years)	Low		Remove & replace	No

Council Officer Note - Vegetation that requires a permit and consideration under this application is highlighted in yellow (annotated). All other vegetation shown and listed is exempt from a permit - see site plan on page 30 of this report.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

7. Recommendations

There are 18 trees located on this property, except for tree 18 these trees all have low retention value and could be removed and replaced as part of the proposed development.

Tree 18 has moderate retention value. This tree will be directly affected by the proposed development and will need to be removed and replaced to allow for the proposal.

Trees 30-37 are in adjoining properties, except for tree 32 these trees will not be directly affected by the proposed development. Provided that basic tree protection measures (see below) are implemented there should be no adverse impact on the health of these trees from the proposed development.

Tree 32 will be directly affected by the proposed development; this is classified as a major intrusion (19%). The tree concerned is a medium to large sized, late mature *Leptospernum laevigatum* (Coastal Ti-Tree) that is in average health but has poor trunk and branch structure. The tree's structure is typical of the species, and it is on a large lean and at risk of failure, the tree has a short useful life expectancy as a result (0-5 years). The tree's poor condition will result in this tree needing to be removed within the next 0-5 years. Based on this I am not recommending that the proposal is amended as it affects this tree.

The remaining trees included in this report are 11 trees located in the road reserve outside this property, these trees will not be directly affected by the proposed development. Provided that basic tree protection measures (see below) are implemented there should be no adverse impact on the health of these trees from the proposed development.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

8. Tree Protection Requirements

Specific Tree Protection Requirements

Demolition and site clearing

Site clearing has the potential to cause significant damage to any trees to be retained on site or trees that are in adjoining properties through disturbance to the soil, changes in soil gradients, soil compaction and physical destruction of tree roots from excavation and scraping.

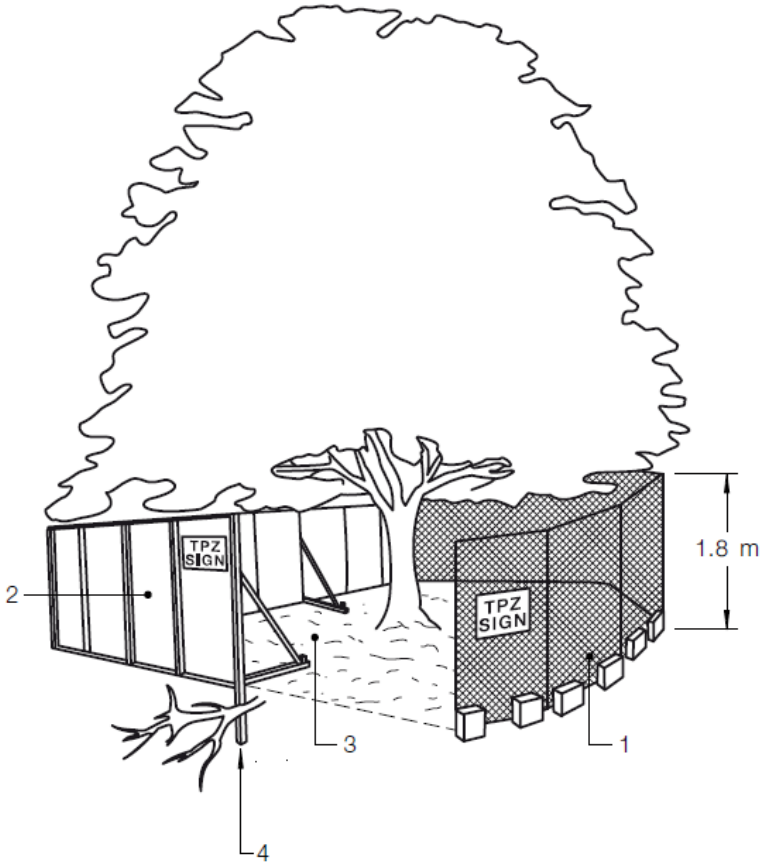
Tree protection measures (see below) need to be implemented prior to any site clearing and demolition works commencing. Where site clearing intrudes into the TPZ of trees to be retained and/or trees in neighbouring properties care must be taken to prevent any unnecessary damage to trees and tree roots.

Basic Tree Protection Requirements

The following basic tree protection measures will need to be implemented prior to any work commencing on site and remain in place for the duration of the work.

1. Before commencing work on site, the contractor is required to meet with the consultant arborist to review all work procedures, access routes, storage areas and tree protection measures.
2. Temporary protective fencing to a minimum height of 1.8m must be erected along the perimeter of the TPZ (or modified TPZ) for any trees that are to be retained on the site. Prior to any machinery or materials being brought on site and before any works including demolition commences.
3. Once erected protective fencing must not be removed or altered without approval from the project arborist.
4. Protective fencing needs to be in accordance with AS 4687. Signs identifying the TPZ should be placed around the protective fencing.
5. Construction vehicles and storage areas must remain outside fenced areas always.
6. If tree roots are encountered or damaged during construction, they need to be cut cleanly to sound tissue with sharp secateurs or a pruning saw.
7. Surplus construction materials (e.g., soil, cement, base rock etc.) are not to be stored or allowed to remain inside the trees' TPZ.
8. Additional tree pruning required during construction must be carried out by an appropriately qualified contractor and in accordance with Australian Standards 4373: 2007, Pruning of Amenity Trees and not by construction personnel.
9. All underground services including drainage and irrigation must be routed outside of trees' TPZs, if this is not possible excavation is to be carried out by tunneling or boring beneath the tree protection zone.
10. Trees retained on site are to be regularly watered (minimum weekly) during periods of dry conditions within the tree protection zone.
11. If trees are damaged during construction, it should be evaluated as soon as possible by the project arborist so that appropriate treatments can be applied.
12. Erosion control such as silt fencing, debris basins and water diversion methods shall be installed to prevent siltation and/or erosion within the tree protection zone.
13. If temporary access roads must pass over the root areas (TPZ) of trees to be retained a roadbed of 150mm of mulch or crushed rock shall be created to prevent soil compaction within the tree's root area. The roadbed material shall be maintained to a depth of 150mm throughout construction.
14. Once construction is completed all foreign (non-organic) debris needs to be removed from within the tree protection zone.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811



LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

Figure 6: Tree protection zone and temporary protective fencing.
The creation of an exclusion zone around trees to be retained on site is the primary means of tree protection during construction. Tree protection zone signage provides clear and readily accessible information to indicate that a TPZ has been established.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

9. Suggested Replacement Species

Possible replacement tree species could include (selection and placement of trees will need to take into consideration the eventual size of the trees when mature) – see landscape plan for complete planting schedule:

Large (canopy) trees:

- Rough Barked Manna Gum (*Eucalyptus pryoriana)* - Indigenous
- Narrow leaved Peppermint (*Eucalyptus radiata)* - Indigenous
- Red Box (*Eucalyptus polyanthemos ssp. Vestita)* - Indigenous
- Yellow Box (*Eucalyptus melliodora*) - Indigenous
- Blackwood (Acacia melanoxylon) - Indigenous
- Smooth-barked Apple Myrtle (*Angophora costata*) - Native
- Argyle Apple (*Eucalyptus cinerea*) – Native
- Illawarra Flame Tree *(Brachychiton acerifolius)* - Native
- Red Maple (*Acer rubrum)* - Exotic
- Pin Oak (*Quercus palustris)* - Exotic

Medium sized trees:

- Lightwood (*Acacia implexa*) – Indigenous
- Flowering Gum (*Corymbia ficifolia)* - Australian Native
- Silver Banksia (*Banksia marginata)* - Indigenous
- Dwarf Apple Myrtle (*Angophora costata 'Little Gumball')* - Native
- Dwarf Yellow Bloodwood (*Corymbia eximia nana)* - Native
- Flowering Gum (*Corymbia ficifolia)* - Native
- Victorian Silver Gum *(Eucalyptus crenulata)* - Native
- Yellow Gum (*Eucalyptus leucoxylon Rosea)* - Native
- Pink Gum (*Eucalyptus fasciculosa)* - Native
- Water Gum (*Tristaniopsis laurina)* - Native
- Honey Locust (*Gleditsia tricanthos)* - Exotic
- Callery Pear (Pyrus calleryana) - Exotic

Small sized trees:

- Gungurru (*Eucalyptus caesia)* - Native
- Fuschia Gum *(Eucalyptus forrestiana)* – Native
- Torwood - (*Eucalyptus x 'Torwood'*) - Native
- Nullabor Lime (*Eucalyptus macrocarpa 'Nullabor Lime')* - Native
- Risdon Peppermint (*Eucalyptus risdonii*) - Native
- Coral Gum (*Eucalyptus torquata*) – Native
- Smooth Barked Coolabah *(Eucalyptus victrix)* - Native
- Crepe Myrtle (L*agerstroemia indica)* - Exotic
- Iowa Crab Apple (*Malus ioensis 'Plena')* – Exotic

Replacement trees should be sourced from a reputable nursery with care taken to ensure that they are in good health, free of structural defects and pests and diseases. They should be

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

advanced grown specimens that are a minimum 1.5 metres in height. When planting advanced grown trees, it is important that they are planted correctly, staked to provide additional support and provided with adequate aftercare to ensure that they become established (the plant supplier should be able to help with planting and establishment guidelines).

Please do not hesitate to call 0425 879 811 if you have any questions regarding the contents or recommendations provided in this report.

Sincerely



Paul Jameson
Graduate Certificate in Arboriculture (Melbourne)
Associate Diploma in Arboriculture (Burnley)
BA/BSW (Monash)

Copyright Notice: © Bluegum Consultancy 2015. All rights reserved.

Disclaimer: Although Bluegum Consultancy uses all due care and skill in providing you the information made available in this report, to the extent permitted by law Bluegum Consultancy otherwise excludes all warranties of any kind, either expressed or implied.

To the extent permitted by law, you agree that Bluegum Consultancy is not liable to you or any other person or entity for any loss or damage caused or alleged to have been caused (including loss or damage resulting from negligence), either directly or indirectly, by your use of the information (including by way of example, arboricultural advice) made available to you in this report. Without limiting this disclaimer, in no event will Bluegum Consultancy be liable to you for any lost revenue or profits, or for special, indirect, consequential, or incidental damage (however caused and regardless of the theory of liability) arising out of or related to your use of that information, even if Bluegum Consultancy has been advised of the possibility of such loss or damage.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

10. References

- Australian Standards (2007). AS4373: 2007, Pruning of Amenity Trees. Sydney, Standards Australia.
- Australian Standards (2009). AS4970: 2009, Protection of trees on development sites. Sydney, Standards Australia.
- Barrell, J. (1993) *Pre-Planning Tree Surveys: Safe Useful Life Expectancy (SULE) is the natural progression*. Arboricultural Journal, 17:1, 33-46.
- DELWP (2019) Land Channel accessed from http://www.land.vic.gov.au/
- Dunster, J., Smiley, T., Mattheny, N. & Lily, S. (2013). *Tree Risk Assessment Manual.* Champaign, Illinois, International Society of Arboriculture.
- Draper, Danny, B & Richards, Peter, A. (2009). Dictionary for managing trees in urban environments. CSIRO Publishing, Collingwood, Australia.
- Matheny, N. & Clark, J. (1998). Trees and Development – A technical guide to the preservation of trees during land development. Champaign, Illinois, International Society of Arboriculture.
- Nearmap (2019) accessed from http://maps.au.nearmap.com

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

Appendix 1 – Tree Assessment Criteria

1. Height describes the height of the tree in metres from ground level.

2. Trunk diameter (DBH) is calculated from the measured trunk circumference at 1.4m above ground level or at an alternative location if required (in accordance with AS 4970-2009).

3. Canopy spread describes the crown spread across the widest point.

4. Estimated age class is the tree's relative age to its species and is expressed as - Young (the first one third of the estimated life expectancy), Semi Mature (the second third of the estimated life expectancy), or Mature (the last third of the estimated life expectancy).

5. Useful life expectancy (ULE) – see appendix 2.

6. Tree protection zone (TPZ) is the principal means of protecting trees on a development site. The TPZ is a combination of the root area and the crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The radius of the TPZ is calculated for each tree by multiplying its DBH x 12, the TPZ radius is measured from the centre of the stem at ground level. A TPZ should not be less than 2m nor greater than 15m (except where crown protection is required).

7. Structural root zone (SRZ) is the area required for tree stability. A larger area is required to maintain tree health.

8. Retention value is adapted from BS5837:2005 – Cascade chart for tree quality assessment. The retention value is applied to the tree in the context of the proposed land use.

High retention value

High ranked trees would meet one or more of the following criteria:

- Trees in such a condition as to be able to make a substantial contribution (a minimum of 40 years is suggested).
- Trees that are particularly good examples of their species, especially if rare or unusual, or essential components of groups, or of formal or semi-formal arboricultural features (e.g., the dominant and/or principal trees within an avenue).
- Trees of visual importance (e.g., avenues or other arboricultural features assessed as groups).
- Trees of significant historical, commemorative, or other value (e.g., veteran trees).

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

Moderate retention value

- Moderate ranked trees would meet one or more of the following criteria:
- Trees in such a condition as to make a significant contribution (a minimum of 20 years is suggested).
- Trees that might be included in the high category but may be downgraded because of impaired condition (e.g., presence of remediable defects including unsympathetic past management and minor storm damage).
- Trees present in numbers, usually as groups or woodlands, such that they form distinct landscape features, thereby attracting a higher collective rating than they might as individuals, but which are not, individually, essential components of formal or semi-formal arboricultural features, or trees situated mainly internally to the site, therefore individually having little visual impact on the wider locality.

Low retention value

- Trees currently in adequate condition to remain until new planting could be established (a minimum of 10 years is suggested), or young trees with a stem diameter below 150 mm.
- Low category trees will usually not be retained where they would impose a significant constraint on development. However, young trees with a stem diameter of less than 150 mm could be considered for relocation.

Remove/None

- Trees ranked for removal/no retention value would meet one or more of the following criteria:
- Trees in such a condition that any existing value would be lost within 10 years and which should, in the current context, be removed for reasons of sound arboricultural management.
- Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other trees (i.e., where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning).
- Trees that have a serious hazard potential (this may consider the context of any proposed development).
- Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline.
- Trees that are environmental weeds.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

Appendix 2 – Useful Life Expectancy Categories (ULE)

Long U.L.E- the tree appeared retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance:

Structurally sound trees located in positions that can accommodate future growth.
Trees which could be made suitable for long term retention by remedial care.
Trees of special significance, which would warrant extraordinary efforts to secure their long-term retention.

Medium U.L.E- the tree appeared to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance:

Trees which may only live from 15-40 years.
Trees that may live for more than 40 years but may be removed for safety or nuisance reasons.
Trees which may live for more than 40 years but would be removed to prevent interference with more suitable individuals or to provide space for new plantings.
Trees which could be made suitable for retention in the medium term with remedial care.

Short U.L.E- trees that appeared to be retainable at the time of assessment for 5-15 years with an acceptable degree of risk, assuming reasonable maintenance:

Trees which may only live from 5 to 15 years.
Trees that may live for more than 15 years but may be removed for safety or nuisance reasons.
Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new plantings.
Trees which require substantial remediation and are only suitable for retention in the short term.

Removal- Tree which should be removed within the next 5 years.

Dead, dying suppressed or declining trees.
Dangerous trees through instability or recent loss of adjacent trees.
Dangerous trees because of structural defects including cavities, decay included bark, wounds, or poor form.
Damaged trees that are clearly not safe to retain.
Trees which may live for more than 5 years but would be removed to prevent interference with more suitable individuals or to provide space for new plantings.
Trees which are damaging or may cause damage to existing structures within the next 5 years.
Trees that will become dangerous after the removal of other trees for the reasons given in (A) to (F).
Trees in categories (A) to (G) that have a high wildlife habitat value and with appropriate treatment could be retained subject to regular review.

Small, young, or regularly pruned- Trees that can be reliably moved or replaced.

Small trees less than 5m in height.
Young trees less than 15 years old but over 5m in height.
Formal hedges and trees intended for regular pruning to artificially control growth.

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

Appendix 3 – Tree Species

Tree #	Botanical & common names	Origin	Health	Structure	Height	Canopy spread	Total DBH	DAB	Age	ULE	Amenity value	Retention value	TPZ	SRZ	Comments	Recommendations
1	*Banksia integrifolia (Coastal Banksia)*	Locally occurring	Good	Average	14	6	0.52	0.61	Mature	Medium (15-40 years)	Moderate	3rd Party Tree	6.24	2.69	ST	Road reserve tree, no intrusion
2	*Bursaria spinosa (Bursaria)*	Locally occurring	Good	Average to Poor	6	9	0.3	0.36	Mature	Short (5-15 years)	Moderate	3rd Party Tree	3.6	2.15	ST, previous branch failure, trunk lean	Road reserve tree, no intrusion
3	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Good	Average to Poor	6	8	0.26	0.35	Mature	Medium (15-40 years)	Moderate	3rd Party Tree	3.12	2.13	ST, TGx2, trunk lean	Road reserve tree, no intrusion
4	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Good	Average to Poor	7	4	0.26	0.35	Mature	Medium (15-40 years)	Moderate	3rd Party Tree	3.12	2.13	ST	Road reserve tree, no intrusion
5	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Good	Average to Poor	10	6	0.29	0.36	Mature	Short (5-15 years)	Moderate	3rd Party Tree	3.48	2.15	ST	Road reserve tree, no intrusion
6	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Good	Average	5	5	0.37	0.39	Mature	Short (5-15 years)	Moderate	3rd Party Tree	4.44	2.23	ST	Road reserve tree, no intrusion
7	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Good	Average	8	4	0.26	0.34	Mature	Short (5-15 years)	Moderate	3rd Party Tree	3.12	2.1	ST	Road reserve tree, no intrusion
8	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Good	Poor	11	8	0.69	0.78	Mature	Short (5-15 years)	Moderate	3rd Party Tree	8.28	2.98	ST, Multistemmed, Previous branch failure	Road reserve tree, no intrusion
9	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Good	Average to Poor	7	7	0.37	0.45	Mature	Short (5-15 years)	Moderate	3rd Party Tree	4.44	2.37	ST	Road reserve tree, no intrusion
10	*Bursaria spinosa (Bursaria)*	Locally occurring	Good	Average to Poor	7	7	0.2	0.25	Mature	Medium (15-40 years)	Moderate	3rd Party Tree	2.4	1.85	ST	Road reserve tree, no intrusion
11	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Good	Average	4	3	0.13	0.14	Mature	Medium (15-40 years)	Moderate	3rd Party Tree	2	1.5	ST, TGx4, *Bursaria spinosa*	Road reserve tree, no intrusion
12	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Average	Average	4	4	0.18	0.24	Mature	Medium (15-40 years)	Moderate	Low	2.16	1.82		Remove & replace
13	*Eucalyptus cinerea (Argyle Apple)*	Australian native	Good	Average	6.5	4	0.22	0.26	Early mature	Medium (15-40 years)	Moderate	Low	2.64	1.88		Remove & replace
14	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Average	Average	4	4	0.14	0.15	Mature	Medium (15-40 years)	Moderate	Low	2	1.5	TGx2	Remove & replace
15	*Eucalypt kitsoniana (Gippsland Mallee)*	Locally occurring	Average to Poor	Average to Poor	3.5	4	0.1	0.11	Early mature	Medium (15-40 years)	Moderate	Low	2	1.5		Remove & replace
16	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Good	Average	3.5	3	0.12	0.13	Mature	Medium (15-40 years)	Moderate	Low	2	1.5		Remove & replace
17	*Banksia sp.*	Australian native	Good	Poor	3	4	0.16	0.18	Early mature	Medium (15-40 years)	Moderate	Low	2	1.61	Partially failed	Remove & replace

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

18	*Bursaria spinosa (Bursaria)*	Locally occurring	Good	Average	7	4	0.18	0.23	Mature	Medium (15-40 years)	Moderate	Moderate	2.16	1.79		Remove & replace
19	*Allocasuarina torulosa (Forest Sheoak)*	Australian native	Good	Average to Poor	9	5	0.32	0.41	Early mature	Medium (15-40 years)	Moderate	Low	3.84	2.28		Remove & replace
20	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Good	Average	4	4	0.16	0.17	Early mature	Medium (15-40 years)	Moderate	Low	2	1.57	TGx4	Remove & replace
21	*Acacia podalyrifolia (Mt Morgan Silver Wattle)*	Australian native	Good	Poor	3	4	0.12	0.14	Over-mature	Removal (0-5 years)	Moderate	Remove	2	1.5		Remove & replace
22	*Bursaria spinosa (Bursaria)*	Locally occurring	Good	Average to Poor	10	5	0.31	0.36	Mature	Medium (15-40 years)	Moderate	Low	3.72	2.15	Bifurcated main trunk	Remove & replace
23	*Allocasuarina littoralis (Black She-Oak)*	Locally occurring	Good	Average to Poor	6	6	0.28	0.35	Mature	Medium (15-40 years)	Moderate	Low	3.36	2.13	Moderate lean, asymmetrical	Remove & replace
24	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Average	Poor	11	7	0.38	0.46	Mature	Short (5-15 years)	Moderate	Low	4.56	2.39	Moderate lean, asymmetrical	Remove & replace
25	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Good	Average	4	4	0.11	0.13	Mature	Medium (15-40 years)	Moderate	Low	2	1.5		Remove & replace
26	*Agonis flexuosa (Willow leaf Myrtle)*	Australian native	Good	Average to Poor	9.2	10	0.61	0.68	Mature	Medium (15-40 years)	Moderate	Low	7.32	2.81		Remove & replace
27	*Alogyne huegelii (Lilac Hybiscus)*	Australian native	Good	Average	4.5	3	0.1	0.12	Early mature	Medium (15-40 years)	Moderate	Low	2	1.5		Remove & replace
28	*Bursaria spinosa (Bursaria)*	Locally occurring	Good	Average	5	4	0.13	0.13	Mature	Medium (15-40 years)	Moderate	Low	2	1.5		Remove & replace
29	*Eucalypt sp. (Unknown Eucalypt)*	Australian native	Average	Average to Poor	6	2	0.09	0.11	Early mature	Medium (15-40 years)	Moderate	Low	2	1.5		Remove & replace
30	*Bursaria spinosa (Bursaria)*	Locally occurring	Good	Average	5	3	0.14	0.17	Mature	Medium (15-40 years)	Moderate	3rd Party Tree	2	1.57	NT, 3m	Neighbouring tree, no intrusion
31	*Bursaria spinosa (Bursaria)*	Locally occurring	Average to Poor	Average to Poor	6	4	0.14	0.16	Mature	Medium (15-40 years)	Moderate	3rd Party Tree	2	1.53	NT, 1m, TGx2	Neighbouring tree, no intrusion
32	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Average	Poor	9	6	0.54	0.62	Late mature	Removal (0-5 years)	Moderate	3rd Party Tree	6.48	2.71	NT, 0.6m	Neighbouring tree, major intrusion
33	*Hakea salicifolia (Willow leaved Hakea)*	Environmental weed	Good	Good	6	4	0.15	0.17	Early mature	Short (5-15 years)	Moderate	3rd Party Tree	2	1.57	NT, 2m	Neighbouring tree, no intrusion
34	*Bursaria spinosa (Bursaria)*	Locally occurring	Good	Average	7	6	0.33	0.36	Mature	Medium (15-40 years)	Moderate	3rd Party Tree	3.96	2.15	NT, 3.3m	Neighbouring tree, no intrusion
35	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Average	Very Poor	4.5	8	0.37	0.45	Over-mature	Removal (0-5 years)	Moderate	3rd Party Tree	4.44	2.37	NT, 4.3m, partially failed resting on adjacent trees	Neighbouring tree, no intrusion
36	*Bursaria spinosa (Bursaria)*	Locally occurring	Very Poor	Very Poor	5	5	0.27	0.35	Over-mature	Removal (0-5 years)	Moderate	3rd Party Tree	3.24	2.13	NT, 0.2m	Neighbouring tree, no intrusion

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

37	*Leptospernum laevigatum (Coastal Ti-Tree)*	Locally occurring	Good	Average	6	6	0.46	0.48	Mature	Medium (15-40 years)	Moderate	3rd Party Tree	5.52	2.43	NT, 2.4m	Neighbouring tree, no intrusion

* Please Note: All measurements are in metres. * Note: unless otherwise stated the diameters of neighbouring trees have been estimated.
Legend: DBH: Diameter breast height (1.4m), DAB: Diameter at base (at base or just above basal flare), ULE: Useful Life Expectancy

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811

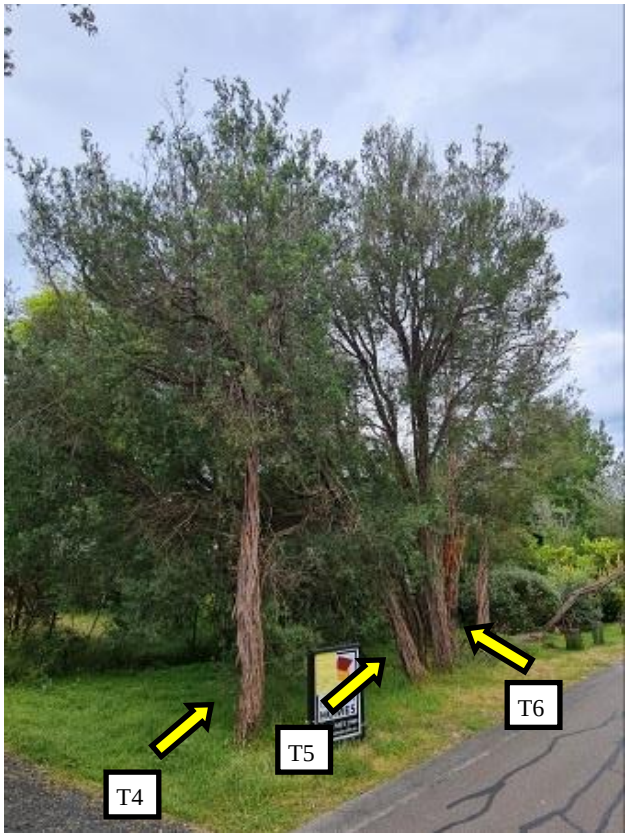
Appendix 4 – Tree Images



Tree 1



Trees 2-3



Trees 4-6



Tree 8

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811



Tree 12



Tree 13



Tree 14



Tree 15

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811



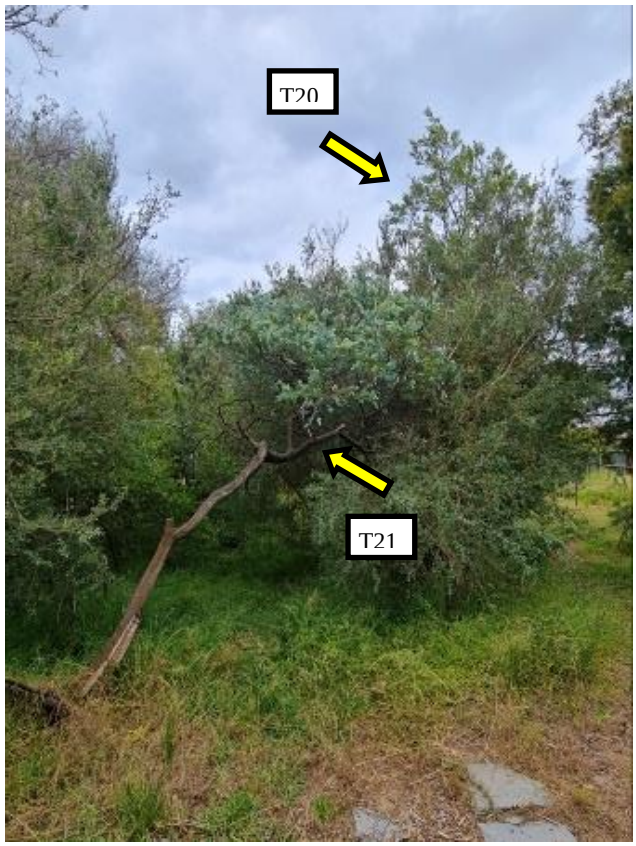
Tree 16



Tree 18



Tree 19



Trees 20-21

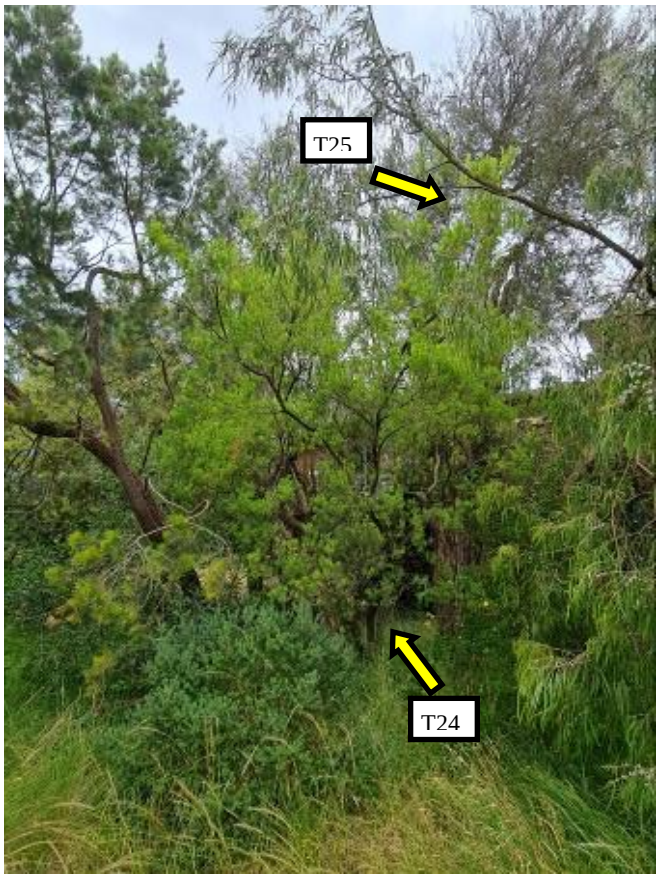
Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811



Tree 22



Tree 23

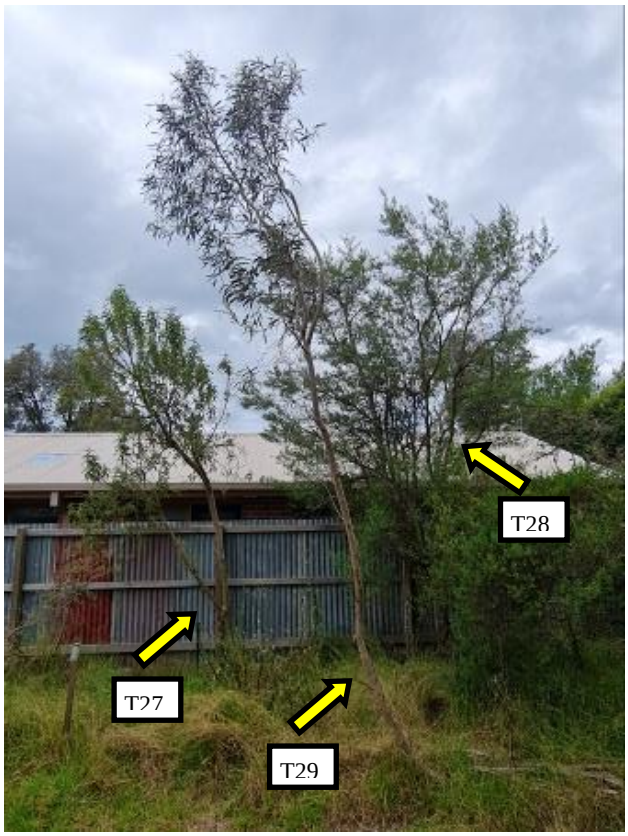


Trees 24-25



Tree 26

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811



Trees 27-29


Tree 30


Tree 31


Tree 33

Paul Jameson
(Grad. Cert. Arb. (Melb) Ass. Dip. Hort. (Burnley) BA, BSW)
Consultant Arborist
Info@bluegumreports.com.au
0425 879 811



Tree 35



Tree 36



Tree 37

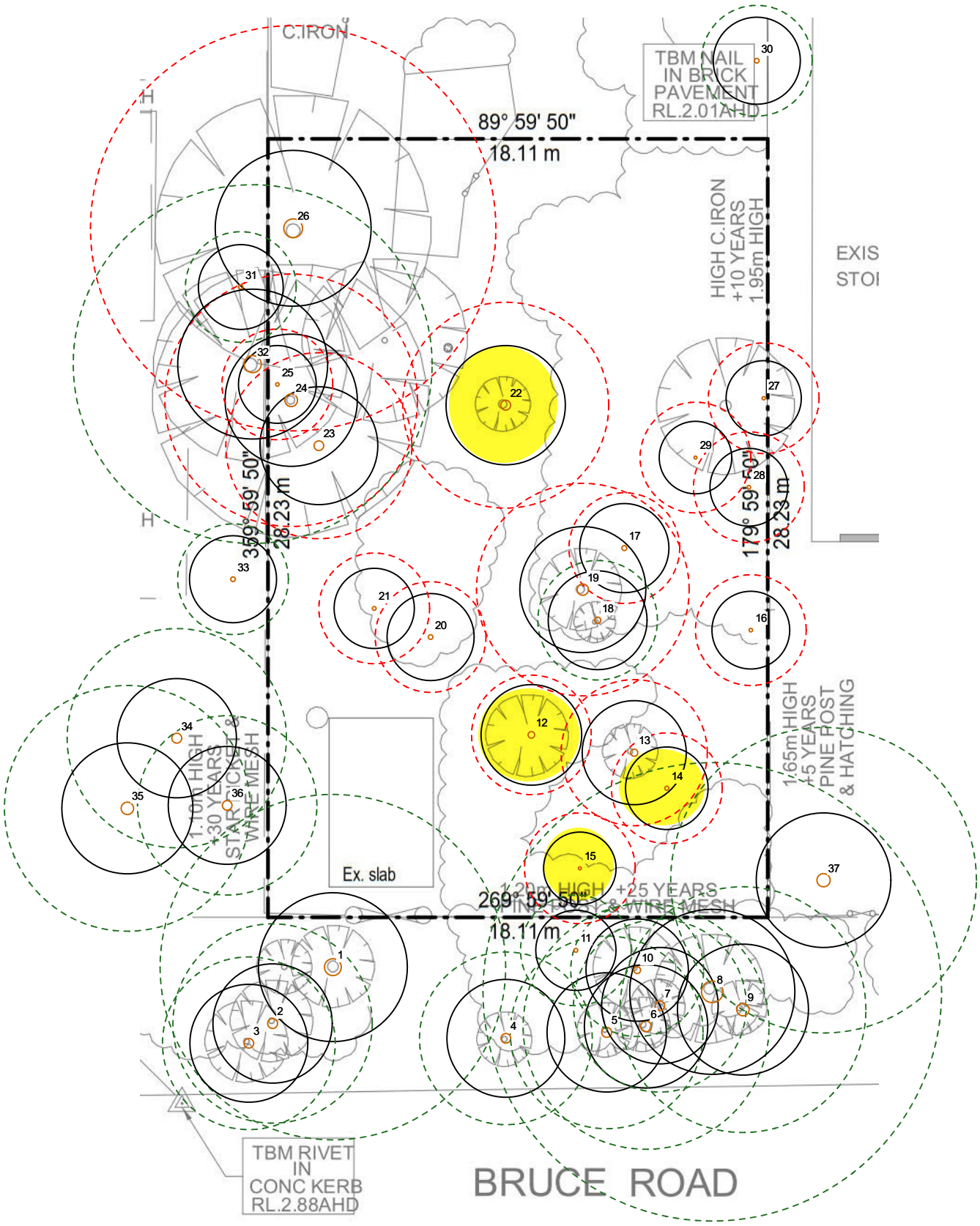


Table 1: Trees to be removed:

Tree #	Common & Botanical names	Origin	Age	ULE	Retention value	Comments	Recommendations	Permit required
12	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Mature	Medium (15-40 years)	Low		Remove & replace	Yes
13	*Eucalyptus cinerea (Argyle Apple)*	Australian native	Early mature	Medium (15-40 years)	Low		Remove & replace	Yes
14	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Mature	Medium (15-40 years)	Low	TGx2	Remove & replace	Yes
15	*Eucalypt kitsoniana (Gippsland Mallee)*	Locally occurring	Early mature	Medium (15-40 years)	Low		Remove & replace	Yes
16	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Mature	Medium (15-40 years)	Low		Remove & replace	Yes
17	*Banksia sp.*	Australian native	Early mature	Medium (15-40 years)	Low	Partially failed	Remove & replace	Yes
18	*Bursaria spinosa (Bursaria)*	Locally occurring	Mature	Medium (15-40 years)	Moderate		Remove & replace	Yes
19	*Allocasuarina torulosa (Forest Sheoak)*	Australian native	Early mature	Medium (15-40 years)	Low		Remove & replace	Yes
20	*Leptospermum laevigatum (Coastal Ti-Tree)*	Locally occurring	Early mature	Medium (15-40 years)	Low	TGx4	Remove & replace	Yes
21	*Acacia podalyrifolia (Mt Morgan Silver Wattle)*	Australian native	Over-mature	Removal (0-5 years)	Remove		Remove & replace	Yes
22	*Bursaria spinosa (Bursaria)*	Locally occurring	Mature	Medium (15-40 years)	Low	Bifurcated main trunk	Remove & replace	Yes
23	*Allocasuarina littoralis (Black She-Oak)*	Locally occurring	Mature	Medium (15-40 years)	Low	Moderate lean, asymmetrical	Remove & replace	Yes
24	*Leptospermum laevigatum (Coastal Ti-Tree)*	Locally occurring	Mature	Short (5-15 years)	Low	Moderate lean, asymmetrical	Remove & replace	Yes
25	*Leucopogon parviflorus (Coast Beard Heath)*	Locally occurring	Mature	Medium (15-40 years)	Low		Remove & replace	Yes
26	*Agonis flexuosa (Willow leaf Myrtle)*	Australian native	Mature	Medium (15-40 years)	Low		Remove & replace	Yes
27	*Alogyne huegelii (Lilac Hybiscus)*	Australian native	Early mature	Medium (15-40 years)	Low		Remove & replace	Yes
28	*Bursaria spinosa (Bursaria)*	Locally occurring	Mature	Medium (15-40 years)	Low		Remove & replace	Yes
29	*Eucalypt sp. (Unknown Eucalypt)*	Australian native	Early mature	Medium (15-40 years)	Low		Remove & replace	No

Council Officer Note - Vegetation that requires a permit and consideration under this application is highlighted in yellow (annotated). All other vegetation shown and listed is exempt from a permit.

Legend

- TPZ Tree to be removed
- TPZ Tree to be retained
- Structural Root Zone
- Prescribed TPZ offset
- Proposed intrusion
- Proposed intrusion with root sensitive footings

Bluegum Consultancy
PO Box 107
Hampton VIC 3188
info@bluegumreports.com
0425 879 811

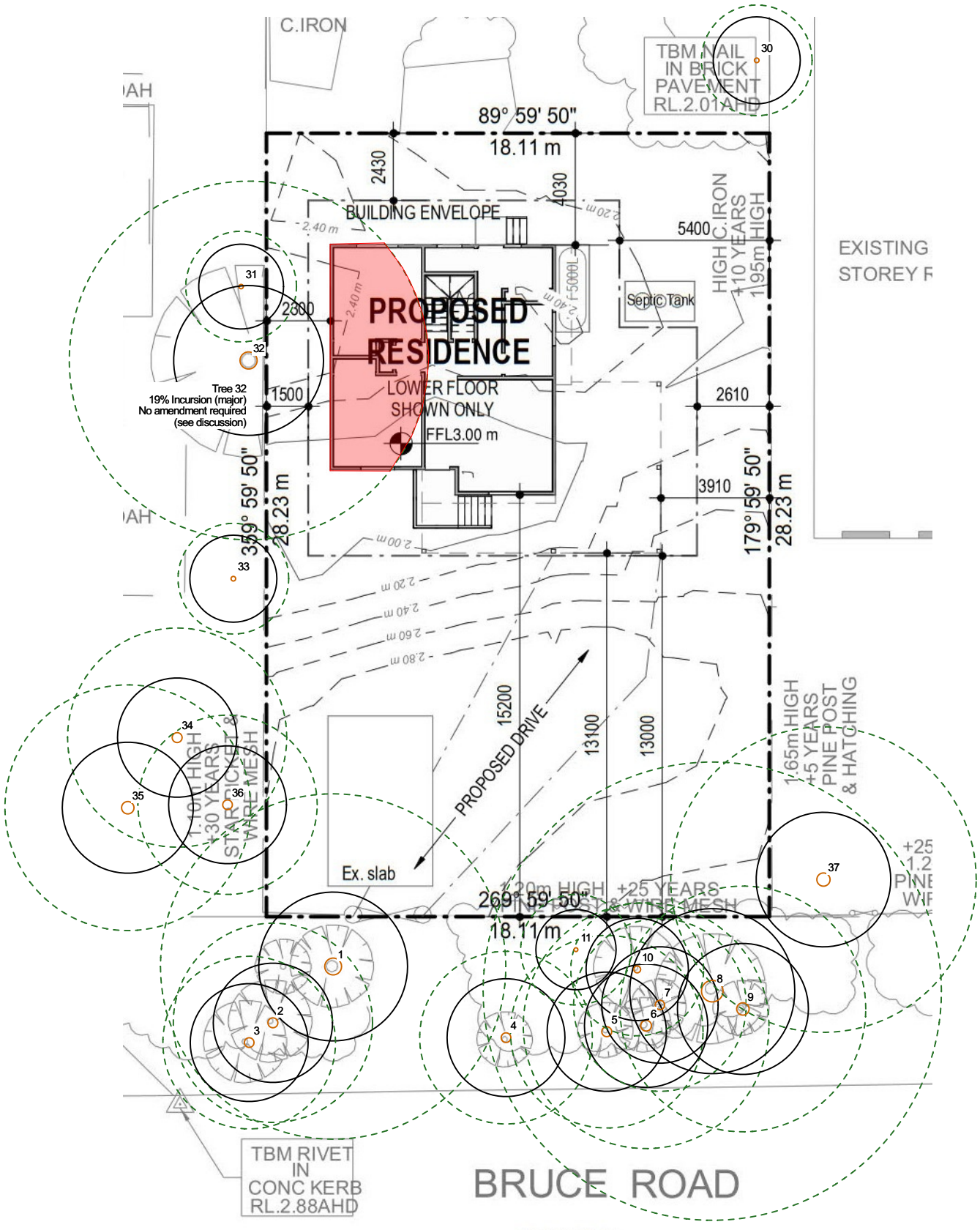
Date: 12/12/2021
Drawn by: Paul Jameson

SCALE 1:200 @A3

Coldon Homes

Site Plan - 37 Bruce Road, Silverleaves

A3



Legend

- TPZ Tree to be removed
- TPZ Tree to be retained
- Structural Root Zone
- Prescribed TPZ offset
- Proposed intrusion
- Proposed intrusion with root sensitive footings

Bluegum Consultancy
PO Box 107
Hampton VIC 3188
info@bluegumreports.com
0425 879 811

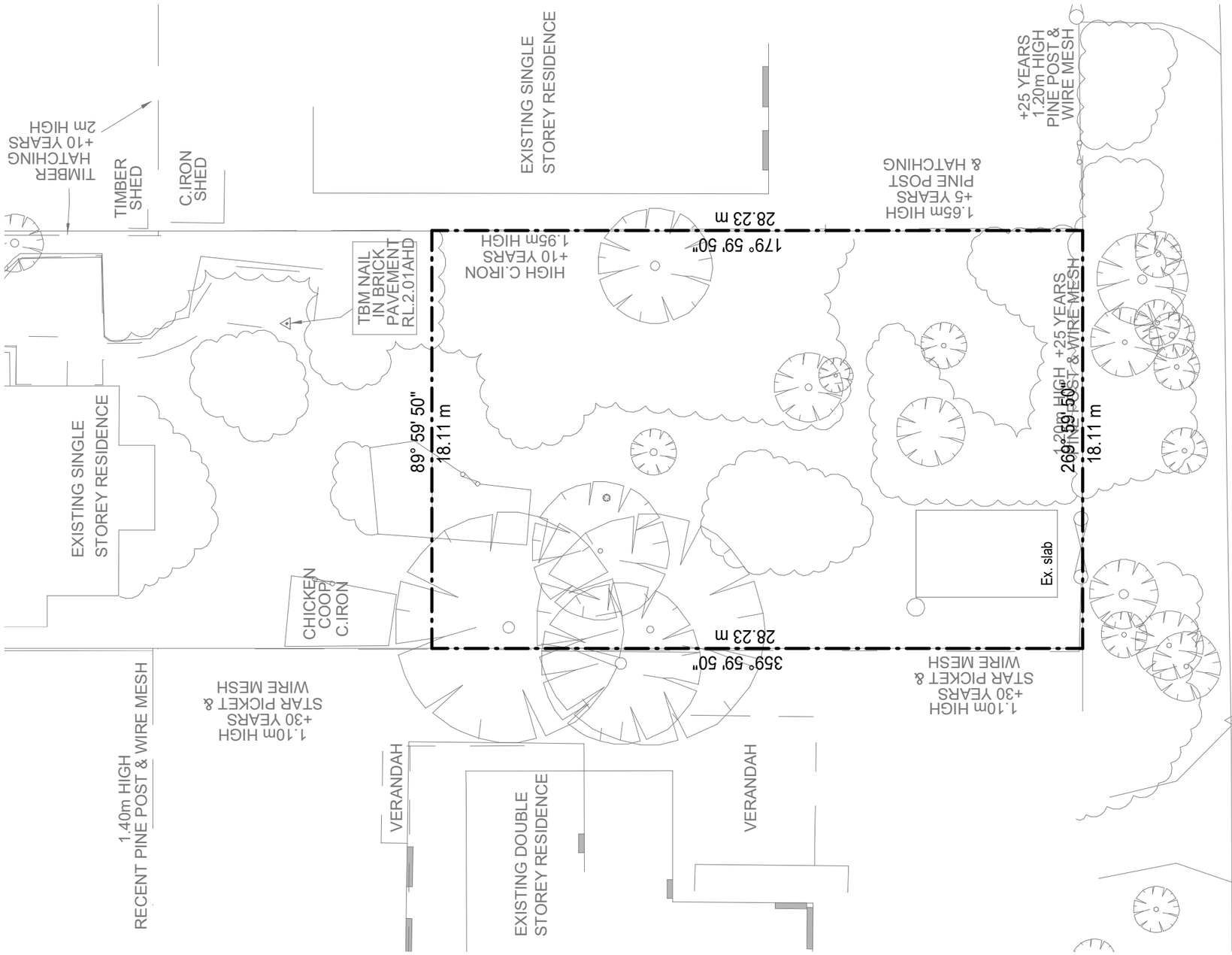
Date: 12/12/2021
Drawn by: Paul Jameson

SCALE 1:200 @A3

Coldon Homes

Proposed Site Plan - 37 Bruce Road, Silverleaves

A3



Site Area
511 m²

Existing Conditions Site Plan

P-01 1 : 200

COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

3/09/2021 3:11:57 PM

Issued For: PLANNING PERMIT

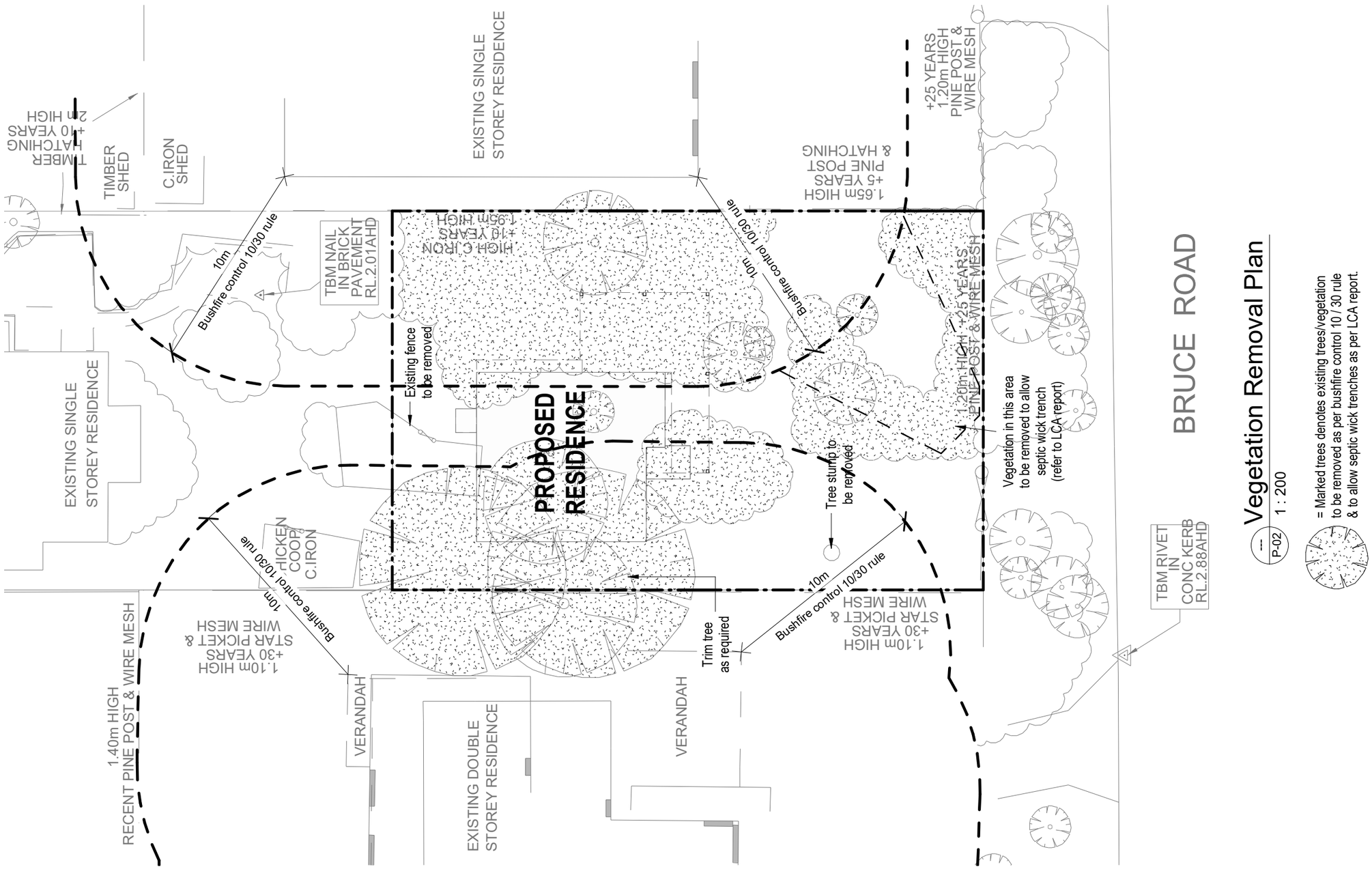
REV	DATE	DESCRIPTION	BY
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3
Date: April 2021
Drawn: Mitch
Chk: Wal
Rev No. B
Job No. 21-021
Sheet Name: P-01
Sheet No: 1 of 7



COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken
3/09/2021 3:11:58 PM

Issued For: PLANNING PERMIT

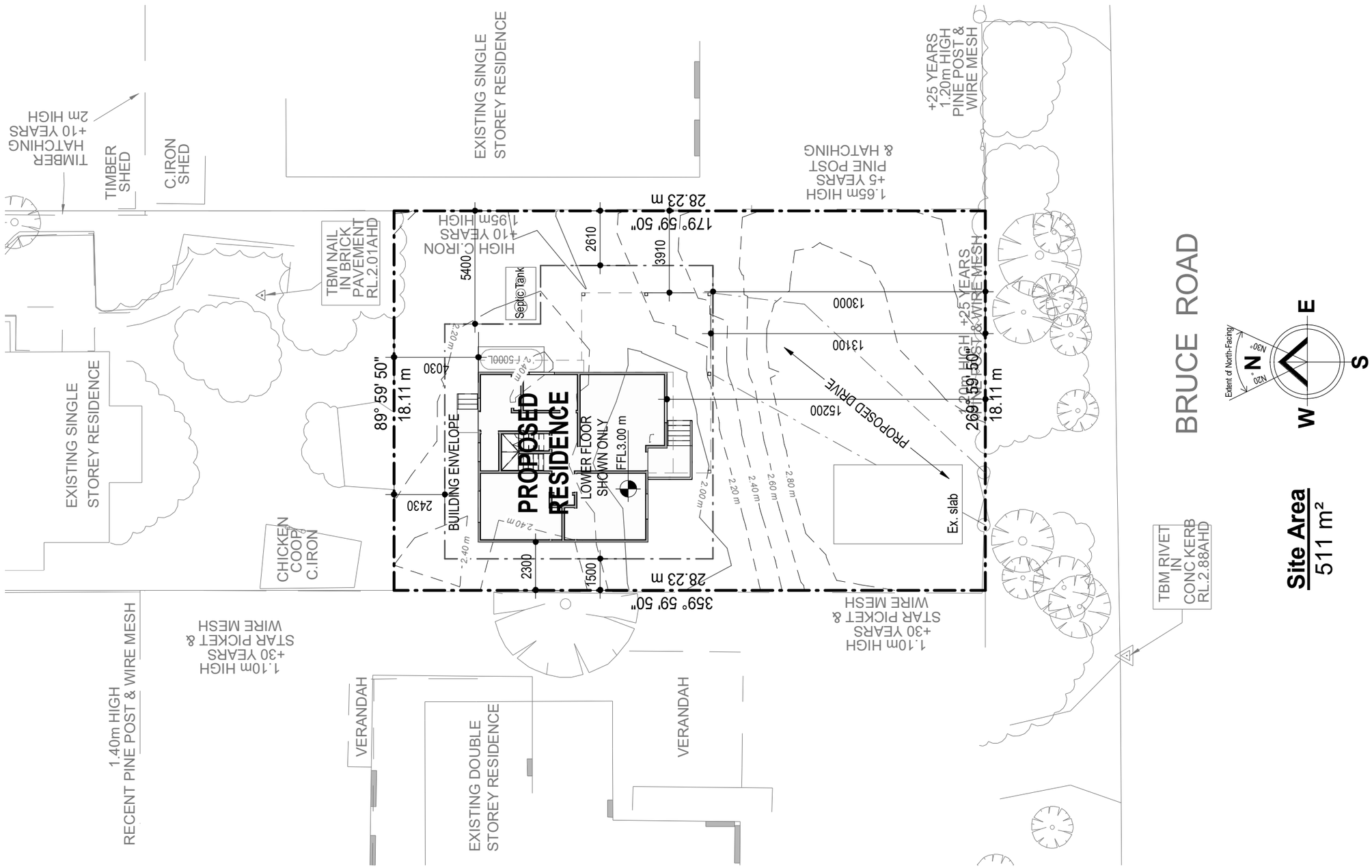
REV	DATE	DESCRIPTION	BY
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3
Date: April 2021
Drawn: Mitch
Chk: Wal
Rev No. B
Job No. 21-021
Sheet Name: P-02
Sheet No: 2 of 7



COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

3/09/2021 3:11:58 PM

Issued For: PLANNING PERMIT

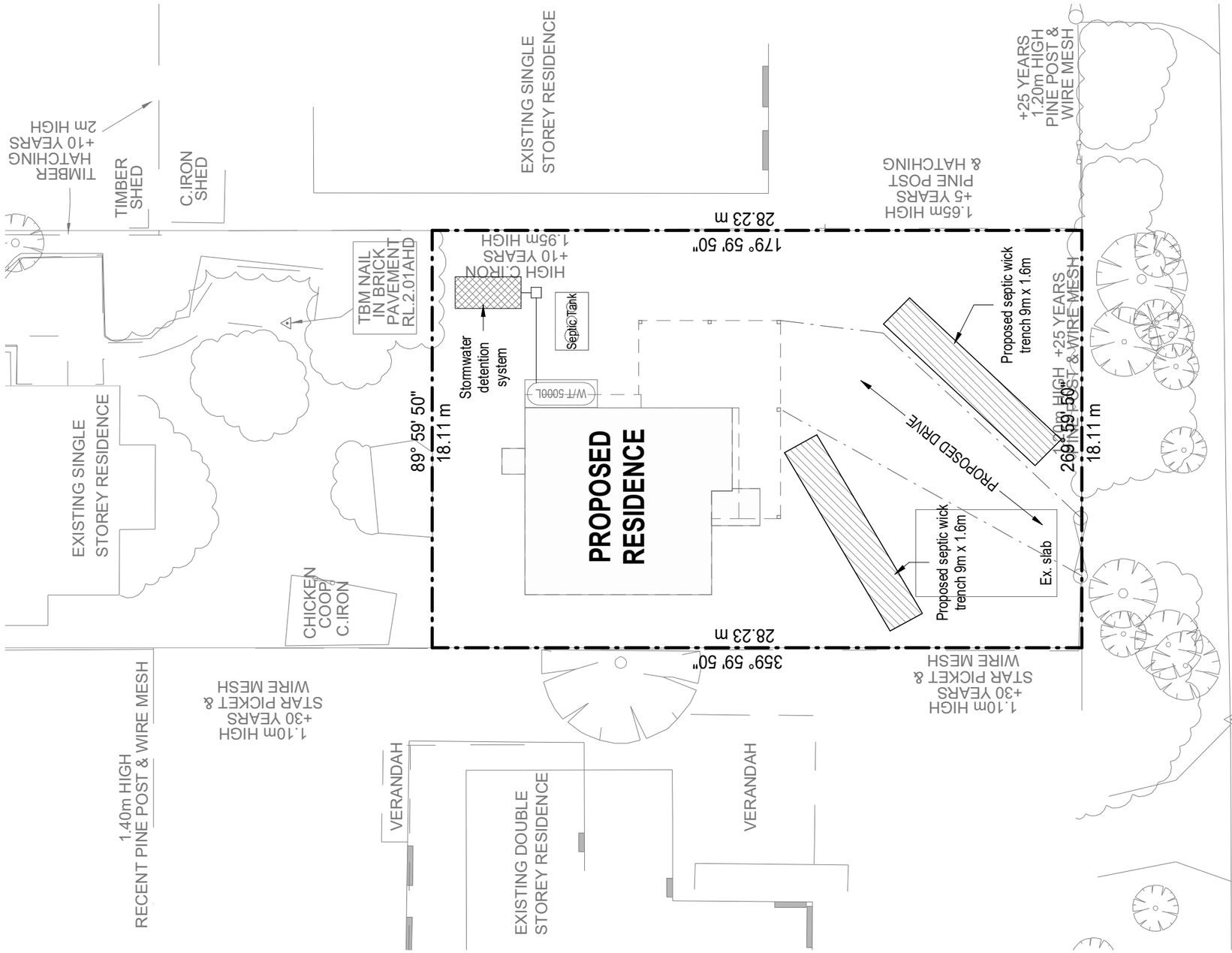
REV	DATE	DESCRIPTION	BY
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3
Date: April 2021
Drawn: Mitch
Chk: Wal
Rev No. B
Job No. 21-021
Sheet Name: P-03
Sheet No: 3 of 7



Site Area
511 m²

Septic & Stormwater Plan

P-04 — 1 : 200

COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

3/09/2021 3:11:59 PM

Issued For: PLANNING PERMIT

REV	DATE	DESCRIPTION	BY
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

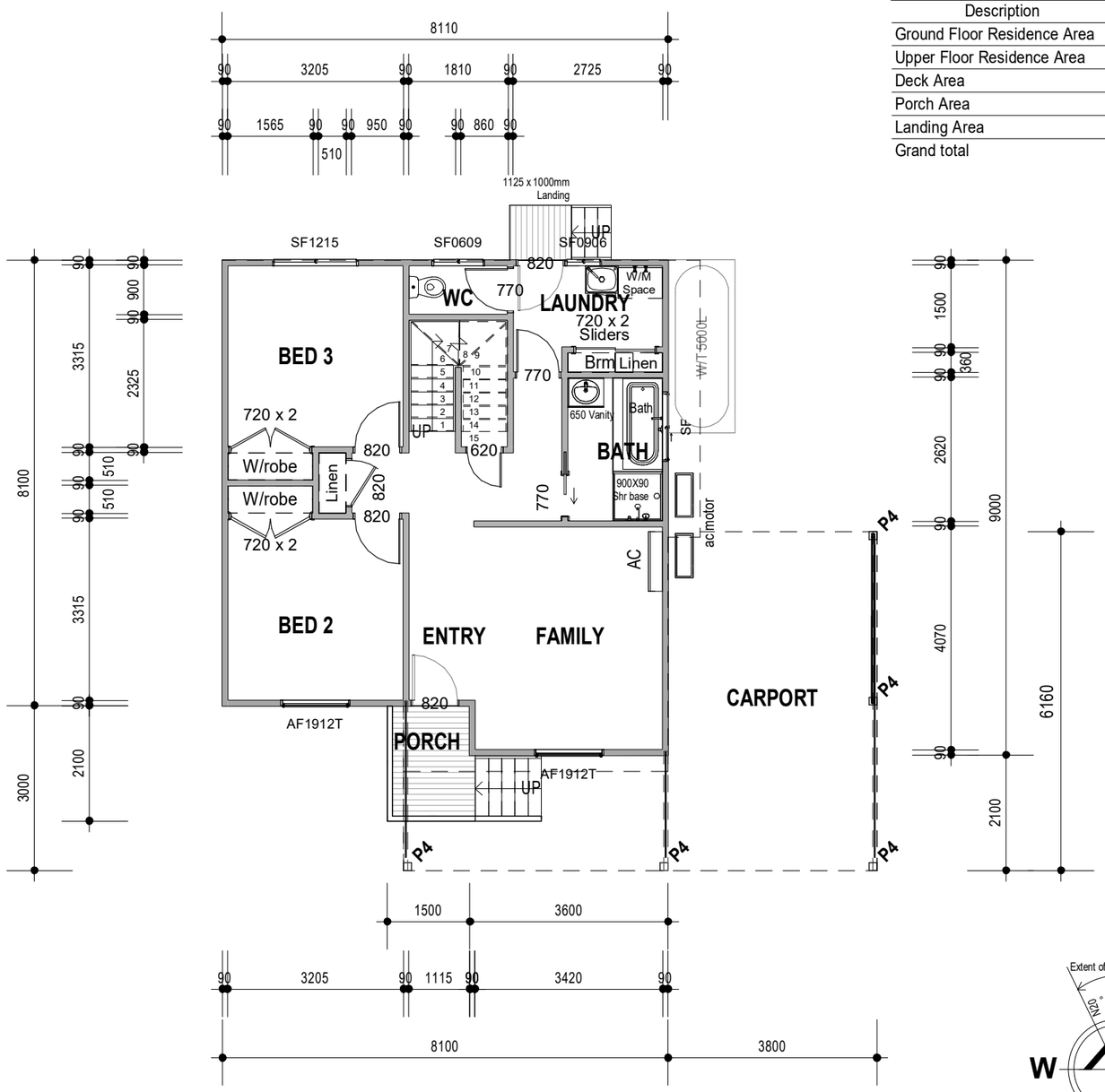
Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3
Date: April 2021
Drawn: Mitch
Chk: Wal
Rev No. B
Job No. 21-021
Sheet Name: P-04
Sheet No: 4 of 7

Proposed Building Area

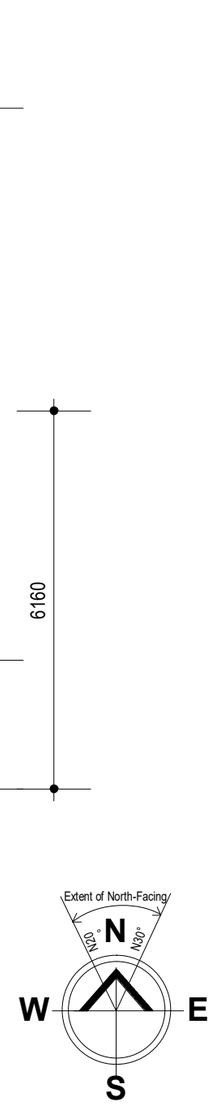
Description	Area (m2)	Sq.
Ground Floor Residence Area	68.85 m²	7.41
Upper Floor Residence Area	74.35 m²	8.00
Deck Area	32.00 m²	3.44
Porch Area	3.27 m²	0.35
Landing Area	1.13 m²	0.12
Grand total	179.59 m²	19.33

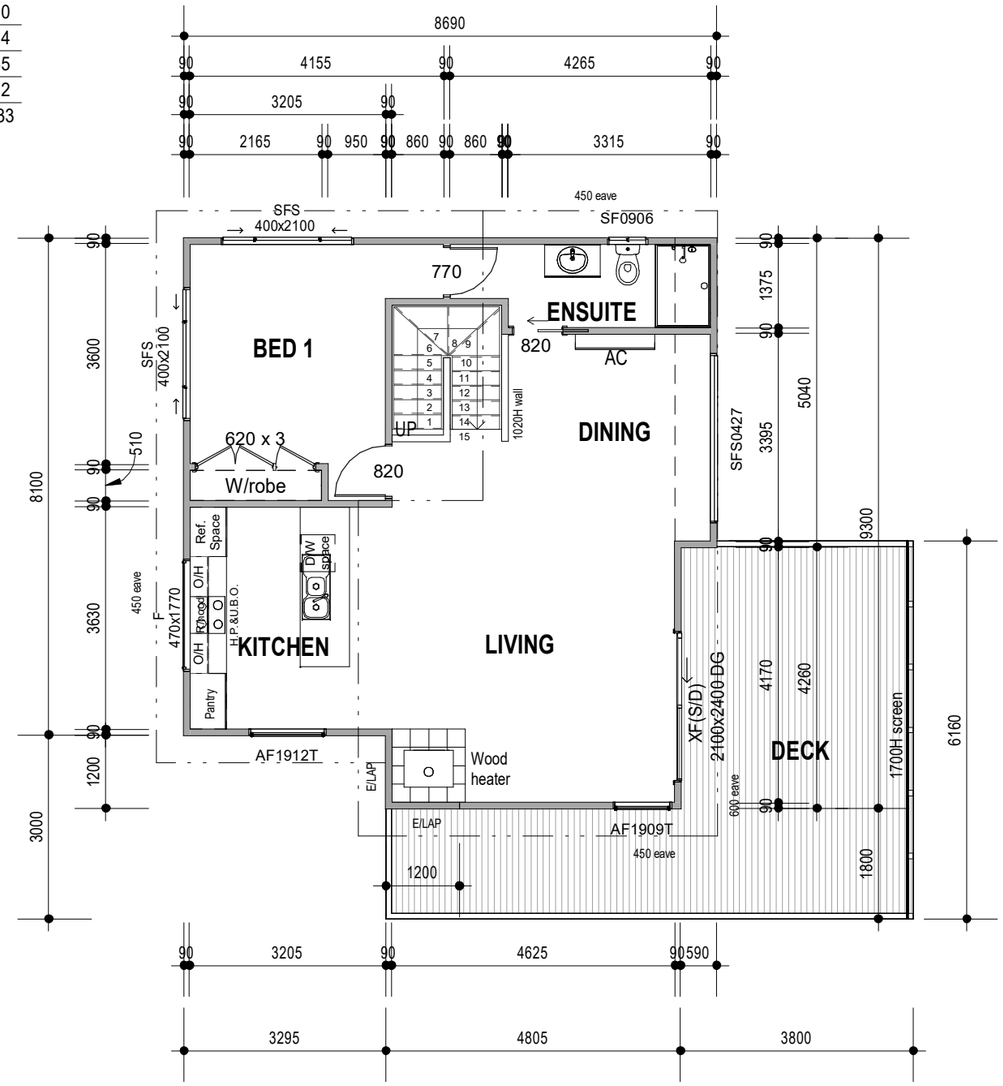


Ground Floor Layout

P-05

1 : 100





Upper Floor Layout

P-05

1 : 100

COLDON HOMES

Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

3/09/2021 3:12:00 PM

Issued For: PLANNING PERMIT

REV	DATE	DESCRIPTION	BY
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3

Date: April 2021

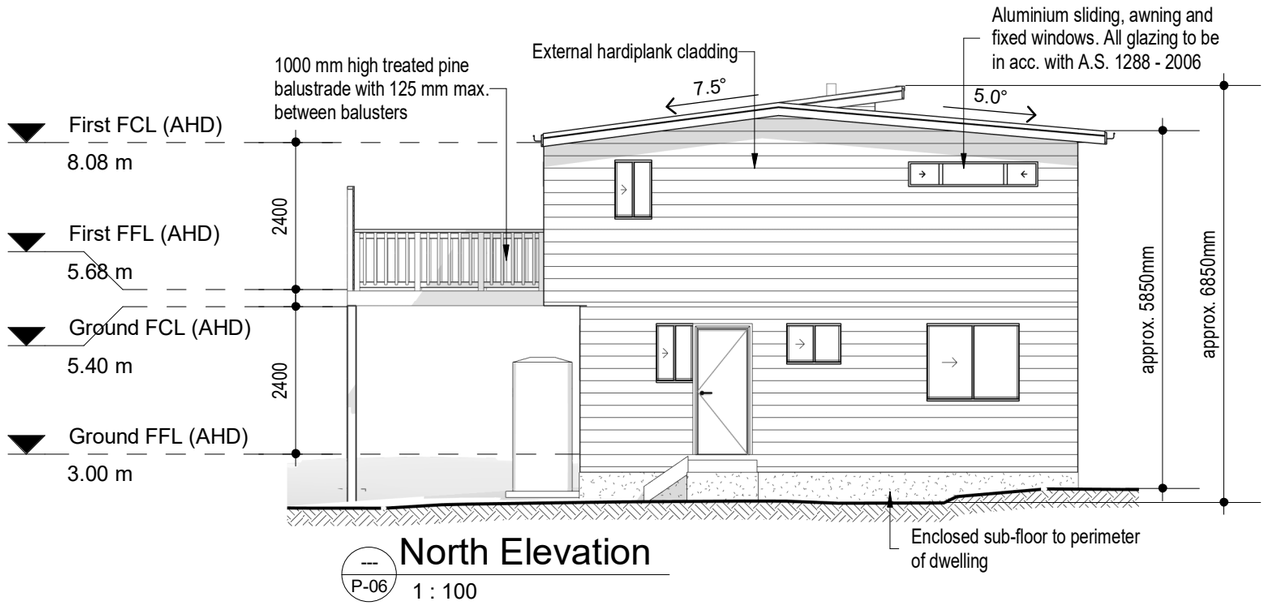
Drawn: Mitch

Chk: Wal

Rev No. B

Job No. 21-021

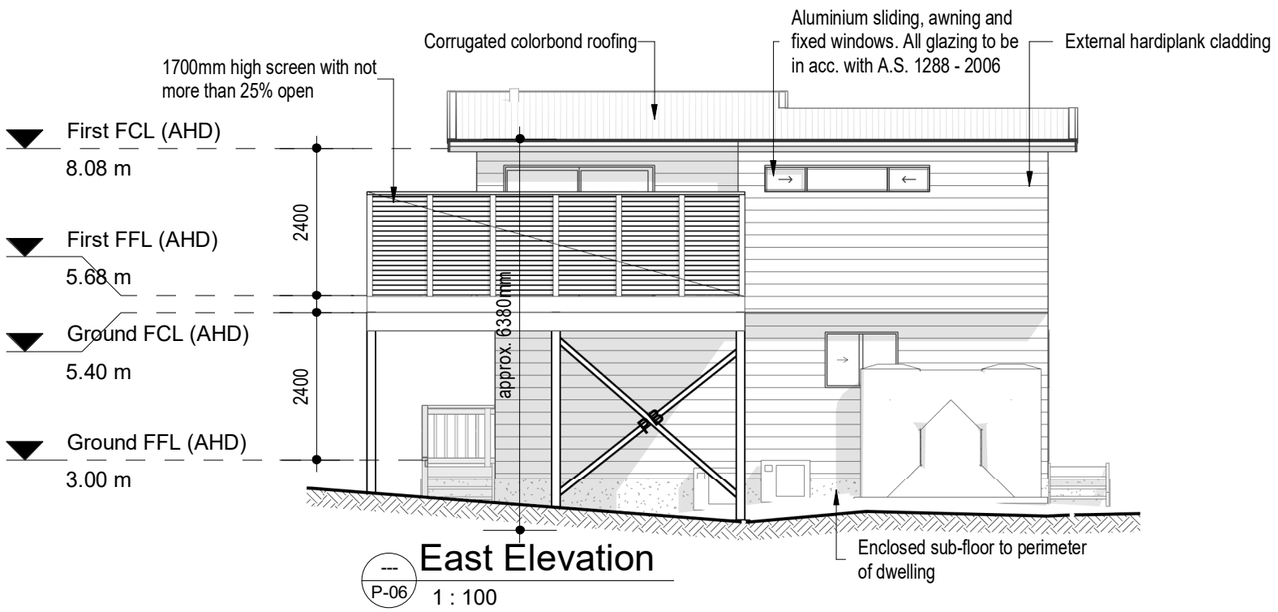
Sheet Name: P-05



North Elevation

P-06

1 : 100



East Elevation

P-06

1 : 100

Material Schedule

Type	Description	Color	Indicative Type Image
External Hardiplank Cladding Wall	Hardies Weatherboard Cladding	Wattyl - Colorbond Shale Grey	
Hardie Fine Texture Cladding Wall	Hardie Fine Texture Sheet	Wattyl - Colorbond Woodland Grey	
Roof	Colorbond Corrugated Roofting, Fascia & Guttering	Woodland Grey	
Windows/Sliding Door	Aluminum Sliding Windows	Woodland Grey	
Handrail	1000 mm high treated pine balustrade	Wattyl - Colorbond Surfmist	
Timber Screen	1700mm high screen with not more than 25% open	Wattyl - Colorbond Surfmist	
Posts	Cypress pine posts bolt to sub-floor with 1/M12 galv. bolt	Wattyl - Colorbond Surfmist	
Sub Floor Walls	Sub-Floor Perimeter	Wattyl - Colorbond Woodland Grey	

COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

3/09/2021 3:12:04 PM

Issued For: PLANNING PERMIT

REV	DATE	DESCRIPTION	BY
B	03/09/21	Bushfire notation added to veg removal plan	Mitch
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3

Date: April 2021

Drawn: Mitch

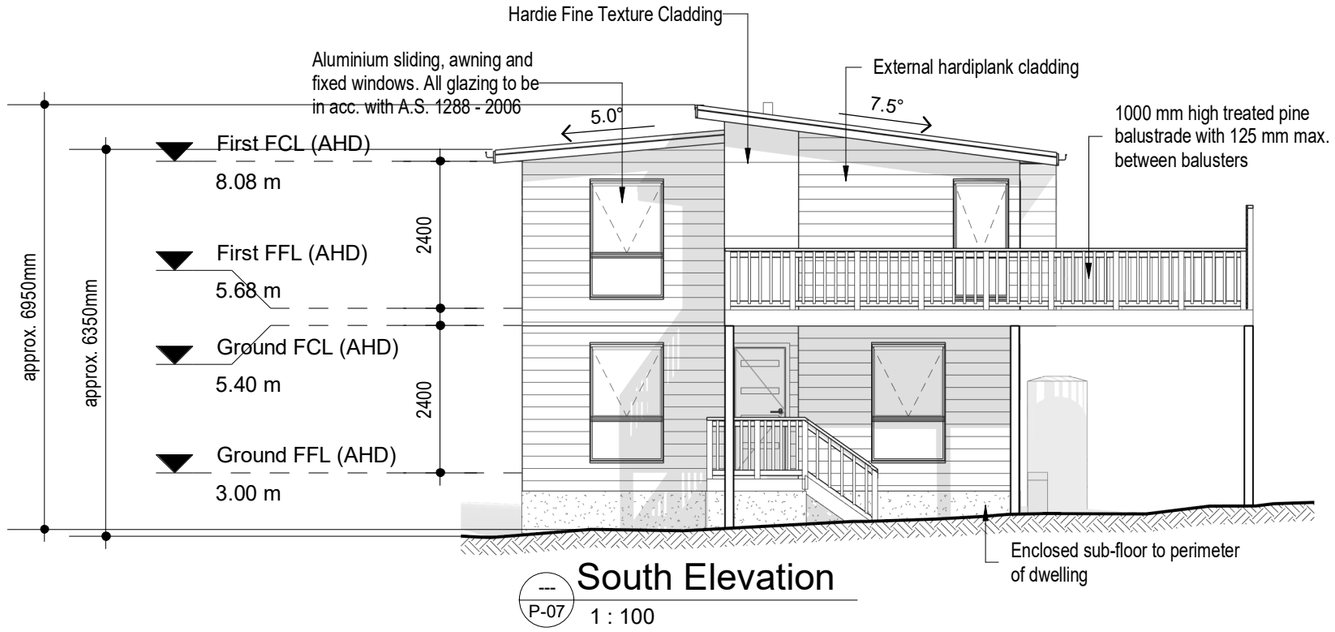
Chk: Wal

Rev No. B

Job No. 21-021

Sheet Name: P-06

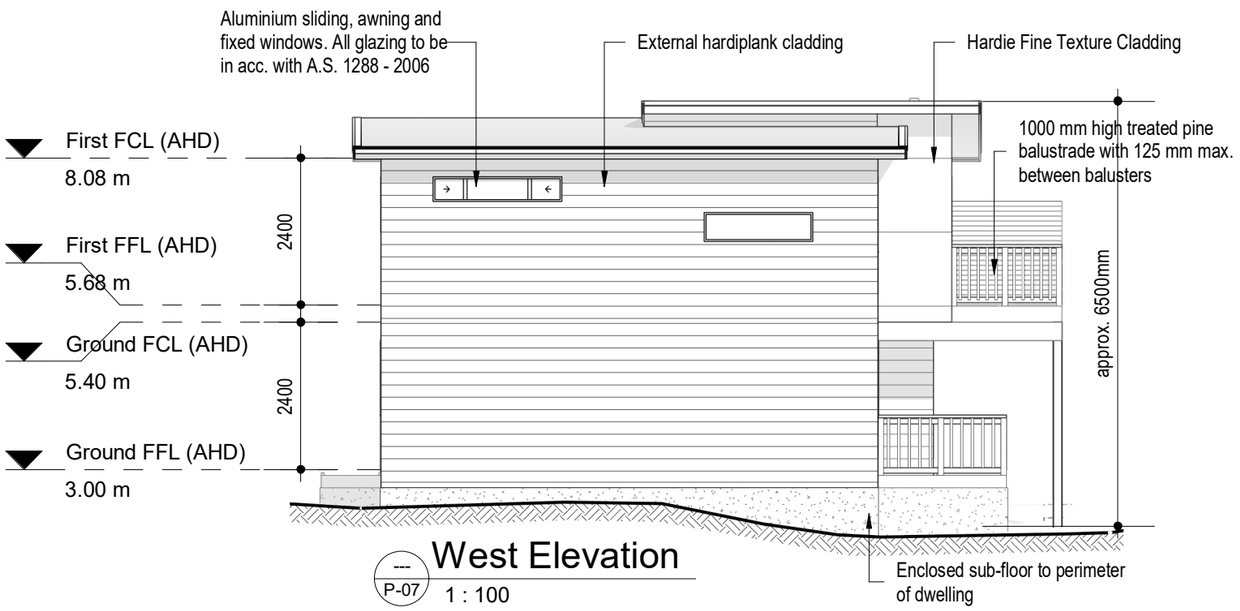
Sheet No: 6 of 7



South Elevation

P-07

1 : 100



West Elevation

P-07

1 : 100

Material Schedule

Type	Description	Color	Indicative Type Image
External Hardiplank Cladding Wall	Hardies Weatherboard Cladding	Wattyl - Colorbond Shale Grey	
Hardie Fine Texture Cladding Wall	Hardie Fine Texture Sheet	Wattyl - Colorbond Woodland Grey	
Roof	Colorbond Corrugated Roofting, Fascia & Guttering	Woodland Grey	
Windows/Sliding Door	Aluminum Sliding Windows	Woodland Grey	
Handrail	1000 mm high treated pine balustrade	Wattyl - Colorbond Surfmist	
Timber Screen	1700mm high screen with not more than 25% open	Wattyl - Colorbond Surfmist	
Posts	Cypress pine posts bolt to sub-floor with 1/M12 galv. bolt	Wattyl - Colorbond Surfmist	
Sub Floor Walls	Sub-Floor Perimeter	Wattyl - Colorbond Woodland Grey	

COLDON HOMES
Cape Paterson Road Wonthaggi 3995
Ph: 03 56 721 999
Fax: 03 56 722 979

(c Copyright
All drawings are subject to copyright and any attempt or actual infringment by using, reproducing or copying the same wholly or in part without written concent will result in legal action being taken

3/09/2021 3:12:07 PM

Issued For: PLANNING PERMIT

REV	DATE	DESCRIPTION	BY
A	25/08/21	Planner's requests	Mitch
-	29/06/21	Planning plans	Mitch

G:\PLANS\2021\21-021 PUNTURERE\21-021 PUNTURERE.rvt

Client: PUNTERERE

Project: PROPOSED RESIDENCE AT
Lot 1 No 37 Bruce Road, Silverleaves 3922

Scale: As indicate @ A3

Date: April 2021

Drawn: Mitch

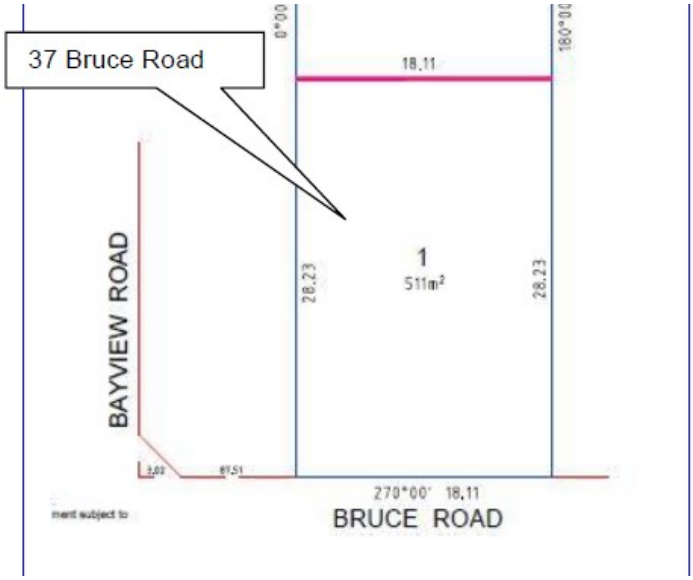
Chk: Wal

Rev No. A

Job No. 21-021

Sheet Name: P-07

Sheet No: 7 of 7







EPA CODE 891.4.

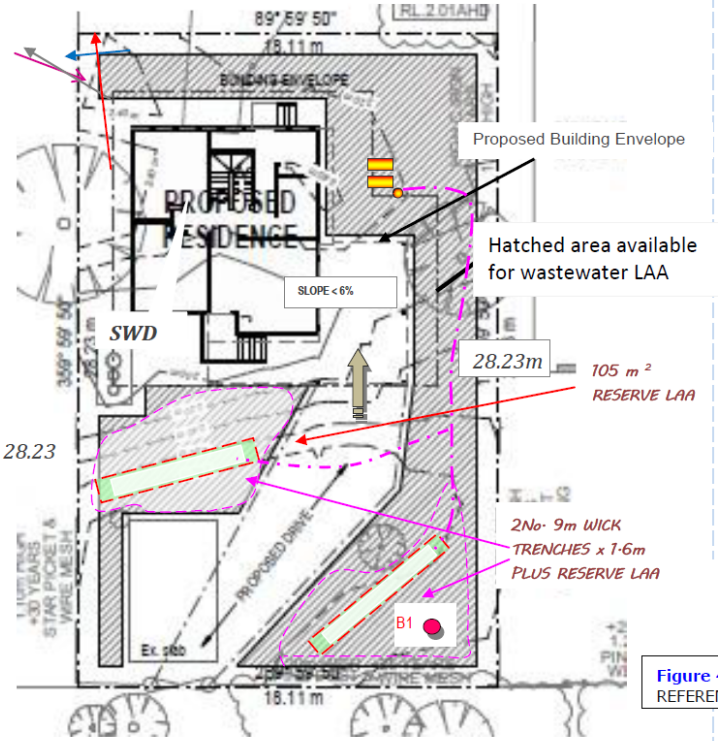
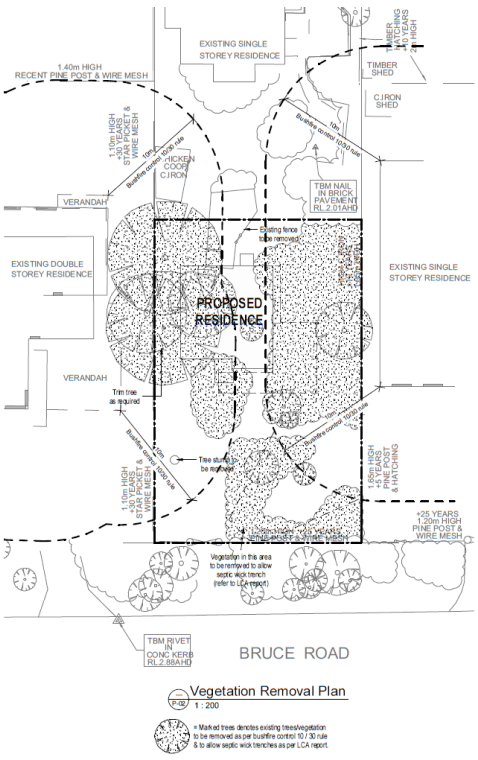


Figure
REFERE



LAND CAPABILITY ASSESSMENT (LCA)

(Consistent with new Environment Protection Regulations 2021, effective 1 July 2021)

PROPOSED ONSITE WASTEWATER MANAGEMENT SYSTEM

37 Bruce Road, Silverleaves

Prepared for: Coldron Homes

CPN: 39425

SPI: 1/PS 832707

Date: 30 August 2018
Revised: 23 August 2021

Reference: 180808

Prepared by:

EWS ENVIRONMENTAL
Water & Soil Consultants
ABN 14 740 748 489
Telephone: (03) 9849 0150
Email: ews@bigpond.com

Copyright

© 2018 EWS Environmental

No part of this report shall be used for any other purpose nor by any third party without the written permission of EWS Environmental. This land capability assessment has been undertaken expressly for the works described in this report.

Conditions of Use

This report is intended to be submitted to Council.

No part of this report shall be used by any third party for any other purpose without the express permission of EWS Environmental.

No responsibility is accepted for any third party who may use or rely on any part. Further, no responsibility shall be taken for this report if it is altered in any way, or not reproduced in full.

Document Templates

MAV Land Capability Assessment Framework, January 2014

ES_MAV2 _August 2016

Prepared for: (Client)	Coldron Homes
Municipal authority: (Council)	Bass Coast
Prepared by: (Consultant)	John Lawrey, EWS ENVIRONMENTAL PO Box 4, BOX HILL VIC 3128
Reference No.	180808
Site risk sensitivity:	Minor
Certificate of Use:	Not applicable
Document version:	Version 1 - Doc. pdf:
Date:	30 August 2018
Revised:	23 August 2021

John Lawrey	*Professional Engineer*	Reg. No. 142295
Senior Environmental Engineer	*MIEAust. Dip CE. CPEng (Ret)*	Date: 23/08/21

Accreditation: On-site Wastewater Management Certificate CET-NZ, 2001
Professional Indemnity: DUAL Australia Pty Ltd on behalf of certain underwriters at Lloyds. Policy No. SOB/26785/000/21/L, Period: 01/07/21 to 01/07/22.

© EWS Environmental. 2021

TABLE OF CONTENTS

Page

1. Introduction 3
1.1. Consultant
1.2. Report Summary
1.3. Site Overview
1.4 Client summary

2. Description of Development 5

3. Soil and Site Assessment 6
3.1. Site Key Features
3.2. Development and Site Photographs
3.3. Soil Key Features
3.4. Risk Management Assessment

4. Wastewater Management System 13
4.1 Treatment Systems
4.2 Effluent Management System
4.3 Setback Distances
4.4 Stormwater Measures
4.5 Reserve Area

5. Monitoring, Operation and Maintenance 19

6. Servicing & Report Monitoring

7. Conclusions 20

8. References

9. Acronyms and Definitions

APPENDICES 23

Appendix A: Soil Bore Logs and Irrigation Design Rates
Appendix A1:Field Soil Tests
Appendix A2:Feature Survey
Appendix B: Water Balance Calculations

FIGURES

Figure 1: Development Plan
Figure 2: Locality Plan
Figure 3: Site Analysis Plan
Figure 4: Site Plan 21

1. Introduction and Background

EWS Environmental has been engaged to undertake a Land Capability Assessment (LCA) for 37 Bruce Road, Silverleaves.

1.1 Consultant

EWS Environmental has been engaged to prepare a Land Capability Assessment (LCA) for an application for a subdivision application.

To further assess land features for long-term sustainable development and address the risk consequences of using best practice (septic sewerage) management options.

The field investigation and report have been undertaken and prepared by a suitably experienced consultant. EWS Environmental has appropriate professional indemnity insurance for this type of work, details of which are enclosed.

1.2 Report Summary

This report will accompany an application for a Permit to Subdivide the site into two allotments.

This report provides information about the site and soil conditions. It also provides an assessment for the allotments including a conceptual design for a suitable wastewater envelopes and recommendations for monitoring and management requirements.

A number of options are provided for both the treatment system and land application area (LAA).



Elevation proposed residence

1.3 Site Overview

Location
Address: 37 Bruce Road, Silverleaves
Map Ref: 634 K-2
Nearest cross Road: Bayview
Land area: 511 m^2
Number of bedrooms: **3**

Land features
Drainage: towards Western Port Bay.
Slope of land: < 6%
Distance to surface water > 30 m:
Flooding: > 1 in 20 years
Climate: Rainfall 778 mm
Evap 'A' 1069 mm

Soil characteristics
Soil texture (limiting layer): Sandy Loam,
Structure: Category: 2b
Permeability (K_{sat}) > 3.0 metre/day.

Wastewater system sizing (AS/NZS 1547:2012)
Water supply: Tank or Town.
Number of persons: 4
Daily contribution: 180 (Litres/day)
Maximum flow: 720 litres,
Design Loading rate(DLR) 30 litres/m^2.day
Dispersal area (LAA): 105 (m^2)

Management
Annual servicing: YES
Desludging (pump-outs) primary tank: 3 yearly

Quarterly (4 x) servicing of treatment plant and annual check of the Onsite Wastewater Management System (OWMS)with inspection of the effluent dispersal areas (LAA).

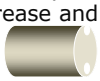
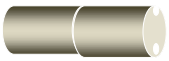
1.3 Client Summary

The nature of the site and the environmental constraints identified requires appropriate treatment by either advanced Onsite Wastewater Management System (OWMS)or secondary treatment system. The treatment options listed below are deemed capable of achieving the desired level of performance.

The property owner will have the responsibility for the final selection of the treatment system details of which may be included in the *Application to Install an Onsite Wastewater Management System (OWMS)* Permit.

The pros & cons depend on site constraints and waste characteristics listed below:

PROS and CONS of options for treatment of wastewater.

TREATMENT METHOD	PROS	CONS
Treatment Option 1 – Primary settling to reduce grease and solids  30% pollutant removal	☑ Minimal maintenance ; ☑ Less expensive operating costs although technically problematic. ☑ Robust operation.	☒ Design service life of 15 years; ☒ Must be connected to sewer immediately it become available; ☒ Sensitive to terrain slope & setbacks to waterway; ☒ Requires more space> 2000 m^2;
Treatment Option 2 – Secondary treatment such as aerated systems  **Must be EPA approved** 90% pollutant removal	☑ Design service life of 30 years; ☑ Default "*best practice*" system ☑ Copes with higher organic and nutrient loads; ☑ Minimal maintenance ☑ Suitable for lots < 2000m^2; ☑ Minimises pollutant run-off risk.	☒ Higher maintenance costs; ☒ Higher energy costs; ☒ Slightly higher installation cost;

PROS and CONS of options for effluent dispersal.

Following the wastewater treatment process effluent must be distributed onto land, the options considered and available for use currently are:

A. Pressure compensating drip irrigation;
B. Low pressure effluent distribution systems (LPED); or
C. Wick trench or bed systems.

The pros & cons depending on terrain, rainfall and soil conditions are listed below:

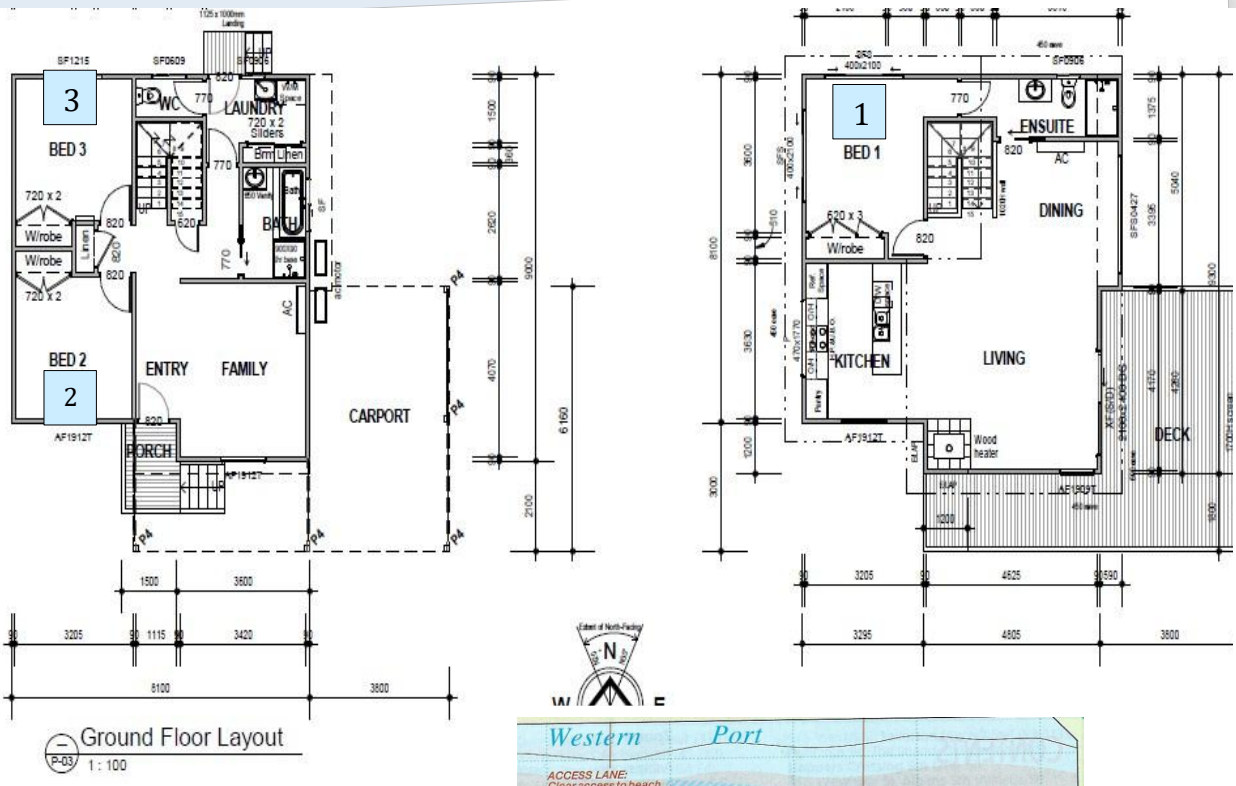
PROS and CONS of options for effluent dispersal.

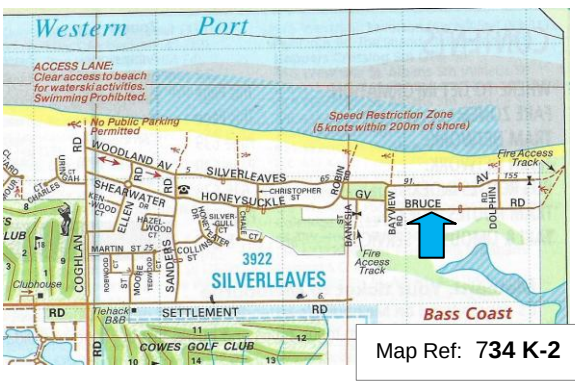
IRRIGATION	PROS	CONS
Irrigation Option A – Pressure compensating drip irrigation	☑ Suitable for shallow soil sites ☑ Not restricted due to rainfall ☑ Less soil depth required to others ☑ Irrigates larger area	☒ Higher maintenance and capital replacement costs ☒ More expensive system ops with technical matters problematic
Irrigation Option B – Low pressure effluent dispersal systems	☑ Complementary loading of system for balance flow ☑ Minimal maintenance ☑ Trench spacing up to 2m apart	☒ Sensitive to terrain slope & setback to waterways ☒ Minimum 250mm topsoil
Irrigation Option C – Wick trenches	☑ Lower energy requirement ☑ Compact system ☑ Complementary trench loading ☑ Balancing high & low flow days ☑ Minimal maintenance	☒ Sensitive to terrain slope & setback to waterways ☒ Experienced installer required ☒ Not suitable high rainfall areas ☒ Significant capital cost

A combination of treatment and subsurface dispersal will produce the best long-term solution.

2. Description of the Development

Site Address:	37 Bruce Road, Silverleaves
Builder/Developer:	Coldron Homes
Contact:	Ph: Glenn Leckie 0447 123 529
Council Area:	Bass Coast Shire Council
Allotment Size:	Lot 1, 511 m2
Domestic Water Supply:	Onsite roof water collection, reticulated supply assumed
Forecast Wastewater Load:	A 3-bedroom residence with full water-reduction fixtures @ 4 people per maximum occupancy. Wastewater generation = 180 Litre/person/day; design load = 720 L/day (source Table 4, EPA Code (891.4:2016).
Availability of Sewer:	The area is unsewered and highly unlikely to be sewered within the next 10 years, due to low development density in the area and the considerable distance from existing sewerage services.





Map Ref: 734 K-2

Figure 1 Proposed residence

3. Site and Soil assessment

EWS Environmental undertook site investigations on the 24 August 2018.

3.1 Site Key Features

Any site constraints and/or need for mitigation measures are summarises Table 1, addressing the key features of the site in relation to effluent management for the proposed site.

NOTE:

- The site is not in a special water supply catchment area.
- The site experiences negligible stormwater run-on.
- There is a shallow watertable on Lot 2 but no other significant constraints, and
- The risk of effluent transport offsite is very low.

Figure 3 provides a site analysis plan describing the location of the proposed envelopes and other development works, wastewater management system components and physical site features.

LEGEND

Declared Waterway

Setback

Slope of land

Soil test pit (1)

SENSITIVITY ANALYSIS

Groundwater: more than 3000 mg/L

Area: 511 m2

Surface waters: Western Port Bay

Mean site slope: < 6 %

Soil texture: Sandy Loam

Ind. K_{sat} = > 3.0 m/day

Soil depth: > 1000mm

Dist to waterway: > 150 m

Groundwater bores: >20 m

SITE DETAILS

Address: 37 Bruce Road,

Locality: Silverleaves

Map Ref: 734 K-2

Planning Zone: Township

Overlays: DDO, LSIO & VPO

Site visit: 24 August 2018

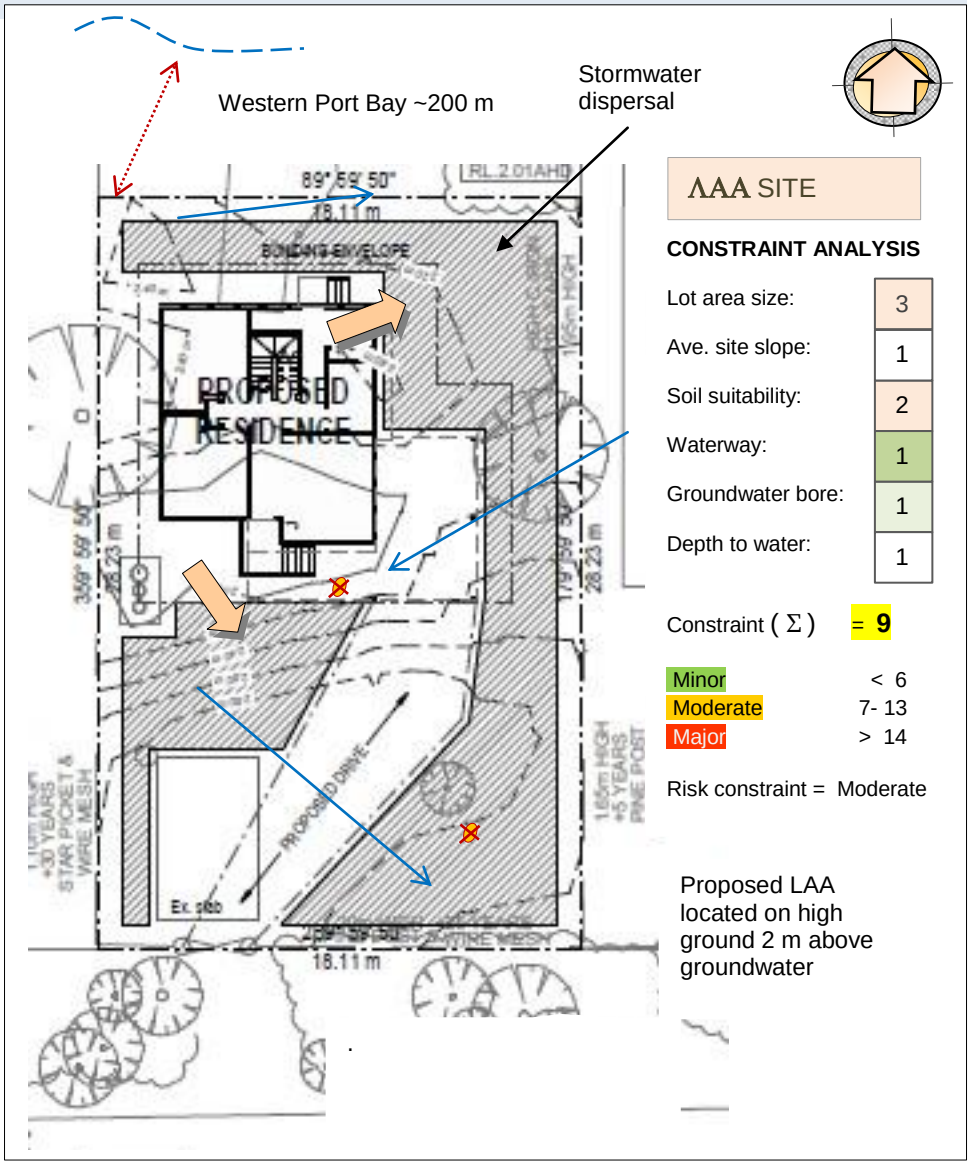
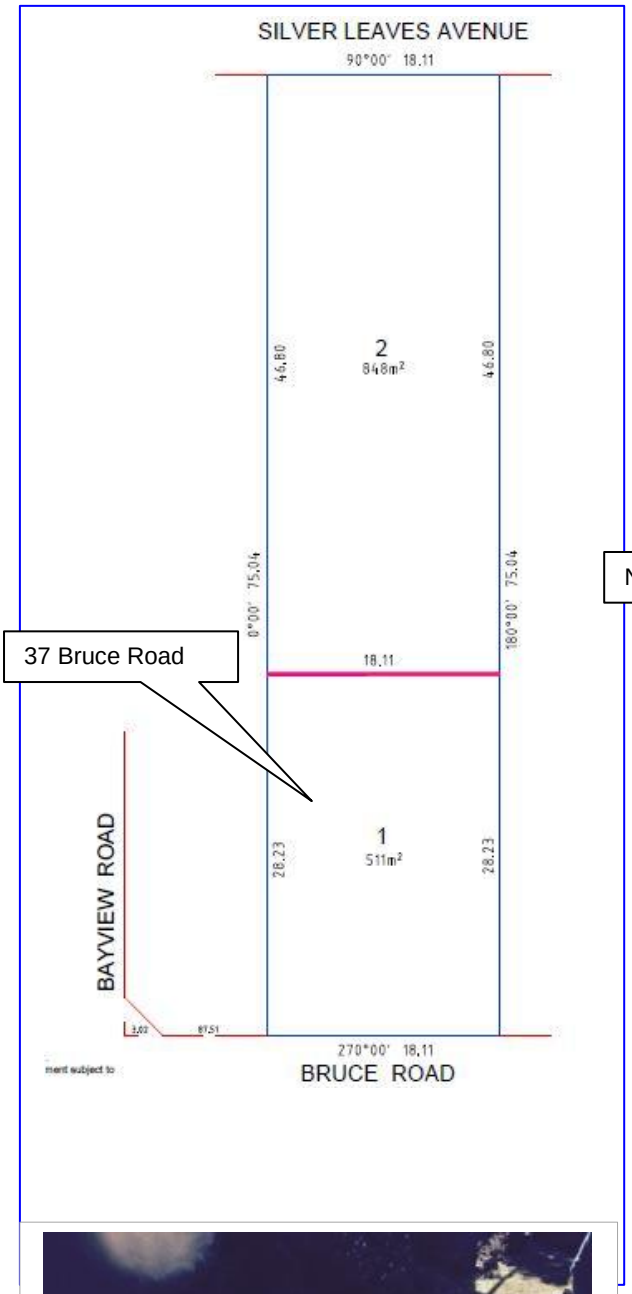


Figure 3: Site analysis plan

3.2 Development and Site Photographs





Aerial view





Soil bore hole profiles

Location: 37 Bruce Road, Silverleaves Date: 24 August 2018 Taken by: JR Lawrey

Table 1: Site Assessment

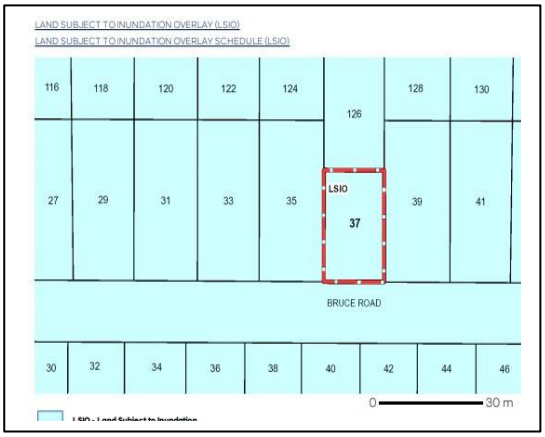
Feature	Description	Constraint	Measures
Buffer Distances	All relevant buffer distances in Table 5 of the Code (2016) are achievable.	Minor	NN*
Climate	Mean annual rainfall 778 mm. Mean annual pan'A' evaporation is 1069 mm.	Minor	NN
Drainage	No visible signs of surface dampness, spring activity or hydrophilic vegetation in the proposed effluent management area.	Moderate	NN
Erosion & Landslip	No evidence of sheet or rill erosion; the erosion hazard is low. No evidence of landslip and landslip potential is low.	Minor	NN
Exposure & Aspect	Site vegetation is sparse, with a northerly aspect and has moderate wind exposure.	Minor	NN
Flooding	The proposed effluent management area is located above the 20 year ARI flood level.	Minor	NN
Groundwater **	No signs of shallow groundwater tables to 1.5 m depth. No potential groundwater bores within 20 m of the proposed effluent area. Groundwater total dissolved solids more than 1000 mg/L.	Minor	NN
Imported Fill	No imported fill material observed on the site.	Nil	NN
Land Available for LAA	Considering all the constraints, the site has ample suitable land for application of effluent.	Nil	NN
Landform	Natural drainage with no spreading over linear plannar slope with no significant drainage lines intersect site.	Moderate	Locate with appropriate setbacks
Rock Outcrops	No evidence of surface rocks or outcrops.	Nil	NN
Run-on & Runoff	Minor stormwater run-on and run-off hazard.	Nil	NN
Slope	The proposed effluent area slope is less than 6 percent.	Nil	NN
Surface Waters	No waterways traverse the site requiring minimum setback to treatment /effluent area.	Nil	NN
Vegetation	Mixture of grasses and native vegetation.	Nil	NN

*__NN__: mitigation measures not needed

** Ground water/flood waters

As the site is subject to an inundation overlay and future high water levels may impact on the effluent dispersal field, a design life (30 years) for the systems have been considered.

Coastal Hazard Vulnerability flood level approximating a level of 1.8m applies to site.
Lot 1 No. 37 Bruce Rd. LAA has AHD of 2.9m that is above flood level for a 20 year ARI.



3.3 Soil Key Features

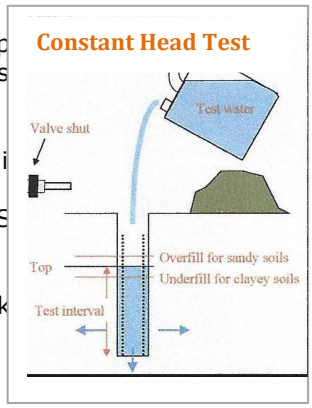
The site's soils have been assessed for their suitability for onsite wastewater management by a combination of soil survey and field analysis as outlined below.

Site assessment criteria

This assessment has been undertaken in accordance with the EPA's *Code of Practice - Onsite Wastewater Management, July 2016* and AS/NZS 1547: *Onsite Domestic Wastewater Management*. Soil assessment and design for on-site wastewater management was taken from AS/NZS 1547, where appropriate.

Site investigations

A key feature of the investigations is a soil permeability assessment in each landscap element or soil type area for effluent attenuation within the boundaries of the premis Review geological and soil mapping data (DEPI).



EPA's Code of Practice, Publication 891.4 (2016) permits two methods to determi the soil permeability. One based on visual and tactile estimation of indicative permeability, the other is the "constant-head" test from AS/NZS 1547 'Site and S Evaluation' procedures.

The physical soil analysis assessment includes soil texture, structure and a shrink /swell potential test, as a substitute for actual water based measurement of soil permeability.

The "*constant –head"* test, allows water to runs out of an unlined test hole in to the ground which is replenished at the same rate from a reservoir, so that the head of water in the hole remains the same. The loss of water from the reservoir is measured over time and a mathematical model is used to calculate the co-efficient of permeability, known as, K_{sat} from the measurement.



Soil permeability has been determined from the critical properties of texture, structure and shrink/swell potential using the method specified in AS/NZS 1547:2012 that prescribes conservative design loading rates.

The structure and texture of the soil was such that a constant head test would no influence the final classification of and design loading rate shown below.

Indicative soil permeability

Classification	Properties	Cat	K sat (m/d)	Wick	Drip	LPED
Gravel & sands	Very little to no coherence; cannot be moulded; single grains stick to fingers	1	> 3.0	25	5	NA
Sandy LOAM	Forms a cast but will not roll into coherent ball; sand grains can be seen and felt; gives a ribbon 15-25 mm long.	2	1.4 - 3.0	30	5	4
LOAMS	Forms a cast but not spongy, very smooth and silky; will form a very thin ribbon 25 mm long and dries rapidly.	3	0.5 – 1.5	30	4	3.5
Clay LOAM	Can be rolled into ball with a spongy feel; slightly plastic; smooth to manipulate; forms a ribbon 40-50 mm long.	4	0.12 – 0.5	20	3.5	3
Light CLAY	Smooth plastic ball that can be rolled, slight resistance to shearing between thumb and fore finger; ribbon 50–70mm.	5	0.06–0.12	10	3	2.5
Medium to heavy CLAY	Smooth plastic ball, handles like plasticine, can be moulded into rods without fracture; some resistance to ribboning, forms a ribbon 75mm or more long.	6	< 0.06	5	2	NA

Reference: EPA Publication 891.4:2016, Table 9

Design Loading/Irrigation Rates

See attachment 'A' for all soil test results and field records.

Table 2: Soil Assessment

Feature	Assessment	Constraint	Comment
Soil Depth (Topsoil more than 250mm YES/NO)	Topsoil: 150mm Sandy LOAM	Minor Mitigation: **NN**	
	Subsoil: >150-200 mm. Total soil depth greater than 1.5 m, no hardpans occur.	Minor Mitigation: **NN**	
Soil Texture & Structure	Topsoil Category 2b. SANDY LOAM	Minor Mitigation: **NN**	
	Subsoil (>200 mm): SAND, Category 2b Structure: Massive as per AS/NZS/NZS 1547:2012	Major Mitigation: **NN**	Sub-surface dispersal preferred
Soil Permeability	Topsoil: > 3.0 m/day saturated conductivity (K_{sat}) (AS/NZS1547:2012);	Minor Mitigation: **NN**	Limiting layer 2b
Design Loading Rates	Design Loading Rate (DLR) 30mm/day. Subsoil: 3.0 m/day saturated conductivity (K_{sat}) (AS/NZS1547:2012);	Minor Mitigation: **NN**	**DLR** = 30 mm/day
Modified Emerson Aggregate Test	Topsoil: minor slaking with no dispersion. Minor Class 1,2, Moderate 3, Major 4 [8] p109	Minor Mitigation: **NN**	
(test AS/NZS 1547)	Subsoil: slaking with no dispersion Minor Class 4 ,5,6 or 8, Moderate Class 2, 3, or 7, Major Class 4 [4] p94	Moderate Mitigation: **NN**	
Rock Fragments	Coarse fragments less than 2% (200 mm depth). No fragments throughout remainder of profile. Minor 0 -10%, Moderate 10 -20%, Major >20% [7] p25	Minor Mitigation: **NN**	
Watertable Depth	Groundwater not encountered,	Minor	
pH	Topsoil pH 7.5; subsoils slightly higher. Soil conditions not affecting plant growth. Minor 4.5 - 8, Major <4.5, >8 [7] p24	Minor Mitigation: **NN**	**pH** = 7.5
Cation Exchange Capacity (CEC)	Present soil conditions do not appear to be restricting plant growth. Minor >15, Moderate 5 -15, Majo r <5 meq+/100g [7] p65	Minor Mitigation: **NN**	
Sodicity (ESP)	Exchangeable Sodium concentrations ESP value is low with no long-term soil sodicity monitoring required. Present soil conditions are not restricting plant growth. Minor 0- 6%, Moderate 6 - 8%, Major >8 % [4] p113	**Minor** Mitigation: **NN**	
SAR	Sodium absorption ratio not a constraint. Minor < 3, Moderate < 8 & ESP > 8%, Major > 3 p95	**Minor** Mitigation: **NN**	
Phosphorus adsorption capacity	Phosphorus adsorption capacity was not tested as nutrient not limiting in location close to sea.	Minor Mitigation: **NN**	

NN: mitigation measures not needed

3.4 Risk Management Assessment

Table 3: Risk Assessment of Site Characteristics

Characteristic	Level of Constraint			Assessed Level of Constraint for Site
	Nil or Minor	**Moderate**	**Major**	
Aspect (affects solar radiation received)	North / North-East / North-West	East / West / South-East / South-West	South	Minor (North)
Climate (difference between rainfall & evaporation)	Excess evaporation over rainfall in the wettest months	Rainfall approximates to evaporation	Excess of rainfall over evaporation in the wettest months	Minor
Erosion (potential for erosion)	Nil or minor	Moderate	Severe	Minor
Exposure to sun and wind	Full sun and/or high wind or minimal shading	Dappled light	Limited patches of light and little wind to heavily shaded	Minor
Imported Fill	No fill or minimal fill, or fill is good quality topsoil	Moderate coverage and fill is good quality	Extensive poor quality fill and variable quality fill	Minor
Flood frequency (ARI)	Less than 1 in 100 years	Between 100 and 20 years	More than 1 in 20 years	Moderate
Groundwater bores	No bores onsite or on neighbouring properties	Setback distance from bore complies with requirements in EPA Code of Practice 891.4	Does not comply with requirements in EPA Code 891.4	Minor
Land area available for LAA	Exceeds LAA and buffer distance requirements	Meets LAA and duplicate LAA and buffer distance requirements	Insufficient area for LAA	Moderate
Landslip (or landslip potential)	Nil	Minor to moderate	High or Severe	Minor
Rock outcrops (% of surface)	<10%	10-20%	>20%	Minor
Slope Form (water shedding ability)	Convex or divergent side-slopes	Straight side-slopes	Concave or converge side-slopes	Minor
Slope gradient (%)				
(a) for absorption trenches and beds	<6%	6-15%	>15%	Minor
(b) for subsurface irrigation	<10%	10-30%	>30%	Minor **< 6%**
Soil Drainage (qualitative)	No visible signs of dampness, even in wet season	Some signs or likelihood of dampness	Wet soil, moisture-loving plants, water ponding on surface	Minor
Soil Drainage (Field Handbook definitions)	Rapidly drained. / Well drained.	Moderately well drained.	Imperfectly drained.	Poorly/Very poorly drained.	Well drained
Stormwater run-on	Low likelihood of stormwater run-on		High likelihood of inundation by run-on	Minor
Surface waters - setback distance (m)	Complies with EPA Code of Practice 891.4		Does not comply with EPA Code of practice	Minor
Vegetation coverage over the site	Plentiful healthy growth & nutrient uptake	Limited variety of vegetation	Sparse vegetation or no vegetation	Minor

Table 4: Risk Assessment of Soil Characteristics

Characteristic	Level of Constraint			Assessed Constraint
	Nil or Minor	Moderate	Major	
Electrical Conductivity	<0.8	0.8 - 2	>2	Minor
Emerson Agg. Test (Modified AS/NZS 1547)	No change to aggregate	Aggregates slake	Aggregates disperse clouding solution	Minor
Gleying (Munsell Soil Colour Chart)	Nil	Evidence of greenish grey / black or bluish grey / black soil	Predominant greenish grey / black, bluish grey / black colours	Minor
Mottling (Munsell Soil Colour Chart)	Generally uniform brownish or reddish colour mottles	Imperfectly drained soils have grey and/or yellow brown mottles	Poorly drained soils predominant yellow brown or reddish	Minor
pH (range for plants)	5.5 - 8 is optimum range for plants	4.5 - 5.5 suitable for acid-loving plants	<4.5, >8	Minor
Rock Fragments (size & volume %)	0 – 10%	10 – 20 %	>20%	Minor
Sodicity [4] (ESP %)	<6%	6 – 8%	>8%	Minor
Soil Depth to Rock or impermeable layer	>1.5 m	1.5 – 1 m	<1 m	Minor
Soil Structure (pedality)	Highly or Moderately structured	Weakly-structured	Structureless, Massive or hardpan	Major
Soil Texture, (indicative permeability)	Cat. 2b, 3a, 3b, 4a	Cat. 4b, 4c, 5a	Cat. 1, 2b, 5b, 5c, 6	Major
Water table depth below base of the LAA	>2 m	2 – 1.5 m	<1.5 m	Major

Adopt WICK evapo-transpiration trenches

Legend:

Nil or Minor: If all constraints are minor, conventional/standard designs are generally satisfactory.

Moderate: For each moderate constraint an appropriate design modification over and above that of a standard design, should be outlined.

Major: Any major constraint might prove an impediment to successful on-site wastewater management, or alternatively will require in-depth investigation and incorporation of sophisticated mitigation measures in the design to permit compliant onsite wastewater management.

Vegetation Impacts

Wastewater dispersal must be irrigated so as to not exceed the optimum water and nutrient requirements of the vegetation within the premises. Nutrient and organic uptake application rates are taken from EPA's Publication 168, *Guidelines for Wastewater Irrigation,* April 1991.

The guidelines and criteria followed for the design of the proposed wastewater effluent dispersal area are based on EPA's Code of Practice for *Onsite Wastewater Management*, Publication 891.4. The purpose of which is to protect public health and the *environment.* To this end it is a requirement of Government policy that wastewater dispersal is sustainable and does not pose an environmental risk including impacts on vegetation beyond the boundaries of the allotment.

In selecting suitable areas for effluent dispersal the following checks for constraints were noted:

- Waterway, springs, dams and likely seasonal wet areas;
- Upslope stormwater run-off, groundwater seepage, springs and depressions;
- Unsuitable topographical features, ground conditions and other structures.

4. Wastewater Management Systems

The following sections provide an overview of a suitable onsite wastewater management system, with sizing and design considerations and justification for its selection. Further detailed design for the system may be undertaken at the time of the application to Council.

4.1 Treatment System

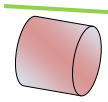
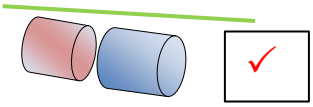
The treatment system for any on-site wastewater application ie. Onsite Wastewater Management System (OWMS) with secondary treatment system requires an EPA approval and a Certificate of Conformity.

Refer to the EPA website for the list of approved options that are available http://www.epa.vic.gov.au/en/your-environment/water/onsite-wastewater .
Any of the treatment system options listed at the above website are deemed capable of achieving the desired level of performance. The property owner has the responsibility for the final selection of the treatment system which should be included with the *Application to Install a Septic System*.

The following sections provide an overview of a suitable onsite wastewater management system, with sizing and design considerations and justification for its selection. Detailed design for the system should be undertaken at the time of the application submitted to Council.

The pros & cons depend on site and waste characteristics listed below:

Table 5: PROS and CONS of options for treatment of wastewater.

TREATMENT METHOD	PROS	CONS
Option A – Primary settling to reduce grease and solids  30% pollutant removal	☑ Minimal maintenance ; ☑ Less expensive operating costs although technically problematic. ☑ Robust operation.	☒ Design service life of 15 years; ☒ Must be connected to sewer immediately it become available; ☒ Not suitable for type 1 or 6 soils; ☒ Sensitive to terrain slope & setbacks to waterway; ☒ Requires a lot > 2000 m^2.
Option B – Secondary system such as aerated systems  90% pollutant removal	☑ Design service life of 30 years; ☑ Default "*best practice*" system ☑ Suitable for type 1 & 6 soils; ☑ Copes with higher organic and nutrient loads; ☑ Suitable for lots < 2000m^2;	☒ Higher maintenance costs; ☒ Higher energy costs; ☒ Slightly higher installation cost;

4.2 Effluent Management System

A range of possible land application systems have been considered, such as absorption trenches, evapo-transpiration / absorption (ETA) beds, subsurface irrigation and mounds.

The options for dispersal of treated effluent are limited to those either specifically approved by EPA or systems installed in accordance with Australian Standard AS/NZS 1547:2012.

Sizing the Irrigation System

To determine the irrigation area, water balance modelling has been undertaken using the method and modeling tool in the *Victorian Land Capability Assessment Framework* (2014) and EPA Codes.

The preferred system of dispersal is pressure compensating subsurface irrigation. Subsurface irrigation will provide even and widespread dispersal of the treated effluent within the root-zone of plants. It will also ensure that the risk of effluent being transported off-site will be negligible.

Calculation of minimum daily domestic flow

EPA Code (**891.4)** clause **3.4.1**, requires potential future flow rates to be based number of people who may be intending to live on the premises. Assessors should include any additional room(s) that could be closed off with a door, as a bedroom for the purposes of the calculations.

This design assumes that wastewater flow based on the EPA's Code has a potential occupancy using the criteria of : *{(Number of Bedrooms) +1}* persons x 180 Litres. *Number of bedrooms*: **3**,*
*All bedrooms plus rooms that could be closed off with a door. (3.5.1)

4.3 Sizing the effluent dispersal system

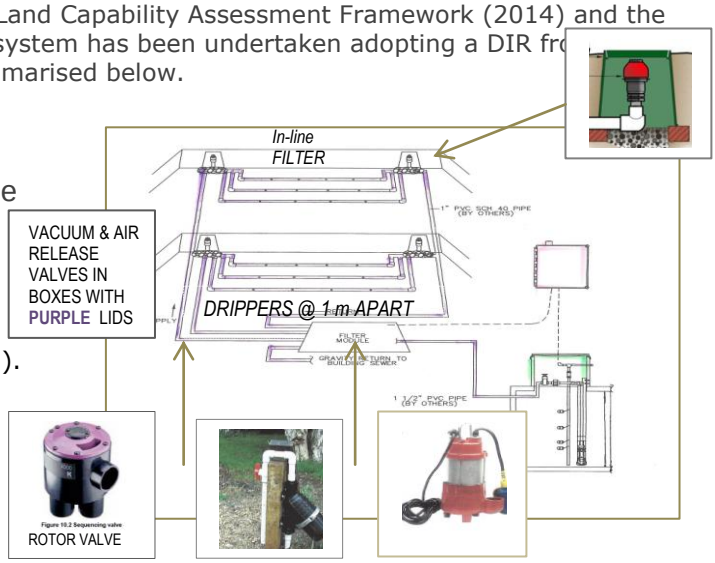
To determine the necessary size of the irrigation area water balance modelling has been considered using the method and water balance tool in the Victorian Land Capability Assessment Framework (2014) and the EPA Code (2016). The final sizings of the irrigation system has been undertaken adopting a DIR fr
9 of the EPA code (2016). The calculations are summarised below.

The field sizing equation can be expressed as:

Formula: DRIP IRRIGATION A = Q/DIR , where

A = irrigation area (m²)
Q = daily flow (L/day)
DIR = Design irrigation rate (mm/day) –
adopt most constraininghorizon (600mm separation).

A = 720/5 Category 2b.
= 144m² (for a 4 person dwelling) from
Water balance area = 200 m²
See Appendix B-1, for water balance calculations.



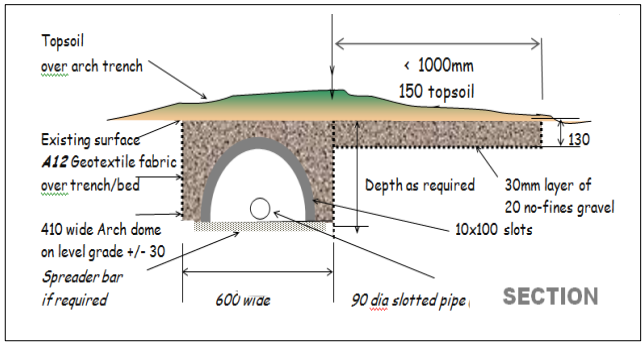
Alternative WICK trenches (Secondary effluent)

Formula: WICK TRENCHES

A = Q/DLR x (1.6m/1.2),

where

A = trench area (m²)
Q = daily flow (L/day)
DLR = Design loading rate (m/day) –
adopt most constraininghorizon (600mm).
A = 720/30 (1.33) [Cat. 2b]
= 18m² (for a 4 person dwelling) from
Water balance area = 25m² Trench length 18.8m
See Appendix B-2, for water balance calculations.



The Land Application Area is sufficient toensure nutrients are assimilated by the soils and vegetation. As well as water balance modelling a check nutrient balance has also been undertaken.

Water Balance

The water balance can be expressed by the following equation:

Precipitation + Effluent Applied = Evapo-transpiration + Percolation

Data used in the water balance includes:

- Mean monthly rainfall and mean monthly pan evaporation;
- Average daily effluent load – 720 Litres (from Table 4 of the Code);
- Design application rate (DIR or DLR) – 5 & 30mm/day (from Table 9 of the EPA Code);
- Crop factor – 0.6 to 0.8; and
- Retained rainfall – 75 % with cut-off drain (gently sloping site of about < 6% to North).

The nominated area method is used to calculate the area required to balance all inputs and outputs to the water balance.

As a result of these calculations at least 80 m^2 of land application area is required.

Nutrient balance

For sustainable, long-term nutrient management, when **nitrogen** is the limiting factor:

- *Use uptake for grasses @ 200 kgTN /ha.year, EPA Guidelines for Wastewater Irrigation, Pub. No.168.*
- *Crop factor for tall fescue grass 220 kg/ha. yr = 220 x 1000 x 1000/10,000/365 = 60mg TN/m^2.day.*
    - *In clayey soil, phosphorus is not a limiting factor, due to adsorption onto clay particles.*
    - *Allow 20% loss through denitrification, volatilisation, microbial attack and other processes,*

Nitrogen load is 720 L x 25 mg/L = 18000 x 80% / 60 = 240 m2.
Nitrogen is therefore the limiting nutrient, as its irrigation area requirements is the larger value.

The results show that the required irrigation area is 105 m^2. The calculations are summarised below, with full details provided in Appendix B. Water and Nutrient balance spreadsheet calculations for most limiting minimum land application area (LAA).

Salt balance

For sustainable,– long-term soil management salt (sodium) levels in water supply and the addition of contributed by washing and use of laundry detergents may cause soils to become less permeable.

Measures to minimise salinity effects include reduced detergent use, low irrigation rates, growing salt tolerant grasses in dispersal area and restricting salt levels in effluent to less than 500 mgTDS/litre.

Use salt tolerant grasses like Kikuyu or Couch grass, ***EPA Guidelines for Wastewater Irrigation, 168.***

Leaching of salt is quantified using a water balance to ensure adequate remove of salt for the dispersal field. Typical sewage salt input is about 375 mgTDS/L, with water supply levels which are below 500.

The pros & cons depending on terrain, rainfall and soil conditions are listed below:

Table 7 - PROS and CONS of options for effluent dispersal.

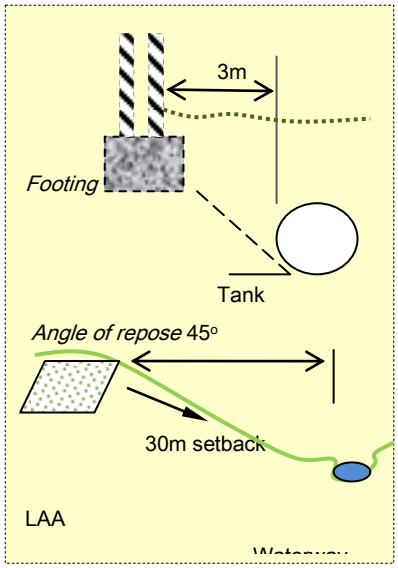
DISPERSAL METHOD	PROS	CONS
Option A – Pressure compensating drip irrigation	☑ Suitable for shallow soil sites ☑ Not restricted due to rainfall ☑ Less soil depth required to others ☑	☒ Higher maintenance and capital replacement costs ☒ More expensive system ops with technical matters problematic ☒ Maximum slope of 30% ☒ Generally requires more space.
Option B – Mounds	☑ Raise level of effluent discharge ☑ Soil depth less important ☑ Minimal maintenance ☑ Suitable ground saturated sites ☑ Minimises polluted run-off risk	☒ Sensitive to terrain slope & setback to waterways ☒ Max. 15% slope situations ☒ May increase wetness at edge ☒ Toe seepage may occur.
Option C – LPED systems	☑ Lower energy requirement ☑ Complementary loading of system for balance flow ☑ Minimal maintenance ☑ Trench spacing up to 2m apart	☒ Sensitive to terrain slope & setback to waterways ☒ Minimum 250mm topsoil ☒ Not suitable type 1 & 6 soils
Option D – Wick trenches ☑	☑ Lower energy requirement ☑ Compact system ☑ Complementary trench loading ☑ Balancing high & low flow days ☑ Minimal maintenance	☒ Sensitive to terrain slope & setback to waterways ☒ Experienced installer required ☒ Not suitable high rainfall areas ☒ Significant capital cost
Option E – ETA evapo-transpiration trenches & beds	☑ Compact system ☑ Complementary trench loading ☑ Balancing high & low flow days ☑ Minimal maintenance	☒ Sensitive to terrain slope & setback to waterways ☒ Experienced installer required ☒ Benching required steep slopes ☒ Significant capital cost

☑ Option most likely to offer the best long-term solution; details are included in Appendices.

4.3 Buffer Distances

Setback distances from effluent land application areas and treatment systems are required to help prevent human contact, maintain public amenity and protect sensitive environments. The relevant buffer distances for this site are taken from Table 5 of the Code.

- 50 metre from groundwater bores in sandy soils, 20 metre in clayey soils;
- 100 metre from waterways (potable supply) and 30 m for non-potable waterways;
- 6 metre if area up-gradient and 3 metre if area down-gradient of property boundaries, swimming pools and buildings (conservative values for primary effluent).



If setback distances are outside default values, ground water modelling may determined that all nutrients, pathogens and other pollutant will not be transport beyond premises boundary, as per Government Policy.

When all pollutants are attenuated within the premises boundaries there will be no cumulative impacts on surface waters or groundwater.

All buffer distances are achievable for this application. See Section 4.2 –

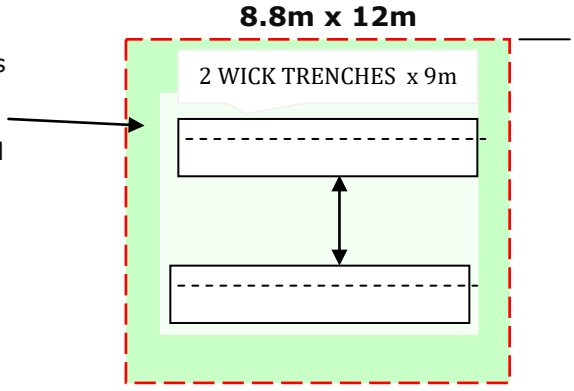
4.4 Stormwater Measures

Stormwater run-on is not expected to be a concern for the proposed irrigation area, due to the landform of the site, its relatively gentle slopes and permeability.

Stormwater run-on poses a risk during significant rainstorm events. The construction and maintenance of a storage retention tanks will mitigate the limitations of site drainage.

4.5 Reserve Area

The spacing of 3.6m in between 1.6m wide WICK trenches can be the reserve area. Only where the spacing between trenches is 1m to 1.5m, is a separated reserve area located on another part of the property required.



5. Monitoring, Operation and Maintenance

Maintenance should be carried out in accordance with the EPA system approval and the *Certificate of Conformity* of the selected secondary treatment system and Council's permit conditions. The treatment system will only function adequately if appropriately and regularly maintained.

To ensure the treatment system functions adequately, residents must:

- Have a suitably qualified maintenance contractor service the secondary treatment system at the frequency required by Council under the permit to use;
- Use household cleaning products suitable for septic tanks;
- Keep as much fat and oil out of the system as possible;
- Don't put sanitary or hygiene products into the system,
- Do Not flush so called flushable wipes into the system, and
- Conserve water, use 3 STAR or better WELS rated fixtures and appliances.



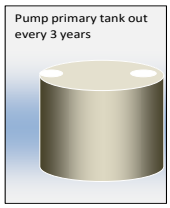
To ensure the land application area (LAA) functions adequately, residents should:

- Regularly harvest (mow) vegetation within the LAA and remove this to maximise uptake of water and nutrients;
- Monitor and maintain the subsurface irrigation system following the manufacturer's recommendations;
- Regularly clean in-line filters;
- No structures/ paths erected over the Land application area;
- Avoid vehicle and livestock access to the LAA, to prevent compaction and damage; and
- Ensure that the LAA is kept uniformly graded by filling any depressions with good quality topsoil (not clay).
- Check water usage (winter water bills) to ensure discharge does not exceeding design.



Table for recording actions undertaken (✓)

Year/month	Water leaks	Service agent	Monitor effluent	Pump-out (3 yearly)	Effluent ponding	Keep records	Comments -& Remarks
Frequency	Regularly	As requires	Annually	Every 3 years	Every year	As required	



Note:

- A permit condition of the Council approval will require the regular servicing of the *wastewater treatment system* in accordance with manufacturer's instructions.
- The system should be inspected annually and report prepared by a qualified person.
- The owner should also have the Onsite Wastewater Management System (OWMS)desludged at least every three years.

6. Service & Performance Report

Operation & maintenance of Onsite Wastewater Management System (***OWMS***)
(*Environment Protection Regulations 2021*) * (Reg. xx)
Key regulatory elements if applicable to be included in any maintenance and performance reports.

OWNER/OCCUPIER name (EP Act 2017, S. 25)……

Records of maintenance are important evidence that the owner /occupier has taken reasonable action to keep the OWMS in good working order (Reg. 159).

ADDRESS OF SYSTEM: ……

OWMS Permit to INSTAL No.(Reg 25)…… MUNICIPALITY COUNCIL: ……

Certificate to USE No. …… CONTACT:……

An accredited service technician must carry out the service and inspection of your on-site wastewater management system. The results from the maintenance inspection on the condition key components are to be recorded and kept to 5 years.

TYPE OF TREATMENT SYSTEM ? [ ]

ALL OPERATIONAL COMPONENTS OF *OWMS* SERVICED AS PER OPERATING MANAUL. .
No odour detected: …… Noise level < 40dBA: …… Remarks:……

Laundry detergent used: Liquid or power: …….…… EC < 1000 μS/cm:……

WATER QUALITY (Field tests): Odour free ☑… Turbidity >100mm ☑…. DO ……..…. mg/L.

LAST LABORTORY ANALYSIS RESULTS: BOD mg/L, TSS mg/L, DATE: ……..…..

NATA or other Accredited laboratory for analysis of water samples. ……

IRRIGATION SYSTEM, Reg. 159(3): ☑…… WARNING SIGNS IN PLACE: ……

IRRIGATION MAINTENANCE: Screens cleaned ☑ Driplines flushed: ☑
Owner may clean screens and flush driplines between services to manufacturer's instructions:

LAND APPLICATION AREA: No leakage or ponding ☑ ……..……

SLUDGE (BIOSOLIDS) DATE LAST PUMPED: ……GYPSUM spread annual if required:……..…

RECORD AND ADVISE DUTY HOLDER AS APPROPROIATE OF MATTERS REQUIRING ATTENTION:
……

Agreed report back Reported by……

DATE: ……/……/…… TIME: …… am/pm ACTION BY: ……..……..……

OWMS INCIDENT REPORT, Reg.162(2): ……..……

NAME:……..…… PHONE or EMAIL: ……..….

Accredited Service Technician *Accreditation:* ……

This record of service or bio-sludge pump outs must be must be kept for 5 years. Reg.162(1).

© EWS Environmental 2021

7. Conclusions

As a result of our investigations it is concluded that sustainable onsite wastewater management is feasible with appropriate mitigation measures, as outlined, for the proposed three (3) bedroom residence at 37 Bruce Road, Silverleaves.

Specifically, it is recommended (as per attached site plan & specifications) that you:

- Install a secondary wastewater treatment system of a type approved by EPA with a Certificate of Conformity to AS/NZS 1546.3;
- Provide a land application area (LAA) plus a reserve area if needed for dispersal of effluent over an area of 105 m^2 (which may be subdivided into evenly sized zones) for 18m x 1.6m WICK trenches;
- Install water saving fixtures and appliances to reduce the effluent load;
- Use of low phosphorus and low sodium (liquid) detergents to improve effluent quality and maintain soil properties for growing plants; and
- Manage the operation and maintenance of the treatment and disposal system in accordance with manufacturer's recommendations, the EPA system approval, Certificate of Conformity, the EPA Code of Practice (891.4) and recommendations of this report.

SPECIAL NOTES:

Stormwater measures:

- Divert roof drainage away from any effluent dispersal area.
- Provide stormwater diversion drains to site drainage.

Water conservation

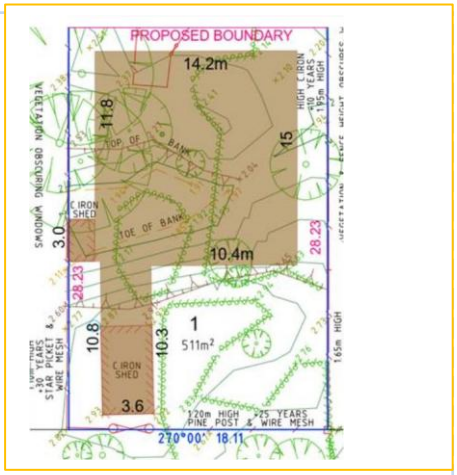
Install at premises (if not already) 3 star WELS rated water closets and shower rose heads.

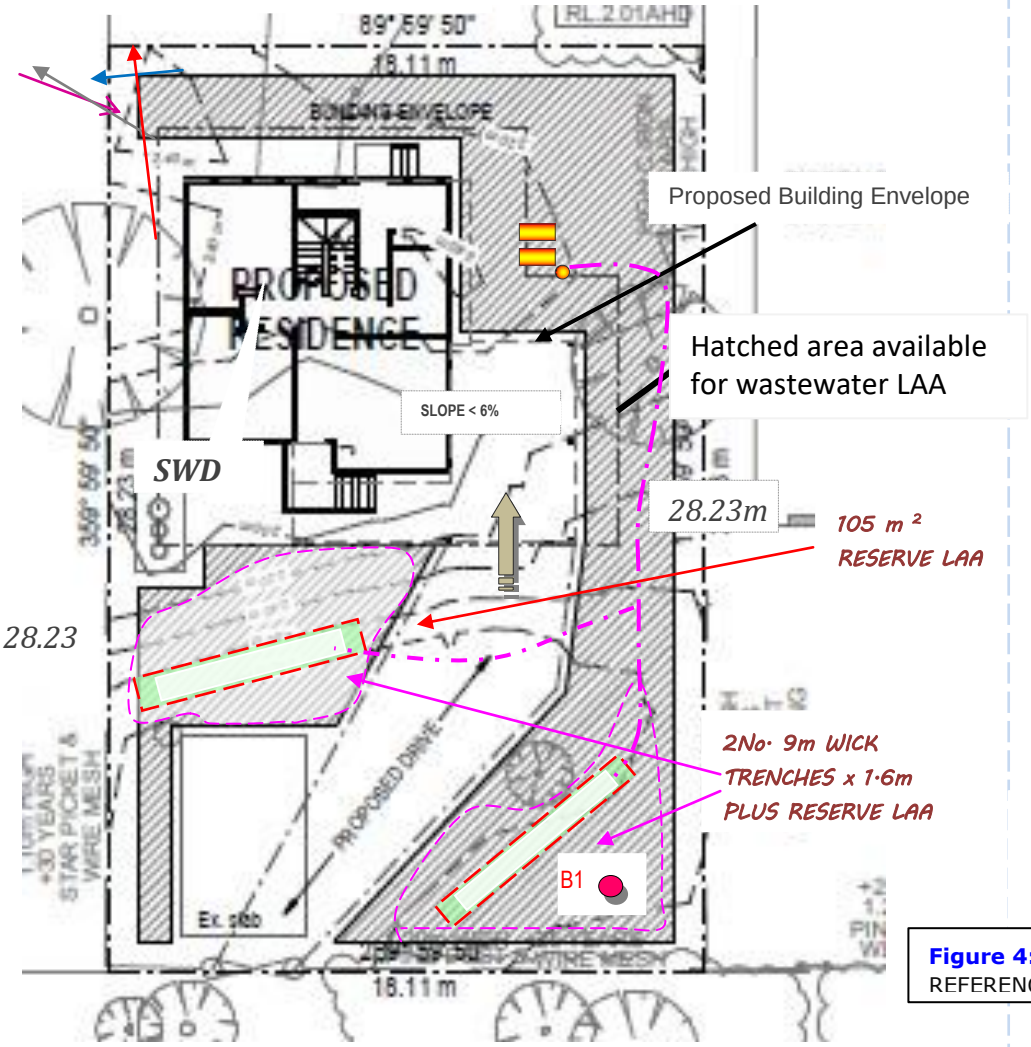
SETBACK DISTANCES, TABLE 5, EPA CODE OF PRACTICE (2016), UP-SLOPE OF BOUNDARIES AND TREATMENT PLANT TO DWELLING ALLOW 6m BOUNDARY

WICK TRENCHES 18m CONSTRUCTED ON FLAT GRADE, 2 No. TRENCHES by 9 m x 1.6m= 50m² over 105m2 INCLUDES RESERVE AREA
EPA CODE OF PRACTICE 891.4 APPENDIX **E**.

PLUMBING WORK TO BE IN ACCORDANCE WITH AS/NZS 3500.5. INSTALL 3 STAR OR HIGHER RATED WATER SAVING FITTINGS & FIXTURES

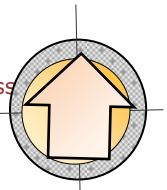
WASTEWATER ENVELOPE
LAND APPLICATION AREA (LAA) **105** m2
CONSTRUCTED ONGRADE TO AS/NZS 1547 & EPA CODE 891.4.





Proposed Building Envelope

Hatched area available for wastewater LAA



***NORTH** (Zone 55)*

LCA - SUMMARY
Soil cat. **Sandy Loam**
Perm. Ksat **> 3.0** m/d
Design Rate **[30** mm/d
No water bores <20m
Groundwater > 2m

LOT AREA => **511** m²
Dispersal area=**105** m²
SLOPE: Fall **< 6** %

LEGEND & KEY
- Insp. Opening
- In line filter screen
- Air release valve
- Rotor valve
- **SEW** Inlet Sewer
- Slope of land
- ① Soil test locations
- ② -3 holes/spatial 9pt AS/NZS1547,D.3.1.2
- EPA approved septic system & dispersal area
- ***COD*** Cut-off drain
- Pressure 32/40DN

ZONING
Township

MAXIMUM LOADING:

No. of Bedrooms: **3**
No. of persons: **4**
Daily flow: **720** L/day
BOD Load:**300 g**BOD/d

MAP REF: 734 K-2
Nearest cross road:
Bayview

www.dialbeforeyoudig.com.au
DIAL1100 BEFORE YOU DIG

Figure 4: SITE PLAN DO NOT SCALE
REFERENCE: **180808** DATE 23.08.21

0 5 10 15 20 metres

SCALE (Approx.) This plan is a sketch and all data shown is general only

SITE PLAN prepared by
EWS ENVIRONMENTAL, PO Box 4, Box Hill 3128
Tel: (03) 9849 0150 **Email**: ews@bigpond.com

Drg No: W180808
Scale: As shown
Date: 30.08.18
Revised: 23.08.21

37 Bruce Road, Silverleaves
Municipal Council: BASS COAST
Installation Date:
System Installed by: .....

Wastewater SITE PLAN

8. References

1. **Canter, LW. and Knox RC.** (1986), *Onsite Wastewater Management System (OWMS) Effects on Ground Water Quality*, Lewis Publishers Inc.

2. **Department of Sustainability and Environment,** *Planning permits for open water supply catchments*, November 2012.

3. **Edis, R** (2014), *Approaches for Risk Analysis of Development with On-Site Wastewater Disposal in Open, Potable Water Catchments*, Mansfield Shire DWMP.

4. **Environment Protection Authority** (2003). Guidelines for *Environmental Management: Use of Reclaimed Water,* Publication 464.2.

5. **Environment Protection Authority** (1991). *Guidelines for Wastewater Irrigation,* Pub. 168.

6. **Environment Protection Authority** (2016). Publication 891.4, *Code of practice-onsite wastewater management*.

7. **Hazelton, P and Murphy, B.** (2007). *Interpreting Soil Test Results – What Do All The Numbers Mean?* CSIRO Publishing, Melbourne

8. **Isbell, R.F.** (1996). The Australian Soil Classification. CSIRO Publishing, Melbourne.

9. **McKenzie, N, Coughlan, K & Cresswell**, H. 2002, Soil Physical Measurement and Interpretation of land Evaluation, CSIRO Publishing.

10. **Municipal Association of Victoria,** Department of Environment and Primary Industries and EPA Victoria (2014) *Victorian Land Capability Assessment Framework*.

11. **Standards Australia** / Standards New Zealand (2012). AS/NZS 1547:2012 *On-site domestic-wastewater management.*

9. Acronyms & Definitions

- AS/NZS - Australian & New Zealand Standards
- EPA – Environment Protection Authority, Victoria
- LCA – Land capability assessment
- LAA - Land application area
- LPED – Low pressure effluent distribution, LPOD – Legal Point of Discharge (Stormwater)
- SAR - Sodium Absorption Ratio (Chem), SAR - Soil Assessment Report (Soil testing)
- Reserve area - a duplicate land disposal area reserved for use when the original land disposal area needs to be rested for future unforeseen contingencies.
- Reticulated water - water supply obtained from mains supply, including any bore, stream or dam.
- Secondary treatment - biological and/or physical treatment following primary treatment of wastewater.
- Sewage - any waste containing human excreta or domestic wastewater.
- TP(1) - Test pit (1), EOH End of Hole, CET Controlled emissions toilet.
- Unsewered area – land where no sewer pipes are adjacent to the allotment boundaries.
- Waterway – as defined by the Water Act 1989

Appendix A: Soil Bore Log

SOIL BORE LOG

EWS ENVIRONMENTAL, PO Box 4, Box Hill, 3128
Email: ews@bigpond.com Telephone: 9849 0150

Client:		Test pit No.	*TP 1 – TP2*
Site:	*37 Bruce Road, Silverleaves*	Assessor:	*JR Lawrey*
Date:	*24 August 2018*	Excavation:	*Pick, spade & auger*
Notes:	*Refer to site plan Fig. 4 for borehole positions*		

 # 1 BORE HOLE - PROFILE DESCRIPTION

Depth (m)	Log	Horizon	Texture	Structure	Colour	Mottles	Fragments	Moisture	Comments
0.10		*A1*	*Sandy Loam*		*Dark*		*nil*	*dry*	*Organic*
0.20									
0.30					*Pale brown*				*Category*
0.60		*B1*	*SAND*	*Massive*		*nil*	*<10%*	*dry*	*2b*
0.90									
1.50									

 # 2 BORE HOLE - PROFILE DESCRIPTION

Depth (m)	Log	Horizon	Texture	Structure	Colour	Mottles	Fragments	Moisture	Comments
0.10		*A1*	*Sandy Loam*		*Dark*		*nil*	*dry*	*Organic*
0.20									
0.30					*Pale brown*				*Category*
0.60		*B1*	*SAND*	*Massive*		*nil*	*<10%*	*dry*	*2b*
0.90									
1.50									

KEY TO SOIL BORELOGS **Symbols** **W** Water table depth **X** Depth of refusal

Graphic Log and Textures

S - Sand
LS – Loamy sand
CS –Clayey sand

CL – Clay loam
SCL – Sandy clay loam
SiCL – Silty clay loam

Gravel (G)

SL – Sandy loam
SC – Sandy clay
SiC – Silty clay

LC – Light clay

Parent material (stiff)

L - Loam
LFS– Loam fine sandy
SiL – Silty loam

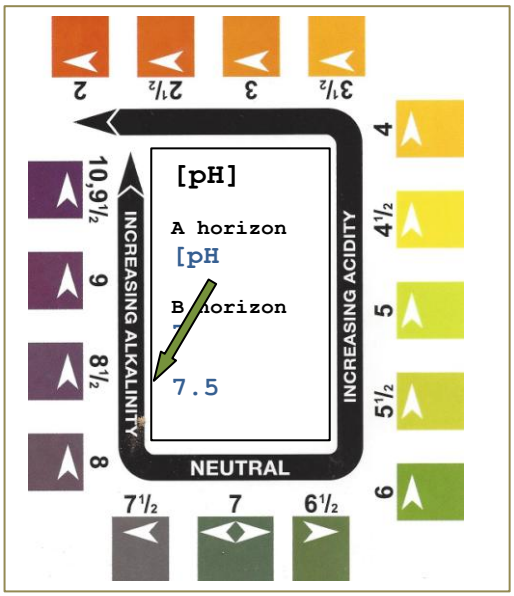
MC – Medium clay
HC – Heavy clay

Parent material (weathered)



Appendix A1 - Field Soil Test & Notes

Test [**pH**] Ref: CSIRO soil test kit



Test [**EC**] Electrical conductivity

[EC] Electrical conductivity
(µS/cm =dS/m x10^{-3}

A horizon

126 µS/cm

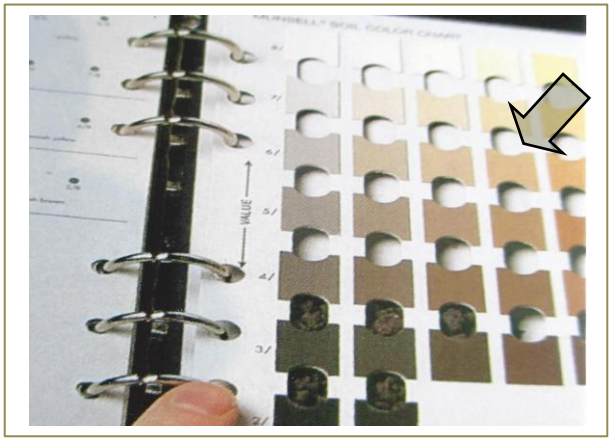
B horizon



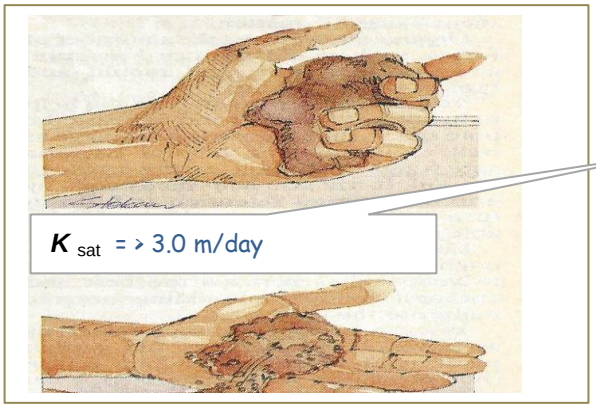
Test: [**EAT**] Modified Emerson -Non dispersive



Colour: Pale brown



Test: [K_{sat}] Soil Permeability (AS/NZS 1547)



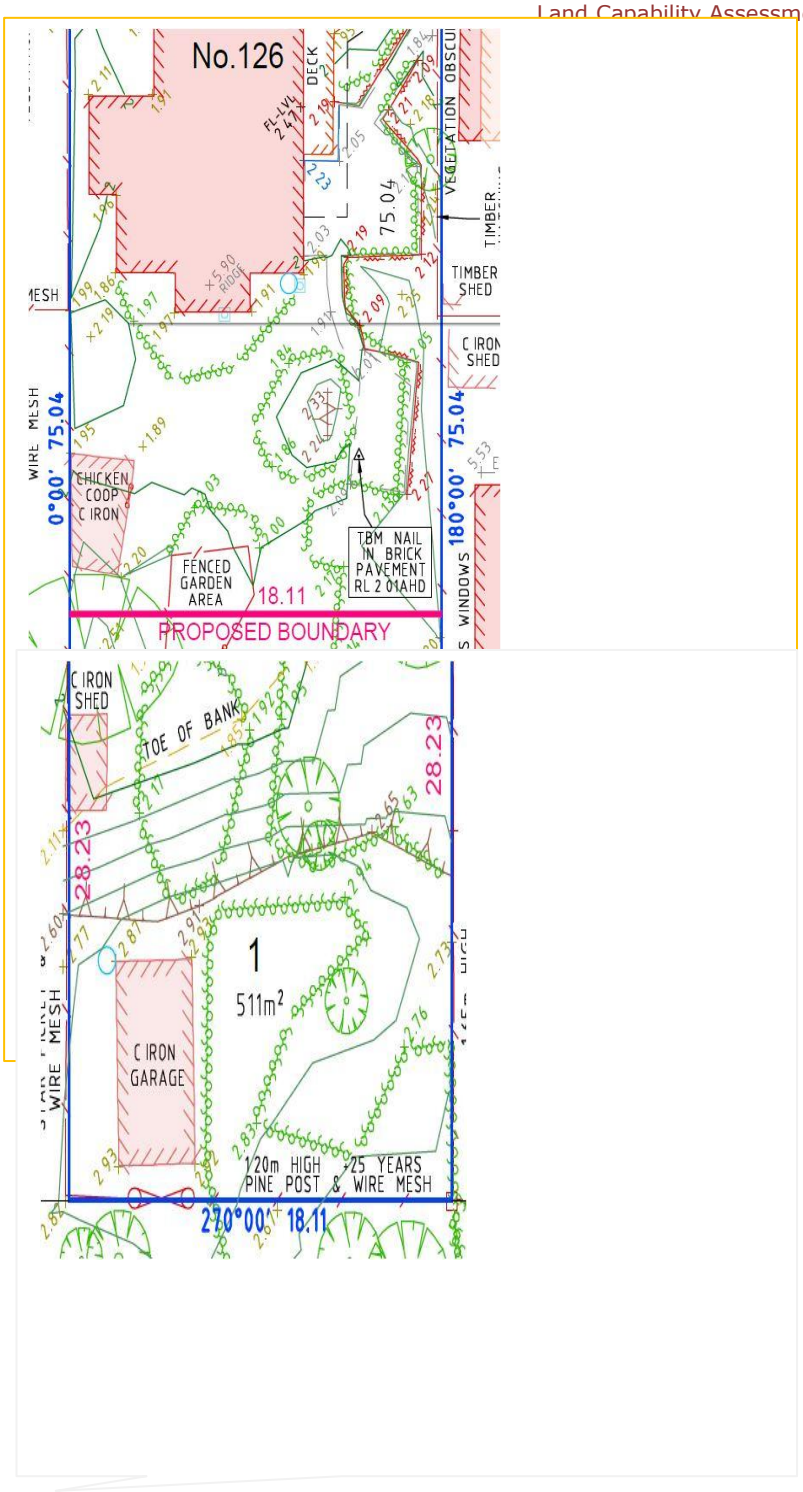
Textural classification [m/day]

Indicative soil permeability

Classification	Properties	Cat	K_{sat} (m/d)
Gravel & sands	Very little to no coherence; cannot be moulded; single grains stick to fingers	1	>3.0
Sandy LOAM	Forms a cast but will not roll into coherent ball; sand grains can be seen and felt; gives a ribbon 15-25 mm long.	2	1.4 - 3.0
LOAMS	Forms a cast but not spongy, very smooth and silky; will form a very thin ribbon 25 mm long and dries rapidly.	3	0.5 - 1.5
Clay LOAM	Can be rolled into ball with a spongy feel; slightly plastic; smooth to manipulate; forms a ribbon 40-50 mm long.	4	0.12 - 0.5
Light CLAY	Smooth plastic ball that can be rolled, slight resistance to shearing between thumb and fore finger; ribbon 50-70mm.	5	0.06-0.12
Medium to heavy CLAY	Smooth plastic ball, handles like plasticine, can be moulded into rods without fracture; some resistance to ribboning, forms a ribbon 75mm or more long.	6	<0.06

Field tests conducted by: J R Lawrey MIEAust No. 142295 Date: *24 August 2018*

Appendix A2 - Feature Survey & Notes


No.126
DECK
VEGETATION OBSCU
TIMBER
TIMBER SHED
C IRON SHED
WIRE MESH
0°00' 75.04
180°00' 75.04
CHICKEN COOP C IRON
FENCED GARDEN AREA
18.11
TBM NAIL IN BRICK PAVEMENT RL 2.01AHD
PROPOSED BOUNDARY
S WINDOWS
C IRON SHED
TOE OF BANK
28.23
28.23
1
511m²
C IRON GARAGE
WIRE MESH
1.20m HIGH 25 YEARS PINE POST & WIRE MESH
270°00' 18.11

Appendix A-1: Irrigation loading rates

Table 9: Soil Categories and Recommended Maximum Design Loading/Irrigation Rates (DLR/DIR) for Land Application Systems [1,2,5]

Soil texture	Soil structure	Soil category	Indicative permeability (Ksat) (m/d)	Design Loading Rates and Design Irrigation Rates (DLR / DIR) (mm/day)					
				Absorption trenches/beds and Wick Trench & Bed Systems 6 for primary effluent (see Table L1 in AS/NZS 1547:2012)	(ETA) Evapo-transpiration absorption beds and trenches (see Table L1 in AS/NZS 1547:2012)	Secondary treated effluent applied to Wick Trench & Bed System [4]	Sub-surface and surface irrigation (see Table M1 in AS/NZS 1547: 2012)	LPED (see Table M1 in AS/NZS 1547:2012)	Mounds (basal are (see Table AS/NZS 1 2012)
Gravels and sands	Structureless (massive)	1	>3.0	NA [3]	NA [3]	25	5 [6] (see Note 2 in Table M1)	NA [3]	2
Sandy loams	Weakly structured	2a	>3.0						2
	Massive	2b	1.4 – 3.0	15	15	30		4	2
Loams	High / moderate structured	3a	1.5 – 3.0	15	15	30	4 (see Note 1 in Table M1)	3.5	2
	Weakly structured or massive	3b	0.5 – 1.5	10	10	30			1
Clay loams	High / moderate structured	4a	0.5 – 1.5	10	12	30	3.5 (see Note 1 in Table M1)	3	1
	Weakly structured	4b	0.12 – 0.5	6	8	20			
	Massive	4c	0.06 – 0.12	4	5	10			(see N Tabl
Light clays	Strongly structured	5a	0.12 – 0.5	5	8	12	3 (see Note 1 in Table M1)	2.5 (see Note 4 in Table M1)	
	Moderately structured	5b	0.06 – 0.12	(see Notes 2 and 3 in Table L1)	5 (see Notes 2, 3 & 5 in Table L1)	10			(see N Tabl
	Weakly structured or massive	5c	<0.06			8			
Medium to heavy clays	Strongly structured	6a	0.06 – 0.5			5 (see Notes 2 and 3 in Table L1)	2 (see Note 2 in Table M1)	NA	
	Moderately structured	6b	<0.06						
	Weakly structured or massive	6c	<0.06						

Appendix B-1: Water balance calculations

Site Address 37 Bruce Road, Silverleaves — Dispersal: **DRIP** — *Ref:* ***180808*** — Date: **24/08/2018**
Input data Rainfall BoM Stn: **778** mm — Evaporation: **1069** mm — *Design Flow:* ***720*** *L/day* — Irrigation Rate: **5**mm/d

Irrigation area sizing using Nominated Area Water Balance & Storage Calculations

Site Address: SUBSURFACE DRIP IRRIGATION - Silverleaves Ave. Silverleaves

INPUT DATA — **Date:** 24-Aug-18 — **Assessor:** *JR Lawrey MIE Aust*

Design Wastewater Flow	Q	720	L/day	Based on maximum potential occupancy and derived from Table 4 in the EPA Code of Practice (2016)
Soil permeability	K	3	m/day	Soil permeability derived from constant head test to Appendix G in AS/NZS 1547:2012
Design Loading Rate	DLR	**5.0**	mm/day	Based on soil class permeability and derived from Table 9 in the EPA Code of Practice (2016)
Land Application Area	L	**199**	m sq	DRIP irrigation dispersal to AS/NZS 1547
Crop Factor	C	0.6 -0.8	unitless	Estimates of evapotranpiration as a fraction portion of panevaporation; varies over season and crop type
Retained Rainfall	RF	0.9	unitless	Proportion of rainfall that remains onsite and infiltrates, allowing for any runoff
Rainfall Data	Average rainfall for COWES 86025 778 mm			
Evaporation Data	BOM Pan A, Devilbend - Aspendale 86104- 1058-1444mm			

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Days in month	D	\	days	31	28	31	30	31	30	31	31	30	31	30	31	**365**
Rainfall	R	\	mm/month	36	34	46	60	72	75	68	72	67	65	55	43	**778**
Evaporation	E	\	mm/month	185	140	112	82	54	37	44	58	69	96	121	141	**1139**
Crop Factor	C			0.80	0.80	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.80	0.80	0.80	
OUTPUTS																
Evapotranspiration	ET	ExC	mm/month	148	112	78	57	38	26	31	41	48	77	97	113	**865.6**
Percolation	B	DIR x D	mm/month	155	140	155	150	155	150	155	155	150	155	150	155	**1825**
Outputs		ET+B	mm/month	303	252	233	207	193	176	186	196	198	232	247	268	**2691**
INPUTS																
Retained Rainfall	RR	R*0.80	mm/month	32	31	41	54	65	68	61	65	60	59	50	39	**624**
Effluent Irrigation	W	(QxD)/L	mm/month	112	101	112	108	112	108	112	112	108	112	108	112	**1319**
Inputs		RR+W	mm/month	144	132	153	162	177	176	173	177	169	171	158	151	**1943**
STORAGE CALCULATION																
Storage remaining from previous month			mm/month	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Storage for the month	S	(RR+W)-(ET+B)	mm/month	-158.6	-120.2	-80.0	-45.0	-16.0	0.0	-12.6	-18.8	-29.6	-61.3	-88.9	-117.1	**-292.6**
Cumulative Storage	M		mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Maximum Storage	N		mm	0.00												
	V	NxL	L	0												
LAND AREA REQUIRED FOR ZERO STORAGE			m^2	82	91	116	141	174	**199**	179	171	157	129	109	97	

MINIMUM AREA REQUIRED FOR ZERO STORAGE: 199 m^2

Water Balance Calculations B-2

Site Address 37 Bruce Road, Silverleaves — Dispersal: **WICK** trenches *Ref:* ***180808*** — Date: **24/08/2018**
Input data Rainfall BoM Stn: **778** mm — Evaporation: **1069** mm *Design Flow:* ***720*** *L/day* — Design Rate: 30 mm/d

Irrigation area sizing using Nominated Area Water Balance & Storage Calculations

Site Address: WICK TRENCH SYSTEM - Silverleaves Ave. Silverleaves

INPUT DATA				**Date:**	24-Aug-18	**Assessor:**	*JR Lawrey MIE Aust*
Design Wastewater Flow	Q	720	L/day	Based on maximum potential occupancy and derived from Table 4 in the EPA Code of Practice (2016)			
Soil permeability	K	3	m/day	Soil permeability derived from constant head test to Appendix G in AS/NZS 1547:2012			
Design Loading Rate	DLR	**30.0**	mm/day	Based on soil class permeability and derived from Table 9 in the EPA Code of Practice (2016)			
Land Application Area	L	**25**	m sq	DRIP irrigation dispersal to AS/NZS 1547			
Crop Factor	C	0.6 -0.8	unitless	Estimates of evapotranpiration as a fraction portion of panevaporation; varies over season and crop type			
Retained Rainfall	RF	0.9	unitless	Proportion of rainfall that remains onsite and infiltrates, allowing for any runoff			
Rainfall Data	Average rainfall for COWES 86025 778 mm						
Evaporation Data	BOM Pan A, Devilbend - Aspendale 86104- 1058-1444mm						

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Days in month	D	\	days	31	28	31	30	31	30	31	31	30	31	30	31	**365**
Rainfall	R	\	mm/month	36	34	46	60	72	75	68	72	67	65	55	43	**778**
Evaporation	E	\	mm/month	185	140	112	82	54	37	44	58	69	96	121	141	**1139**
Crop Factor	C			0.80	0.80	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.80	0.80	0.80	
OUTPUTS																
Evapotranspiration	ET	ExC	mm/month	148	112	78	57	38	26	31	41	48	77	97	113	**865.6**
Percolation	B	DIR x D	mm/month	930	840	930	900	930	900	930	930	900	930	900	930	**10950**
Outputs		ET+B	mm/month	1078	952	1008	957	968	926	961	971	948	1007	997	1043	**11816**
INPUTS																
Retained Rainfall	RR	R*0.80	mm/month	32	31	41	54	65	68	61	65	60	59	50	39	**624**
Effluent Irrigation	W	(QxD)/L	mm/month	887	801	887	858	887	858	887	887	858	887	858	887	**10444**
Inputs		RR+W	mm/month	919	832	928	912	952	926	948	952	919	946	908	926	**11068**
STORAGE CALCULATION																
Storage remaining from previous month			mm/month	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Storage for the month	S	(RR+W)-(ET+B)	mm/month	-158.6	-120.2	-80.0	-45.0	-16.0	0.0	-12.6	-18.8	-29.6	-61.3	-88.9	-117.1	**-292.6**
Cumulative Storage	M		mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Maximum Storage	N		mm	0.00												
	V	NxL	L	0												
LAND AREA REQUIRED FOR ZERO STORAGE			m^2	21	22	23	24	25	**25**	25	25	24	24	23	22	

MINIMUM AREA REQUIRED FOR ZERO STORAGE: 25 m^2