VEGETATION MANAGEMENT PLAN

60 STAPYLTON JACOBS WELL ROAD, 82 CHRISTENSEN ROAD AND 31 YELLOWOOD ROAD, STAPYLTON.

LOT 1 on RP6882, Lot 240 on W31320 and Lot 4 on RP6843

Stage 1

PREPARED FOR: **KS8 Pty. Ltd.**

May 2018

gassman development perspectives

project coordination
urban + regional planning
landscape + urban design
environmental management
visualisation + spatial services
surveying services
advisory services

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GDP Document Control

Originating Office:	Yatala	Job Number:	5738
Physical Address:	76 Business Street	Job Name:	
	Yatala	Project Manager:	Brian Gassman
	QLD 4207	Document Title:	Vegetation
Postal Address:	PO Box 392	Management Plan	
	BEENLEIGH.Q. 4207	Author:	Kathryn Tibbles
Phone:	+61 7 3807 3333	Client:	KS8 Pty. Ltd.
Fax:	+61 7 3287 5461	Client Contact:	
Email:	mail@gassman.com.au	Client Reference:	
Web:	www.gassman.com.au		

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1. Introduction

1.1. Background

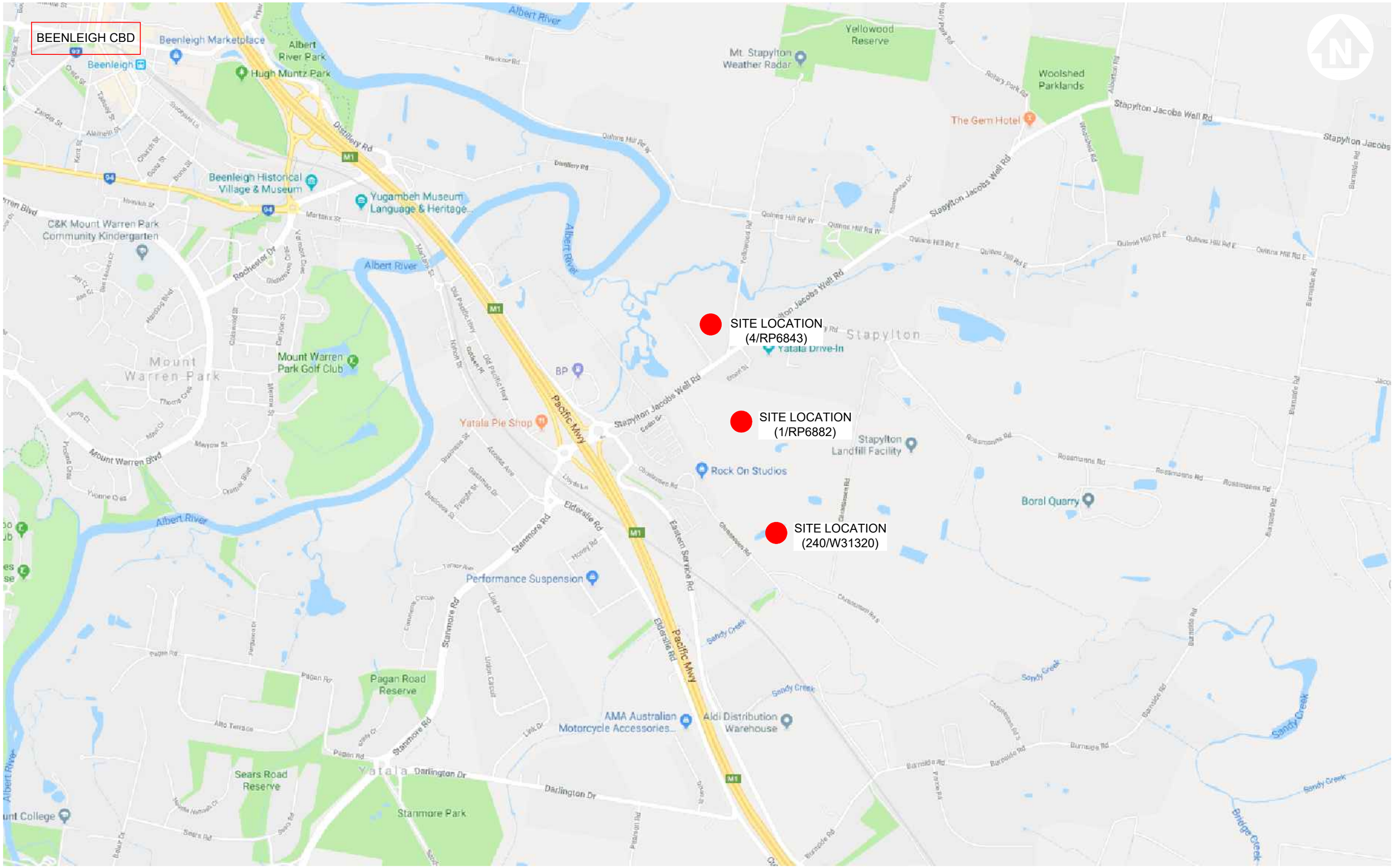
This Vegetation Management Plan (VMP) has been produced by Gassman Development Perspectives in support of proposed vegetation clearing works to facilitate a large scale industrial subdivision. It prescribes the methods in which vegetation should be removed from the subject site in support of the required earthworks to facilitate the proposed industrial development.

This VMP focuses on land occurring over Lot 4 on RP6843, Lot 1 on RP6882 and Lot 240 on W31320, Stapylton. The proposed vegetation clearing is required on Lots 1 on RP6882 and 240 on W31320 to facilitate Stage 1 of the proposed industrial subdivision. Compensatory earthworks are also required on Lot 4 on RP6843 solely for the purpose of providing flood storage and conveyance of the floodplain within the Stapylton area.

The subject site is located approximately 400m to the east of the Pacific Motorway (Figure 1 and 2). The site is currently a mixture of improved pasture in the lower and flatter parts of the site, and low and tall open remnant forests in the north eastern and south eastern corners of the site.

Details of individual trees recorded on the subject site include the species, trunk diameter, height, canopy spread and fauna use.

Trees were recorded using survey equipment and methods. This information has been used for the best practice management strategies for managing clearing on the site. The records of these trees are included in Attachment 1 to this report.



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Gold Coast and Logan Office
Access Business Park
76 Business Street Yatala Q. 4207
t: (07) 38073333
f: (07) 32875461
e: mail@gassman.com.au
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figure 1 - locality | stapylton-jacobs well road, stapylton
KS8 Pty. Ltd.

date: 01-02-18
scale: NTS
design: RM/KT
plan: 5738 E VMP FIG 1

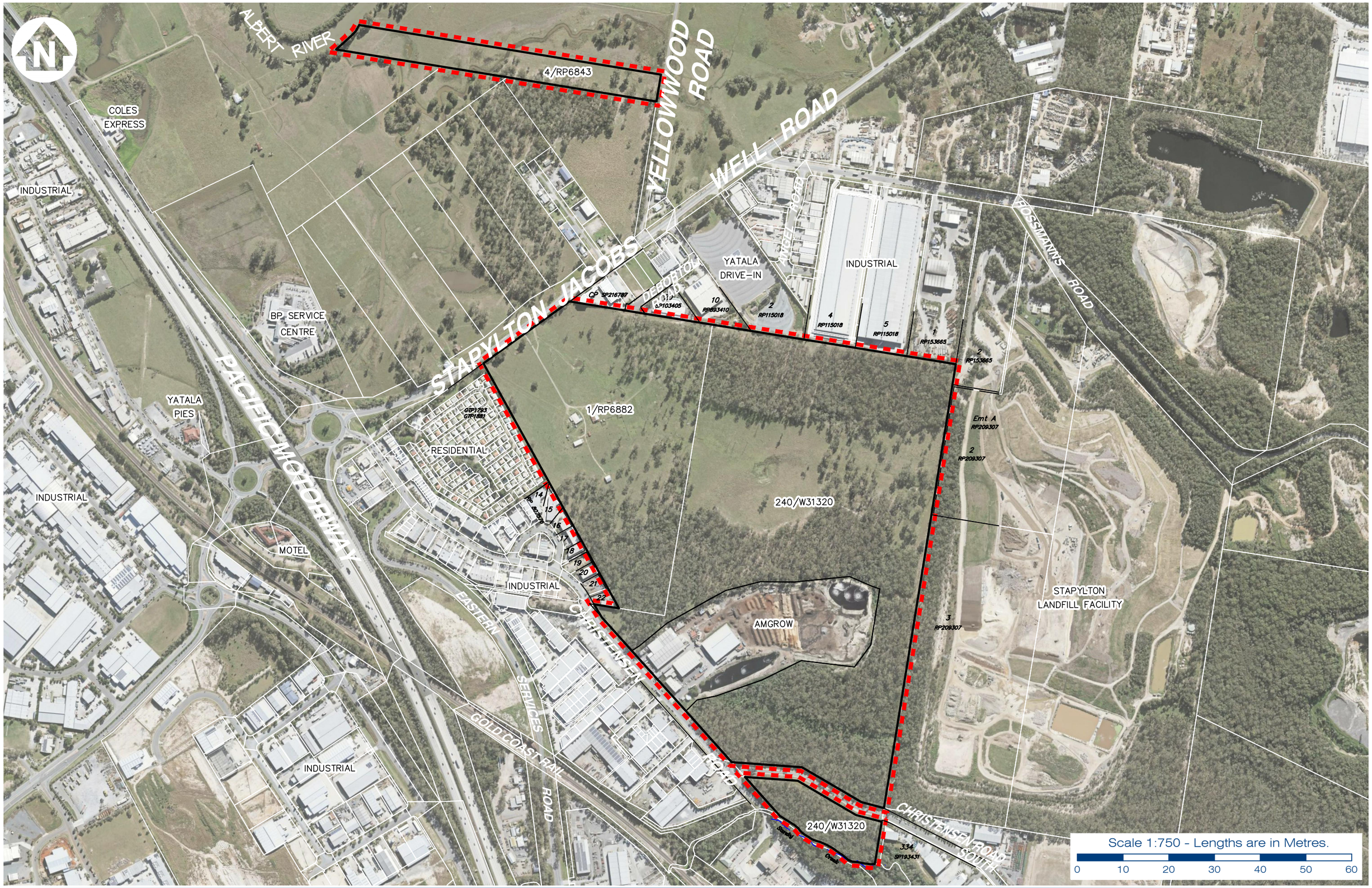

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figure 2 - aerial | stapylton-jacobs well road, stapylton
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date: 05-12-17
scale: 1:750
design: RM/KT
plan: 5738 E VMP FIG 2

2. Purpose

The principle intention of this VMP is to appropriately reflect the current tree species on the site, their location, management and treatment in relation to removal, retention, protection, relocation, propagation and enhancement.

Because of the size of the site, only the trees within the more open areas of the site were individually surveyed. The remaining vegetation subject to this VMP have been identified in vegetation groups. In the more open areas, trees over 40cm in diameter at 1.3 above the ground, or over 4m in height, were individually recorded.

A total of 690 trees were individually surveyed on site, and four additional vegetation groups identified. All of the trees and vegetation groups within the Stage 1 earthworks extent on Lots 1 on RP6882 and 240 on W31320 require removal as part of the proposed development. On Lot 4 on RP6843, some trees are proposed to be retained; these have been identified on the Tree Survey Plan for this part of the site. Of the individually surveyed trees 272 trees were observed to contain habitat values, with 268 proposed of these proposed for removal. Notes have been included in the Tree Survey Plan identifying habitat values associated with individually surveyed trees. There is also expected to be similar habitat values associated within the areas surveyed as vegetation groups. Consequently, a qualified fauna spotter/catcher should be engaged to be present during all clearing operations.

3. VMP Provisions

This VMP has been structured in a manner to incorporate the following provisions:

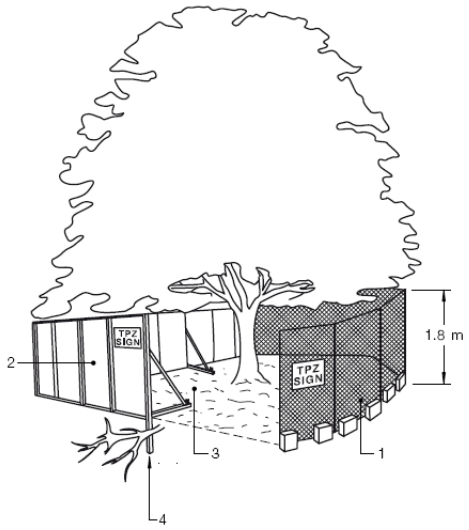
- The location and extents of the proposed construction areas in which the vegetation will be removed and areas that will be protected;
- Particulars of the vegetation occurring on site (Appendix 1);
- A statement of the reasons for the damage and associated factors;
- A vegetation management plan which details the procedures on the following;
    - Vegetation protection
    - Vegetation to be removed
    - Corrective action
    - Reuse of felled Vegetation
    - Stockpiles
    - Habitat Trees
    - Ecological role of the vegetation to be removed
    - Invasive weed species
    - Summary of performance indicators

4. VMP Objectives

4.1. Vegetation Protection

As the required vegetation clearing is for a staged industrial subdivision, all vegetation within the extent of Stage 1 earthworks on Lots 1 on RP6882 and 240 on W31320 is proposed to be removed. On Lot 4 on RP6843, all trees within the Stage 1 Earthworks extent and in the adjacent vegetation Group 4 are required to be removed for compensatory earthworks and access for machinery. However, an effort has been made to retain large habitat trees towards the front of Lot 4 on RP6843. The limit to the proposed clearing for Stage 1 is identified in the Tree Survey Plans provided in Appendix 1, and includes all necessary clearing, including drainage lines, sediment basins and access for construction plant. While, further applications and VMP's may be submitted to support additional clearing of vegetation for future stages, vegetation outside the Stage 1 clearing extent on the subject site will be retained under this VMP.

Because of the scale of the clearing, hard standing steel fence (Figure 3) as per Australian Standard AS 4970-2009 (Protection of Trees on Development Sites) is not a feasible option for protecting retained vegetation. Instead, orange mesh fencing between steel pickets and supported by a continuous wire will be utilised to clearly mark the extent of clearing associated with this Stage 1 VMP. As no vegetation is proposed to be retained within the Stage 1 earthwork extent on Lots 1 on RP6882 and 240 on W31320, no individual tree protection measures are considered necessary. Orange mesh fencing will also be sufficient to delineate the extent of Stage 1 Earthworks on Lot 4 on RP6843 to ensure the retained trees are not damaged. The Stage 1 Earthworks will not impact on tree root systems of these retained trees.



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 3: Individual Tree Protection

The following measures will ensure vegetation outside of the Stage 1 extent is retained in accordance with this VMP;

1) The limit of Stage 1 vegetation clearing will be clearly demarcated with orange mesh fencing between steel pickets and supported by a continuous wire

2) All machine operators conducting the tree clearing process are to have a copy of the approved Tree Clearing Plan;

3) No site sheds, parking areas or buildings are located within the retained vegetation outside of the Stage 1 clearing extent, or under its drip line;

4) The area surrounding the trees for removal is clear of any hazards and maintains adequate room to safely conduct the removal;

5) The vegetation removal process has focused on providing environmentally sensitive and sustainable practices including:

- Fauna removal if required;
- Direction of clearance and felling; and
- Reuse of felled material for on site use

6) The following activities are prohibited to occur within the vegetation protection zones or drip-lines of retained vegetation outside of the Stage 1 extent:

- Machinery or vehicle parking;
- Disposal of liquids of any type;
- Repairs or refuelling;
- Earthworks;
- Temporary sheds; and
- Stockpiling (Refer to section 4.5).

4.2. Vegetation to be Removed

All vegetation within the identified Stage 1 Extent is proposed to be removed on Lots 1 on RP6882 and 240 on W31320. On Lot 4 on RP6843, all trees within the Stage 1 Earthworks extent and in the adjacent vegetation Group 4 are required to be removed for compensatory earthworks and access for machinery. The vegetation communities and individual habitat bearing trees are clearly indicated in the plan contained within Appendix 1.

Small trees, re-growth, understorey or groundcover species that also occur within the allocated clearance areas have not been individually identified. Only individual trees in more open areas have been individually surveyed in Appendix 1, with the remaining vegetation proposed to be removed identified in vegetation groups.

4.2.1. Reasons for Vegetation Removal

The vegetation present on the subject site requires removal for several reasons relating to the proposed development including:

- To facilitate the approved Bulk Earthworks and ultimate construction of proposed industrial subdivision;
- Construction of Stage 1 site access, roads and driveways;
- Necessary drainage and sediment basin infrastructure; and
- Safety for future industrial uses over the property.

4.2.2. Tree Clearing Process

The manner by which the vegetation should be removed from the subject site is outlined in the following section:

1) A pre-start meeting with an environmental officer from Gold Coast City Council prior to commencement shall be scheduled.

2) Locate and fence the extent of clearing to ensure the trees outside the clearing extent of Stage 1 have been protected in accordance with the procedures outlined in Section 4.1 of this report.

3) Fell the allocated vegetation; ensure that it occurs in the recommended clearance direction (Figure 4), i.e., to direction fauna towards retained vegetation, and away from adjacent roads.

5) Woodchip the felled vegetation on site.

6) Stockpile the wood-chipped vegetation in areas which are adequately set back from the retained vegetation.

7) Stump grind remains or remove from ground with excavator.

Legend

- Stage 1 Earthworks Extent_20180110
- Recommended Clearance Direction
- Subject Site
- DCDB_clipped_20170920

250 0 250 500 750 1000 m

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)

Grid: Map Grid of Australia GDA94

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Figure 4 - Clearing Direction

KS8 Pty. Ltd.
Vegetation Management Plan

date: 28.03.2018
scale: 1:7000@A3
plan: Figure 4 - Tree Clearing Direction

4.3. Corrective Actions

If vegetation not identified for removal is disturbed during the bulk earthworks process, then discussions with Council environmental officers will be required to identify any needs for additional rehabilitation to compensate the tree damage or removal.

If a retained tree shows signs of ill health, then the causes are to be identified and amelioration methods are to be discussed with council.

4.4. Reuse of Felled Vegetation

Any wood chipped vegetation should be reused on the site in any future landscape and site stabilisation where appropriate. If a surplus of mulch is produced, it may be transported off site for alternative uses elsewhere. To achieve satisfactory mulch, material pasteurisation is the minimum process required to achieve weed and pathogen free mulch from the chipping process.

The large, fallen trees detected on site will be retained for fauna use. When in the clearing zone, they will be moved to an adjacent area outside the development area.

4.5. Stockpiles

Stockpiles of felled vegetation should be managed with the following considerations:

- Stockpiles are not to be located within 30 meters from significant stands of vegetation.
- Stockpiles are not to be located in areas allocated for road constructions.
- Stockpiles are not to be located in areas with difficult access or on steep slopes.
- Stockpiles are not to exceed 1000mm in height.
- Stockpiles are to be covered with appropriate plastic and fixed securely.
- Stockpiles left for longer than 8 hours should be inspected by a spotter catcher immediately prior to mulching and the spotter catcher must be present for works

5. Fauna Inspection

Individual trees observed to contain fauna values, or trees are very large (>80cm DBH) and have potential fauna values are identified in Appendix 1.

A fauna spotter catcher is required to be present prior to works commencing and inspect the site to ensure identification of any wildlife or habitat features (e.g. nest, tree hollows) prior to clearing. Clearing is not to commence until the fauna spotter has certified that the site has been fully inspected and any necessary fauna protection measures or relocation procedures implemented. A brief letter from the fauna spotter/catcher will be supplied directly to the council ecologist to demonstrate compliance with this condition.

A fauna Spotter Catcher should be on site for the removal of all vegetation. The spotter catcher should hold a current permit with the Department of Environment and Heritage Protection (EHP). Captured fauna should be relocated directly into the retained vegetation outside of the Stage 1 clearing extent immediately adjacent to the clearance area in an appropriate manner. This information can be expanded upon more thoroughly in a Fauna Management Plan conditioned by council if considered necessary.

A pre-start meeting is to be arranged with a Gold Coast City Council Environmental Officer prior to the commencement of vegetation clearing. The ecologist will inspect the tree protection measures. The fauna spotter catcher and consulting ecologist shall be present during the pre-start meeting. The fauna spotter/catcher will submit a letter to Council following the clearing reporting on the details of any fauna rescued, relocated or otherwise.

6. Sediment Control

Sediment control onsite once the clearing process begins should include sediment fencing around the clearance area to reduce the risks of erosion and subsequent sediment entrainment resulting from rain events which may impact upon the adjacent retained vegetation. These measures should be installed once clearing and reshaping of the site begin, and until completion of works once the site is re-stabilised.

Sediment fencing will be installed prior to ground disturbance and 'grubbing' immediately following the initial felling and clearing of the vegetation.

Sediment and erosion control measures will be put in place in accordance with the approved Sediment and Erosion Control Plan.

7. Summary of Performance Indicators

1. Tree removal was restricted to allocated and approved areas;
2. Trees that remain in protected areas are in a healthy condition;
3. The spotter catcher was present for all clearing activities;
4. Fauna was relocated to suitable recommended locations;
5. Clearing occurred in the recommended direction;
7. No increased erosion or sediment loss occurred from site as a result of the tree clearing; and
8. Felled vegetation has been wood-chipped and stockpiled.

8. Conclusion

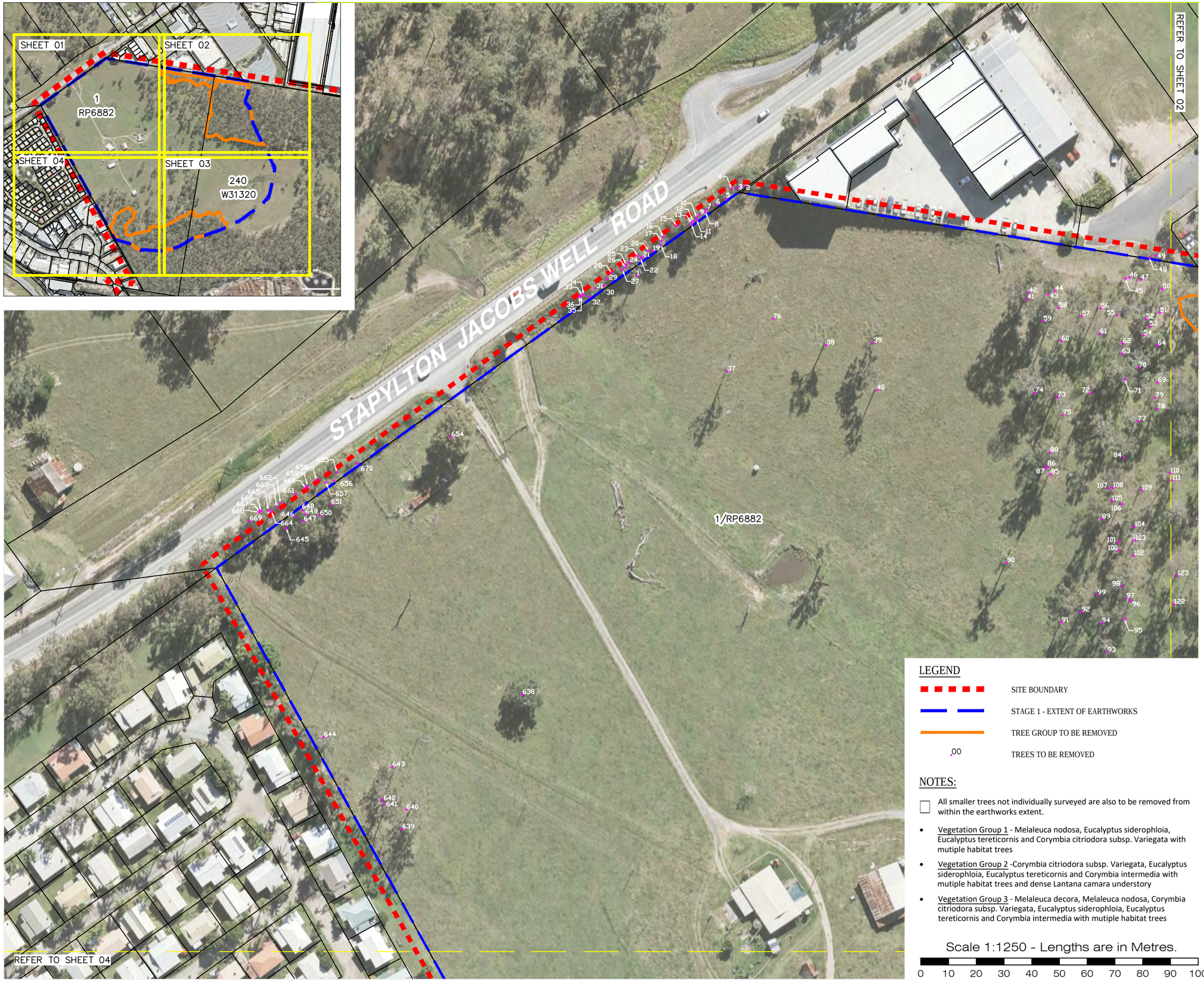
A total of 690 trees were individually surveyed on site, and four additional vegetation groups identified. Of the individually surveyed trees, 272 trees contained habitat values. Habitat values are expected to also be present within the surveyed vegetation groups. All of the trees and vegetation groups within the Stage 1 earthworks extent on Lots 1 on RP6882 and 240 on W31320 are proposed to be removed. On Lot 4 on RP6843, all trees within the Stage 1 Earthworks extent and in the adjacent vegetation Group 4 are required to be removed for compensatory earthworks and access for machinery. Some large habitat trees on Lot 4 on RP6843 are proposed to be retained.

Due to the structure of the vegetation to be removed and its current habitat values, a suitably qualified fauna spotter/catcher will need to be present during all clearing operations.

Specific methodologies have been prescribed which are to be adhered to at all times during the clearing process to ensure that best practice is achieved at all times, and the ecological impacts of the proposed works are minimised as far as practicable.

The above specifications and management plans have been included with the graphic plans to provide the necessary information for council officers to enable it to make a reasonable assessment of the proposed actions. This report has outlined procedures in relation to the vegetation management and clearing procedures to be undertaken as an operational works component for the facilitation of the reconfiguring a lot application currently over the subject site.

Appendix 1 – Tree Survey Plan



LEGEND

- SITE BOUNDARY
- STAGE 1 - EXTENT OF EARTHWORKS
- TREE GROUP TO BE REMOVED
- .00 TREES TO BE REMOVED

NOTES:

- All smaller trees not individually surveyed are also to be removed from within the earthworks extent.
- Vegetation Group 1 - Melaleuca nodosa, Eucalyptus siderophloia, Eucalyptus tereticornis and Corymbia citriodora subsp. Variegata with mutiple habitat trees
- Vegetation Group 2 -Corymbia citriodora subsp. Variegata, Eucalyptus siderophloia, Eucalyptus tereticornis and Corymbia intermedia with mutiple habitat trees and dense Lantana camara understory
- Vegetation Group 3 - Melaleuca decora, Melaleuca nodosa, Corymbia citriodora subsp. Variegata, Eucalyptus siderophloia, Eucalyptus tereticornis and Corymbia intermedia with mutiple habitat trees

Scale 1:1250 - Lengths are in Metres.

0 10 20 30 40 50 60 70 80 90 100

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Stapylton-Jacobs Well Road, Stapylton

RPD:	
Lot:	1
Plan:	RP6882
Parish:	
County:	
Local Authority:	Gold Coast City Council
Level Datum:	
Meridian:	
Contour Interval:	
PSM:	
RL:	

Associated Consultants:

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TREE SURVEY PLAN

STAGE 1

SHEET 01 OF 04

Drawing No: 5738 E VMP TSP S 00

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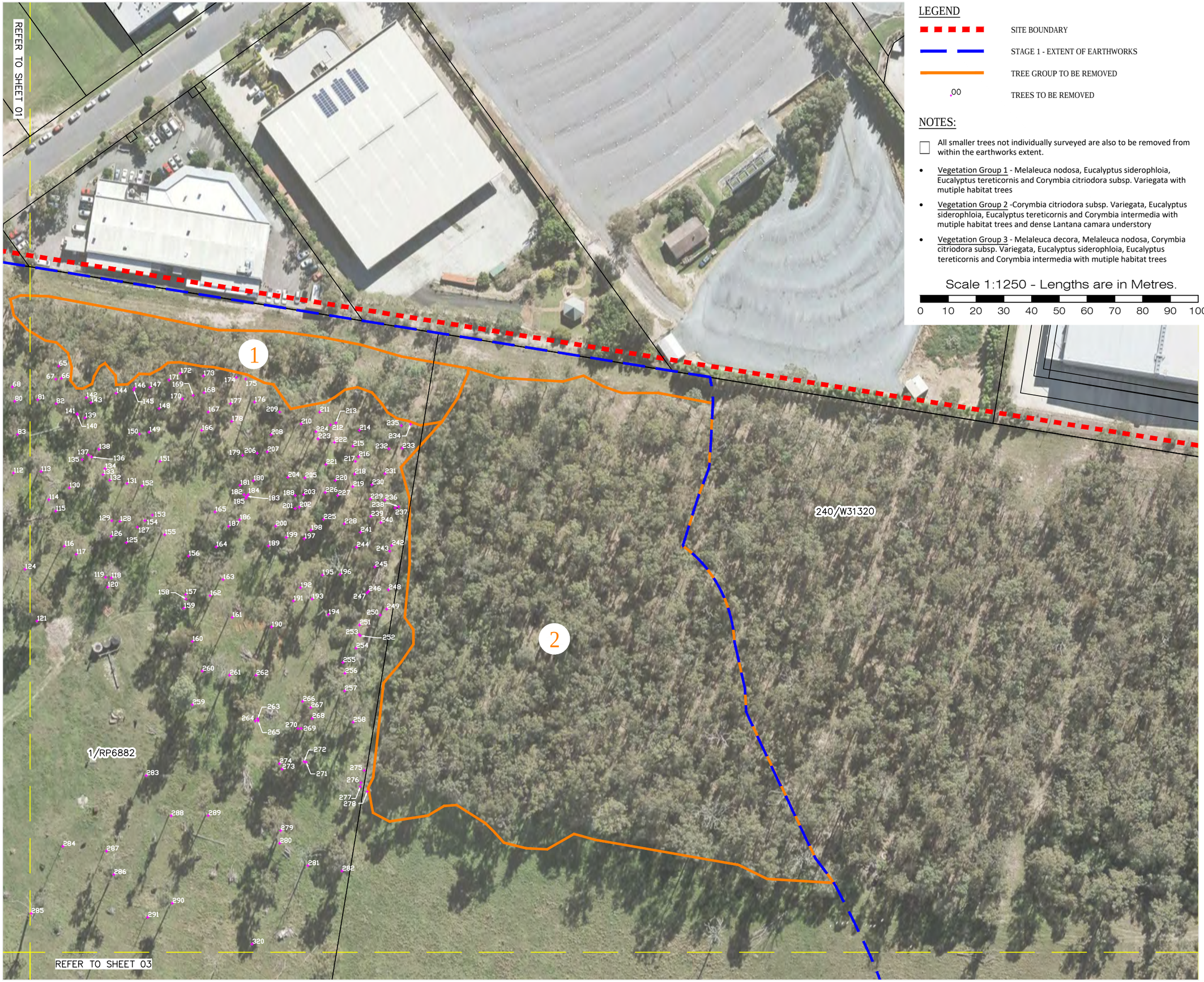

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- SITE BOUNDARY
- STAGE 1 - EXTENT OF EARTHWORKS
- TREE GROUP TO BE REMOVED
- .00 TREES TO BE REMOVED

NOTES:

- All smaller trees not individually surveyed are also to be removed from within the earthworks extent.
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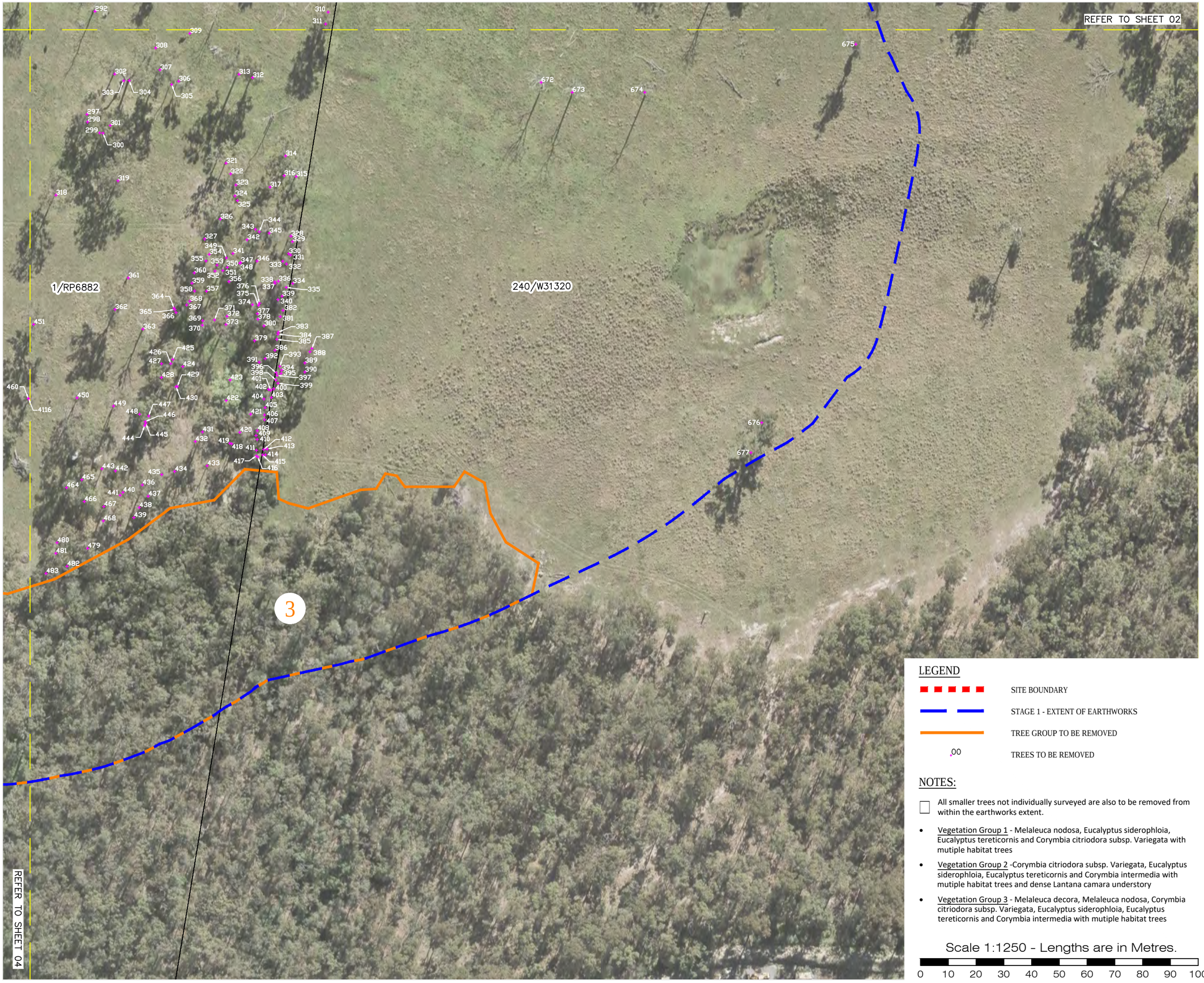
TREE SURVEY PLAN

STAGE 1

SHEET 02 OF 04

Drawing No: 5738 E VMP TSP S 00

Rev. No:



LEGEND

- SITE BOUNDARY
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- TREE GROUP TO BE REMOVED
- 00 TREES TO BE REMOVED

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Issue	Date	Description	DRN	CHK
-	08-02-18	ORIGINAL ISSUE	RGM	KT

Scale at A3: 1:1250
Date: 08-02-18
Design: .
Drawn: RGM
Checked: KT

Drawing Title:

TREE SURVEY PLAN
STAGE 1

SHEET 03 OF 04

Drawing No: 5738 E VMP TSP S 00
Rev. No:

LEGEND

- SITE BOUNDARY
- STAGE 1 - EXTENT OF EARTHWORKS
- TREE GROUP TO BE REMOVED
- .00 TREES TO BE REMOVED

NOTES:

- All smaller trees not individually surveyed are also to be removed from within the earthworks extent.
- Vegetation Group 1 - Melaleuca nodosa, Eucalyptus siderophloia, Eucalyptus tereticornis and Corymbia citriodora subsp. Variegata with mutiple habitat trees
- Vegetation Group 2 -Corymbia citriodora subsp. Variegata, Eucalyptus siderophloia, Eucalyptus tereticornis and Corymbia intermedia with mutiple habitat trees and dense Lantana camara understory
- Vegetation Group 3 - Melaleuca decora, Melaleuca nodosa, Corymbia citriodora subsp. Variegata, Eucalyptus siderophloia, Eucalyptus tereticornis and Corymbia intermedia with mutiple habitat trees

Scale 1:1250 - Lengths are in Metres.

0 10 20 30 40 50 60 70 80 90 100

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Gold Coast & Logan | 76 Business Street, Yatala QLD | PO Box 392, Beenleigh 4207

Client:

KS8 Pty. Ltd.

Site Address:

Stapylton-Jacobs Well Road, Stapylton

RPD:	
Lot:	1
Plan:	RP6882
Parish:	
County:	
Local Authority:	Gold Coast City Council
Level Datum:	
Meridian:	
Contour Interval:	
PSM:	
RL:	

Associated Consultants:

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Issue	Date	Description	DRN	CHK
-	08-02-18	ORIGINAL ISSUE	RGM	KT

Scale at A3: 1:1250

Date: 08-02-18

Design: .

Drawn: RGM

Checked: KT

Drawing Title:

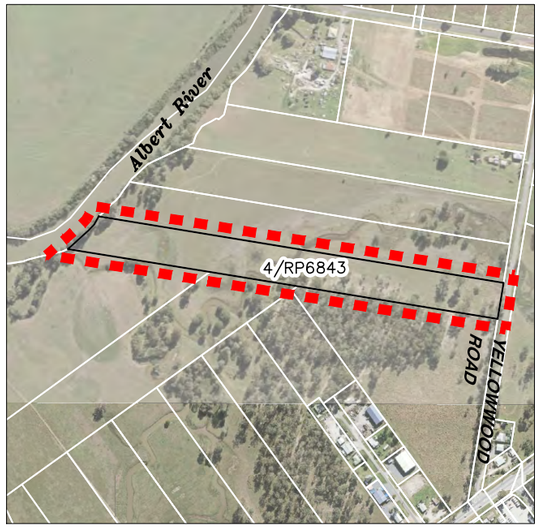
TREE SURVEY PLAN

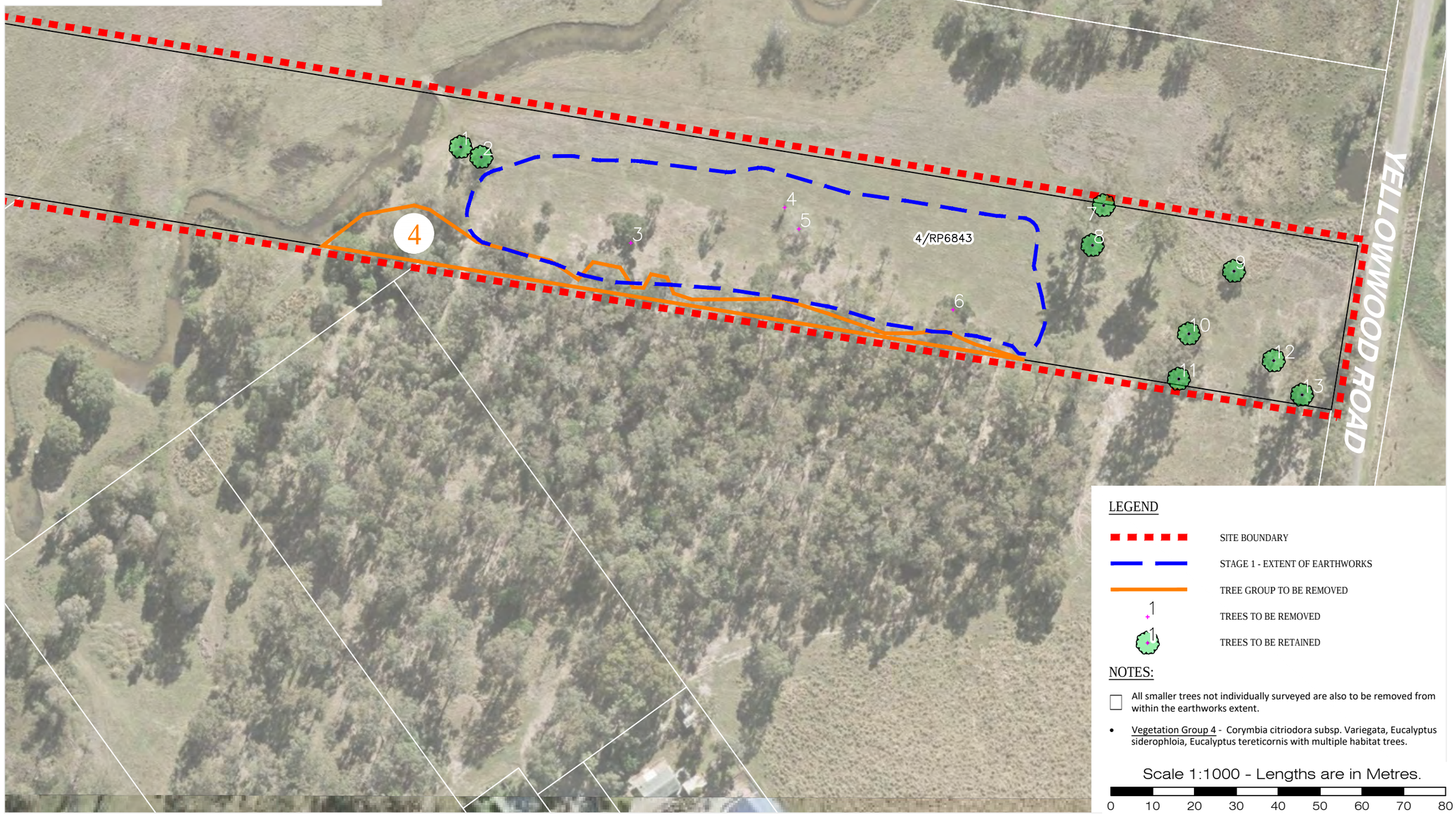
STAGE 1

SHEET 04 OF 04

Drawing No: 5738 E VMP TSP S 00

Rev. No:





LEGEND

- SITE BOUNDARY
- STAGE 1 - EXTENT OF EARTHWORKS
- TREE GROUP TO BE REMOVED
- 1 TREES TO BE REMOVED
- 1 TREES TO BE RETAINED

NOTES:

- All smaller trees not individually surveyed are also to be removed from within the earthworks extent.
- Vegetation Group 4 - Corymbia citriodora subsp. Variegata, Eucalyptus siderophloia, Eucalyptus tereticornis with multiple habitat trees.

Scale 1:1000 - Lengths are in Metres.

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Gold Coast & Logan | 76 Business Street, Yatala QLD | PO Box 392, Beenleigh 4207

Client:

KS8 Pty. Ltd.

Site Address:

Yellowwood Road, Stapylton

RPD:
Lot: 4
Plan: RP6843
Parish:
County:
Local Authority: Gold Coast City Council
Level Datum:
Meridian:
Contour Interval:
PSM:
RL:

Associated Consultants:

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Issue	Date	Description	DRN	CHK
-	06-02-18	ORIGINAL ISSUE	RGM	KT

Scale at A3: 1:1000

Date: 06-02-18

Design: .

Drawn: RGM

Checked: KT

Drawing Title:

TREE SURVEY PLAN

STAGE 1

Drawing No: 5738 E VMP TSP Y 00

Rev. No:

TREE No	SPECIES	TRUNK DIAMETER (m)	HEIGHT (m)	CANOPY (M)	NOTES
Lot 1 on RP6882 and Lot 240 on W31320					
1	Corymbia intermedia	0.5	12	10	Hollows
2	Acacia melanoxylon	0.1	5	6	
3	Acacia melanoxylon	0.1	5	4	
4	Acacia melanoxylon	0.15	5	6	
5	Corymbia intermedia	0.2	9	6	
6	Corymbia intermedia	0.2	9	6	
7	Corymbia intermedia	0.1	4	2	
8	Corymbia intermedia	0.15	7	6	Termite nest
9	Acacia concurrens	0.15	7	6	
10	Corymbia intermedia	0.15	10	4	
11	Corymbia intermedia	0.1	10	8	
12	Acacia concurrens	0.2	7	4	
13	Corymbia intermedia	0.2	10	6	
14	Corymbia tessellaris	0.2	10	8	
15	Corymbia intermedia	0.1	6	3	
16	Acacia concurrens	0.1	6	4	
17	Acacia concurrens	0.2	8	6	
18	Acacia concurrens	0.15	6	4	
19	Acacia concurrens	0.1	6	3	
20	Acacia concurrens	0.1	6	3	
21	Acacia concurrens	0.15	8	4	
22	Alphitonia excelsa	0.1	5	4	
23	Acacia concurrens	0.2	8	4	
24	Alphitonia excelsa	0.15	7	6	
25	Corymbia intermedia	0.15	12	4	Termite nest
26	Acacia concurrens	0.1	6	3	
27	Acacia concurrens	0.15	6	3	
28	Acacia concurrens	0.1	4	4	
29	Corymbia intermedia	0.1	6	3	
30	Acacia concurrens	0.1	4	4	
31	Acacia melanoxylon	0.2	7	5	
32	Acacia concurrens	0.1	4	5	

33	Alphitonia excelsa	0.1	7	5	
34	Alphitonia excelsa	0.1	7	6	
35	Acacia melanoxylon	0.2	7	5	
36	Acacia melanoxylon	0.2	7	6	
37	Corymbia intermedia	0.6	14	10	Hollows
38	Corymbia intermedia	0.6	12	10	Hollows
39	Corymbia intermedia	0.6	10	10	Hollows
40	Corymbia intermedia	0.5	10	8	Hollows
41	Eucalyptus siderophloia	0.6	16	12	Hollows, termite nest
42	Eucalyptus tereticornis	0.5	10	6	Hollows
43	Eucalyptus crebra	0.2	6	4	Hollows
44	Eucalyptus siderophloia	0.5	14	8	
45	Corymbia citriodora subsp. Variegata	0.1	8	4	
46	Corymbia citriodora subsp. Variegata	0.1	6	4	
47	Corymbia citriodora subsp. Variegata	0.1	8	4	
48	Acacia concurrens	0.2	6	6	
49	Acacia concurrens	0.3	6	6	
50	Eucalyptus siderophloia	0.5	18	12	Hollows, termite nest
51	Corymbia citriodora subsp. Variegata	0.4	14	10	
52	DEAD	0.6	12	6	Hollows, termite nest
53	Corymbia citriodora subsp. Variegata	0.1	7	3	
54	Corymbia citriodora subsp. Variegata	0.5	14	10	Hollows
55	Eucalyptus siderophloia	0.3	12	10	Hollows
56	Corymbia citriodora subsp. Variegata	0.6	12	10	Hollows
57	Eucalyptus siderophloia	0.3	10	8	Hollows, termite nest
58	Eucalyptus siderophloia	0.5	14	8	Hollows
59	Eucalyptus tereticornis	0.6	10	10	Hollows
60	Corymbia citriodora subsp. Variegata	0.5	12	10	Hollows

61	Eucalyptus siderophloia	0.3	10	6	
62	Eucalyptus siderophloia	0.4	14	8	termite
63	Eucalyptus siderophloia	0.2	12	8	
64	Corymbia intermedia	0.3	10	8	
65	Eucalyptus siderophloia	0.3	12	8	
66	Eucalyptus siderophloia	0.2	12	6	Termite nest, hollows
67	Eucalyptus siderophloia	0.3	12	6	
68	Eucalyptus siderophloia	0.3	12	6	
69	Eucalyptus siderophloia	0.3	14	8	Hollows
70	Eucalyptus siderophloia	0.4	14	8	
71	Eucalyptus siderophloia	0.4	14	8	
72	Eucalyptus siderophloia	0.3	14	4	Hollows
73	Eucalyptus siderophloia	0.6	14	6	Hollows
74	Eucalyptus siderophloia	0.5	10	10	Hollows
75	Eucalyptus siderophloia	0.3	10	6	Hollows
76	Eucalyptus siderophloia	0.4	14	8	Termite nest, hollows
77	Eucalyptus siderophloia	0.4	16	8	
78	Eucalyptus siderophloia	0.3	10	4	Hollows
79	Eucalyptus siderophloia	0.4	16	12	Hollows
80	Elaeocarpus kirtonii	0.4	10	10	
81	Eucalyptus siderophloia	0.4	16	8	Hollows
82	Corymbia citriodora subsp. Variegata	0.4	16	8	
83	Eucalyptus siderophloia	0.3	8	6	Hollows
84	Eucalyptus siderophloia	0.4	16	12	Hollows
85	Eucalyptus siderophloia	0.4	12	4	Hollows
86		0.6	12	10	
87	Corymbia citriodora subsp. Variegata	0.2	6	4	
88	Corymbia citriodora subsp. Variegata	0.2	10	4	
89	Corymbia citriodora subsp. Variegata	0.6	20	12	Hollows
90	Corymbia intermedia	0.5	20	12	Hollows
91	Corymbia intermedia	0.5	14	10	Hollows
92	Corymbia citriodora	0.7	20	12	Hollows

	subsp. Variegata				
93	Eucalyptus siderophloia	0.5	14	8	Hollows / termite nest
94	Corymbia citriodora subsp. Variegata	0..4	14	6	Hollows
95	Eucalyptus siderophloia	0.4	14	6	Hollows
96	Eucalyptus siderophloia	0.5	16	8	Hollows
97	Corymbia citriodora subsp. Variegata	0..4	16	4	
98	Eucalyptus siderophloia	0.8	20	12	Hollows
99	Eucalyptus siderophloia	0.5	14	10	
100	Corymbia citriodora subsp. Variegata	0.5	14	6	Hollows
101	Corymbia citriodora subsp. Variegata	0.3	14	4	
102	Eucalyptus siderophloia	0.3	14	8	
103	DEAD	0.5	16	DEAD	Hollows, termite nest
104	Corymbia citriodora subsp. Variegata	0.5	16	10	Hollows
105	Eucalyptus siderophloia	0.4	10	6	
106	Corymbia citriodora subsp. Variegata	0.5	20	8	Hollows
107	DEAD	0.5	20	DEAD	Hollows
108	Eucalyptus siderophloia	0.5	18	12	Hollows
109	Corymbia citriodora subsp. Variegata	0.5	20	14	Hollows
110	Corymbia citriodora subsp. Variegata	0.3	16	8	
111	Eucalyptus siderophloia	0.4	16	12	Hollows
112	Corymbia citriodora subsp. Variegata	0.3	16	10	Hollows
113	Eucalyptus siderophloia	0.5	20	12	Hollows
114	Eucalyptus siderophloia	0.2	14	6	Hollows
115	Corymbia citriodora subsp. Variegata	0.4	16	8	Hollows
116	Corymbia citriodora subsp. Variegata	0.6	20	12	

117	Eucalyptus tereticornis	0.7	14	8	Hollows
118	Eucalyptus siderophloia	0.3	14	8	Hollows
119	Eucalyptus siderophloia	0.2	8	6	Hollows
120	Eucalyptus siderophloia	0.3	8	6	
121	Eucalyptus tereticornis	0.6	16	12	
122	Corymbia intermedia	0.3	12	12	
123	Eucalyptus siderophloia	0.6	20	12	Hollows
124	Corymbia intermedia	0.3	10	8	
125	Corymbia citriodora subsp. Variegata	0.3	8	10	Hollows
126	Eucalyptus siderophloia	0.3	16	8	Hollows
127	Corymbia citriodora subsp. Variegata	0.4	20	8	Hollows
128	DEAD	0.4	16	DEAD	Hollows
129	Eucalyptus siderophloia	0.5	14	6	
130	Eucalyptus tereticornis	0.7	12	8	Hollows
131	DEAD	0.3	12	DEAD	Hollows
132	Eucalyptus siderophloia	0.3	12	8	Termite Nest
133	Corymbia citriodora subsp. Variegata	0.4	14	8	Hollows
134	Eucalyptus tereticornis	0.1	10	4	
135	Eucalyptus tereticornis	0.2	10	6	
136	DEAD	0.2	8	DEAD	hollows
137	Eucalyptus tereticornis	0.2	8	6	
138	Corymbia citriodora subsp. Variegata	0.6	14	12	
139	DEAD	0.6	8	DEAD	
140	Eucalyptus microcorys	0.2	8	8	
141	Eucalyptus siderophloia	0.4	16	14	Hollows
142	Corymbia citriodora subsp. Variegata	0.2	16	6	
143	Corymbia citriodora subsp. Variegata	0.2	16	6	
144	Eucalyptus crebra	0.4	20	10	Hollows
145	Eucalyptus tereticornis	0.9	18	12	Hollows
146	Acacia concurrens	0.2	6	6	

147	Eucalyptus crebra	0.7	20	14	Hollows
148	Eucalyptus microcorys	0.1	8	4	
149	Corymbia citriodora subsp. Variegata	0.1	8	4	
150	Eucalyptus microcorys	0.3	14	10	
151	Eucalyptus crebra	0.4	16	12	Hollows
152	Eucalyptus tereticornis	0.4	20	12	Hollows
153	Eucalyptus siderophloia	0.4	12	12	Hollows
154	Corymbia citriodora subsp. Variegata	0.2	12	6	
155	Corymbia citriodora subsp. Variegata	0.6	14	12	Hollows
156	Corymbia citriodora subsp. Variegata	0.4	16	10	Hollows
157	Eucalyptus siderophloia	0.2	12	12	
158	Corymbia citriodora subsp. Variegata	0.5	20	14	Hollows
159	dead	0.3	14	DEAD	Hollows
160	Eucalyptus siderophloia	0.5	14	10	Termite nest, hollows
161	Corymbia citriodora subsp. Variegata	0.6	16	14	Hollows
162	Corymbia citriodora subsp. Variegata	0.6	16	8	Hollows
163	Corymbia citriodora subsp. Variegata	0.6	20	14	Hollows
164	Corymbia citriodora subsp. Variegata	0.7	20	14	Hollows
165	Eucalyptus siderophloia	0.4	20	10	Hollows
166	DEAD	0.3	16	DEAD	Hollows
167	Corymbia citriodora subsp. Variegata	0.6	20	18	Hollows
168	Eucalyptus tereticornis	0.3	12	6	
169	Corymbia citriodora subsp. Variegata	0.1	10	4	
170	Corymbia citriodora subsp. Variegata	0.1	10	4	

171	Eucalyptus tereticornis	0.7	14	10	
172	Corymbia citriodora subsp. Variegata	0.1	12	6	
173	Eucalyptus siderophloia	0.4	18	16	Hollows
174	Eucalyptus siderophloia	0.2	10	6	
175	Corymbia citriodora subsp. Variegata	0.1	10	8	
176	Eucalyptus siderophloia	0.4	20	12	Hollows
177	Corymbia citriodora subsp. Variegata	0.3	10	4	Hollows
178	Corymbia tesselaris	0.2	14	6	
179	Eucalyptus siderophloia	0.2	10	4	
180	Eucalyptus siderophloia	0.3	20	8	Termite nest
181	Corymbia citriodora subsp. Variegata	0.3	18	12	
182	Corymbia citriodora subsp. Variegata	0.2	14	10	
183	Eucalyptus siderophloia	0.3	14	10	Termite nest
184	Corymbia citriodora subsp. Variegata	0.1	6	6	
185	Acacia concurrens	0.15	8	6	
186	Eucalyptus siderophloia	0.3	12	12	Hollows, termite nest
187	Corymbia citriodora subsp. Variegata	0.5	16	12	Hollows
188	Corymbia citriodora subsp. Variegata	0.2	12	10	
189	Corymbia citriodora subsp. Variegata	0.3	14	6	Hollows
190	Corymbia citriodora subsp. Variegata	1.5	24	14	Hollows
191	Eucalyptus tereticornis	0.4	16	10	
192	Corymbia citriodora subsp. Variegata	0.5	12	8	Hollows
193	DEAD	0.7	14	DEAD	Hollows
194	DEAD	0.4	12	DEAD	Hollows
195	Corymbia citriodora	0.3	16	10	

	subsp. Variegata				
196	DEAD	0.7	18	DEAD	Hollows
197	Eucalyptus siderophloia	0.4	16	8	Termite nest
198	Corymbia citriodora subsp. Variegata	0.2	14	6	
199	Corymbia citriodora subsp. Variegata	0.4	16	12	
200	Corymbia citriodora subsp. Variegata	0.4	14	10	
201	Eucalyptus siderophloia	0.3	14	6	Termite nest
202	c	0.1	8	8	
203	Eucalyptus siderophloia	0.4	20	14	
204	Corymbia citriodora subsp. Variegata	0.4	20	6	
205	Corymbia citriodora subsp. Variegata	0.2	12	8	
206	Eucalyptus siderophloia	0.3	16	12	Termite nest
207	Eucalyptus siderophloia	0.3	16	12	Termite nest
208	Corymbia tesselaris	0.1	8	4	
209	Corymbia citriodora subsp. Variegata	0.4	20	14	
210	Eucalyptus crebra	0.5	20	14	
211	DEAD	0.4	14	DEAD	Hollows
212	Corymbia citriodora subsp. Variegata	0.2	14	6	
213	Eucalyptus siderophloia	0.2	14	6	
214	Eucalyptus tereticornis	0.3	16	8	Hollows
215	Acacia concurrens	0.2	8	8	
216	Corymbia citriodora subsp. Variegata	0.3	14	10	
217	Eucalyptus siderophloia	0.3	14	10	Termite Nest
218	Eucalyptus siderophloia	0.2	12	6	
219	Corymbia citriodora subsp. Variegata	0.4	14	10	
220	Eucalyptus fibrosa	0.15	10	4	
221	Eucalyptus fibrosa	0.2	12	6	

222	Eucalyptus fibrosa	0.5	20	14	Hollows
223	Eucalyptus fibrosa	0.5	20	10	
224	Eucalyptus fibrosa	0.3	20	10	
225	Ficus watkinsiana	0.7	10	10	Hollows, bee hive / swarm
226	Eucalyptus fibrosa	0.3	20	6	
227	Eucalyptus microcorys	0.3	12	10	
228	Eucalyptus siderophloia	0.2	10	10	
229	Eucalyptus fibrosa	0.3	16	8	
230	Eucalyptus siderophloia	0.4	20	10	
231	Eucalyptus siderophloia	0.3	20	14	
232	Eucalyptus siderophloia	0.4	24	12	
233	Eucalyptus tereticornis	0.6	24	14	Hollows
234	Eucalyptus siderophloia	0.5	20	14	
235	Corymbia tesselaris	0.2	10	8	
236	Eucalyptus siderophloia	0.4	14	12	Termite nest
237	DEAD	0.2	10	DEAD	
238	Eucalyptus siderophloia	0.3	12	6	
239	Lophostemon suaveolens	0.1	6	6	
240	Eucalyptus siderophloia	0.4	14	10	
241	Corymbia citriodora subsp. Variegata	0.7	14	12	
242	Eucalyptus fibrosa	0.3	14	8	
243	Corymbia citriodora subsp. Variegata	0.3	14	12	
244	Eucalyptus fibrosa	0.4	14	10	Termite Nest
245	Eucalyptus fibrosa	0.5	14	10	
246	Corymbia citriodora subsp. Variegata	0.15	8	6	
247	DEAD	0.7	6	DEAD	Hollows
248	Corymbia citriodora subsp. Variegata	0.1	10	4	
249	Corymbia citriodora subsp. Variegata	0.6	16	12	Termite nest, hollows
250	Corymbia citriodora	0.1	8	4	

	subsp. Variegata				
251	Eucalyptus fibrosa	0.3	14	8	
252	Eucalyptus fibrosa	0.2	8	4	
253	Eucalyptus fibrosa	0.4	14	12	
254	DEAD	0.3	12	DEAD	Hollows, termite nest
255	Eucalyptus siderophloia	0.4	16	8	Hollows
256	Corymbia citriodora subsp. Variegata	0.4	12	12	
257	Eucalyptus siderophloia	0.4	18	10	
258	Eucalyptus siderophloia	0.6	18	12	Termite nest, hollows
259	Eucalyptus siderophloia	0.6	20	8	Termite nest
260	Eucalyptus siderophloia	0.6	14	12	
261	Eucalyptus siderophloia	0.6	18	10	Hollows
262	Eucalyptus tereticornis	0.3	16	8	
263	Corymbia citriodora subsp. Variegata	0.2	8	8	
264	Corymbia citriodora subsp. Variegata	0.4	12	12	Hollows
265	DEAD	0.3	12	DEAD	
266	Eucalyptus siderophloia	0.2	12	10	
267	Corymbia citriodora subsp. Variegata	0.4	16	10	Hollows
268	Eucalyptus siderophloia	0.6	16	10	
269	DEAD	0.2	8	DEAD	
270	Corymbia citriodora subsp. Variegata	0.3	16	12	Hollows
271	Eucalyptus microcorys	0.6	14	8	Hollows
272	Corymbia citriodora subsp. Variegata	0.1	10	4	
273	Corymbia citriodora subsp. Variegata	0.3	16	8	
274	DEAD	0.3	16	DEAD	Termite
275	Eucalyptus fibrosa	0.15	10	6	
276	Corymbia intermedia	0.15	10	4	
277	Corymbia intermedia	0.2	10	10	
278	Eucalyptus siderophloia	0.6	16	10	Hollows

279	Eucalyptus siderophloia	0.7	20	14	Hollows
280	DEAD	0.4	20	DEAD	Hollows
281	DEAD	0.5	22	DEAD	Hollows, termite nest
282	Eucalyptus siderophloia	0.6	22	12	
283	Corymbia citriodora subsp. Variegata	0.4	16	10	
284	Corymbia citriodora subsp. Variegata	0.3	18	6	
285	Corymbia citriodora subsp. Variegata	1	26	14	
286	Corymbia citriodora subsp. Variegata	0.8	26	12	
287	Corymbia citriodora subsp. Variegata	0.3	24	14	
288	Corymbia citriodora subsp. Variegata	0.6	20	6	
289	Corymbia citriodora subsp. Variegata	0.5	16	14	
290	Corymbia citriodora subsp. Variegata	0.6	22	16	
291	DEAD	0.2	8	DEAD	
292	DEAD	0.5	22	DEAD	Holloows
293	Corymbia citriodora subsp. Variegata	0.4	20	14	
294	DEADD	0.3	14	DEAD	
295	Eucalyptus siderophloia	0.6	24	18	
296	Eucalyptus siderophloia	0.4	22	14	Nest
297	Eucalyptus tereticornis	0.6	20	12	Termite nest
298	Corymbia citriodora subsp. Variegata	0.2	12	8	
299	Corymbia citriodora subsp. Variegata	0.2	8	6	
300	Corymbia citriodora subsp. Variegata	0.5	20	18	
301	Corymbia intermedia	0.3	10	10	
302	Eucalyptus siderophloia	0.5	20	14	

303	Eucalyptus tereticornis	1	22	6	Hollows, termite nest
304	Eucalyptus crebra	0.8	26	18	
305	DEAD	0.3	12	DEAD	
306	Corymbia intermedia	0.3	10	14	
307	Eucalyptus crebra	0.7	26	16	Hollows
308	DEAD	0.7	12	DEAD	Hollows
309	DEAD	0.3	20	DEAD	
310	Eucalyptus tereticornis	0.5	22	10	
311	Eucalyptus tereticornis	0.6	22	12	
312	Eucalyptus siderophloia	0.6	26	16	
313	Eucalyptus crebra	0.7	26	16	Termite nest
314	Corymbia intermedia	0.4	16	14	
315	Corymbia intermedia	0.6	22	14	Hollows
316	Corymbia citriodora subsp. Variegata	0.5	18	12	Hollows
317	Corymbia citriodora subsp. Variegata	0.4	18	8	
318	Corymbia citriodora subsp. Variegata	0.7	22	18	Hollows
319	Corymbia citriodora subsp. Variegata	0.7	22	18	
320	Corymbia citriodora subsp. Variegata	0.5	18	12	Hollows
321	Corymbia intermedia	0.4	16	14	
322	DEAD	0.2	10	DEAD	
323	Eucalyptus siderophloia	0.6	24	14	
324	Corymbia intermedia	0.2	12	12	
325	Corymbia citriodora subsp. Variegata	0.3	10	8	
326	Eucalyptus crebra	0.5	26	16	Hollows
327	Corymbia citriodora subsp. Variegata	0.4	16	12	
328	Corymbia citriodora subsp. Variegata	0.7	20	20	Hollows
329	Corymbia intermedia	0.2	12	12	
330	Acacia concurrens	0.15	4	6	

331	Acacia leiocalyx	0.1	4	6	
332	Corymbia citriodora subsp. Variegata	0.3	16	12	
333	Corymbia citriodora subsp. Variegata	0.2	16	4	
334	Acacia concurrens	0.2	6	12	
335	Acacia concurrens	0.2	6	DEAD	
336	Eucalyptus fibrosa	0.3	10	12	
337	Eucalyptus siderophloia	0.6	22	20	
338	Eucalyptus siderophloia	0.2	14	8	
339	Corymbia intermedia	0.15	6	16	
340	DEAD	0.3	8	DEAD	
341	DEAD	0.2	12	DEAD	
342	Corymbia citriodora subsp. Variegata	0.2	12	8	
343	Corymbia citriodora subsp. Variegata	0.2	12	8	
344	Corymbia intermedia	0.3	16	12	
345	Eucalyptus siderophloia	0.6	26	16	Hollows
346	Eucalyptus siderophloia	0.4	20	12	Termite nest
347	Acacia disparrima	0.2	8	8	
348	Corymbia citriodora subsp. Variegata	0.2	16	12	
349	Eucalyptus siderophloia	0.7	26	12	Hollows
350	Corymbia citriodora subsp. Variegata	0.3	16	12	
351	DEAD	0.15	8	DEAD	
352	DEAD	0.4	16	DEAD	Hollows
353	Corymbia citriodora subsp. Variegata	0.6	26	12	Hollows
354	Corymbia citriodora subsp. Variegata	0.2	12	10	
355	Eucalyptus siderophloia	0.7	26	16	Hollows
356	Lophostemon suaveolens	0.2	10	6	
357	Eucalyptus fibrosa	0.4	20	10	

358	Eucalyptus fibrosa	0.3	20	10	
359	Lophostemon suaveolens	0.2	18	8	
360	Eucalyptus tereticornis	0.6	18	12	
361	DEAD	0.7	16	DEAD	Termite nest
362	Eucalyptus crebra	0.7	22	14	Hollows
363	DEAD	0.6	20	DEAD	Hollows
364	Lophostemon suaveolens	0.15	10	10	
365	Corymbia intermedia	0.4	20	16	
366	Corymbia citriodora subsp. Variegata	0.15	12	12	
367	Eucalyptus microcorys	0.4	14	12	
368	Corymbia citriodora subsp. Variegata	0.6	22	16	
369	DEAD	0.4	10	DEAD	
370	Acacia disparrima	0.2	6	10	
371	Eucalyptus siderophloia	0.3	20	14	
372	DEAD	0.15	8	DEAD	
373	Corymbia citriodora subsp. Variegata	0.7	22	14	Hollows
374	DEAD	0.2	10	DEAD	
375	Lophostemon confertus	0.2	10	8	
376	DEAD	0.2	6	DEAD	
377	Eucalyptus fibrosa	0.2	18	10	
378	Eucalyptus fibrosa	0.6	18	8	
379	Corymbia citriodora subsp. Variegata	0.2	18	6	
380	Corymbia citriodora subsp. Variegata	0.15	12	10	
381	Acacia concurrens	0.1	8	8	
382	Corymbia citriodora subsp. Variegata	0.2	12	10	
383	Lophostemon confertus	0.15	10	8	
384	Corymbia citriodora subsp. Variegata	0.5	20	16	Hollows

385	Corymbia citriodora subsp. Variegata	0.2	16	6	
386	Corymbia citriodora subsp. Variegata	0.2	14	10	
387	Acacia concurrens	0.2	8	10	
388	DEAD	0.3	8	DEAD	
389	Eucalyptus siderophloia	0.6	16	16	Termite
390	Eucalyptus siderophloia	0.2	12	8	
391	Eucalyptus tereticornis	0.2	16	8	
392	Eucalyptus tereticornis	0.2	16	8	
393	Corymbia intermedia	0.2	18	6	
394	Corymbia intermedia	0.1	8	8	
395	Lophostemon suaveolens	0.1	8	6	
396	Acacia concurrens	0.1	6	8	
397	Corymbia intermedia	0.1	10	6	
398	Corymbia intermedia	0.1	6	4	
399	Lophostemon confertus	0.2	10	12	
400	Corymbia intermedia	0.2	10	10	
401	Lophostemon suaveolens	0.1	8	4	
402	Eucalyptus tereticornis	0.1	8	8	
403	Lophostemon suaveolens	0.3	14	12	
404	Eucalyptus fibrosa	0.5	14	20	Hollows
405	Corymbia intermedia	0.3	16	10	
406	Corymbia intermedia	0.1	10	4	
407	Corymbia intermedia	0.2	10	8	
408	Acacia concurrens	0.2	10	3	
409	Eucalyptus tereticornis	0.1	10	3	
410	Meleauca decora	0.1	6	3	
411	Eucalyptus tereticornis	0.2	10	12	
412	Corymbia intermedia	0.2	12	12	
413	Corymbia intermedia	0.2	18	12	
414	Eucalyptus tereticornis	0.3	14	14	
415	Corymbia intermedia	0.1	6	8	

416	Lophostemon confertus	0.1	6	8	
417	Corymbia intermedia	0.15	12	10	
418	Corymbia intermedia	0.3	18	12	
419	Meleauca decora	0.1	6	8	
420	Eucalyptus siderophloia	0.4	24	20	Hollows
421	Lophostemon confertus	0.45	12	12	
422	Lophostemon confertus	0.3	12	16	Hollows
423	Corymbia intermedia	0.15	12	6	
424	Lophostemon confertus	0.5	24	10	
425	Eucalyptus siderophloia	0.4	24	10	Hollows
426	Corymbia intermedia	0.2	16	8	
427	Lophostemon confertus	0.3	18	8	
428	Corymbia intermedia	0.4	22	10	
429	Lophostemon confertus	0.3	16	8	
430	Eucalyptus fibrosa	0.2	16	8	
431	Corymbia intermedia	0.5	24	10	Hollows
432	Eucalyptus fibrosa	0.5	24	9	Termite nest, hollows
433	Eucalyptus tereticornis	0.3	18	10	
434	Eucalyptus tereticornis	0.15	10	6	
435	Corymbia intermedia	0.4	18	12	
436	Eucalyptus siderophloia	0.5	24	12	Hollows, termite nest
437	Lophostemon confertus	0.2	12	6	
438	Corymbia intermedia	0.3	20	8	
439	Eucalyptus tereticornis	0.3	18	6	
440	Corymbia intermedia	0.3	18	8	
441	Eucalyptus microcorys	0.3	18	10	Termite nest
442	Lophostemon confertus	0.2	14	5	
443	Lophostemon confertus	0.3	14	10	
444	Corymbia citriodora subsp. Variegata	0.2	18	8	
445	Corymbia intermedia	0.6	20	12	Hollows
446	Lophostemon confertus	0.2	14	8	
447	Eucalyptus microcorys	0.3	14	14	
448	Eucalyptus tereticornis	0.3	22	8	
449	Lophostemon confertus	0.5	18	10	Termite nest
450	Corymbia citriodora	0.4	18	10	

	subsp. Variegata				
451	Eucalyptus siderophloia	0.5	22	14	Hollows
452	Eucalyptus fibrosa	0.4	20	10	
453	Eucalyptus fibrosa	0.5	20	10	
454	Corymbia intermedia	0.4	18	10	Hollows
455	Corymbia intermedia	0.6	24	16	Hollows
456	Corymbia intermedia	0.4	18	12	Hollows
457	Corymbia intermedia	0.4	18	12	Hollows
458	Corymbia intermedia	0.6	22	14	
459	Eucalyptus siderophloia	0.7	24	14	Hollows
460	Eucalyptus siderophloia	0.6	18	8	Hollows
461	Eucalyptus siderophloia	0.15	12	10	Hollows, termite nest
462	DEAD	0.8	12	DEAD	Hollows
463	Corymbia citriodora subsp. Variegata	0.7	18	14	
464	Lophostemon confertus	0.4	16	10	
465	Corymbia intermedia	0.3	14	8	
466	Lophostemon confertus	0.7	14	12	
467	Eucalyptus crebra	0.5	22	12	Termite nest, hollows
468	Corymbia intermedia	0.3	18	6	
469	Corymbia intermedia	0.4	18	10	
470	Corymbia intermedia	0.6	18	12	Hollows
471	Corymbia citriodora subsp. Variegata	0.5	20	10	
472	Corymbia intermedia	0.7	20	18	
473	Lophostemon confertus	0.3	12	8	
474	Eucalyptus siderophloia	0.2	12	8	
475	Lophostemon confertus	0.2	10	5	
476	Eucalyptus siderophloia	0.6	20	12	Hollows
477	Corymbia intermedia	0.4	18	6	Hollows
478	Corymbia intermedia	0.4	14	8	
479	Corymbia intermedia	0.4	12	8	
480	Corymbia intermedia	0.4	16	8	
481	Corymbia intermedia	0.4	16	8	
482	Eucalyptus siderophloia	0.2	10	6	Hollows
483	Corymbia intermedia	0.4	12	8	

484	Eucalyptus tereticornis	0.8	16	6	Hollows, termite nest
485	Corymbia intermedia	0.4	18	10	Hollows
486	Corymbia intermedia	0.4	20	10	
487	Eucalyptus siderophloia	0.4	18	8	Hollows
488	Corymbia intermedia	0.4	22	10	Hollows
489	Eucalyptus tereticornis	0.5	16	4	Hollows
490	Eucalyptus fibrosa	0.7	24	10	Termite nest, hollows
491	Corymbia intermedia	0.4	15	10	
492	Corymbia citriodora subsp. Variegata	0.4	24	12	
493	Corymbia citriodora subsp. Variegata	0.4	26	14	
494	Corymbia citriodora subsp. Variegata	0.4	26	10	
495	Eucalyptus siderophloia	0.6	28	12	Termite nest
496	Corymbia intermedia	0.4	18	8	Hollows
497	Corymbia citriodora subsp. Variegata	0.6	24	10	
498	Corymbia citriodora subsp. Variegata	0.15	8	4	
499	Corymbia intermedia	0.6	26	12	Hollows
500	Corymbia intermedia	0.5	24	10	Hollows
501	Eucalyptus tereticornis	0.5	26	12	Hollows
502	Corymbia citriodora subsp. Variegata	0.1	6	2	
503	Corymbia citriodora subsp. Variegata	0.6	26	12	
504	Corymbia citriodora subsp. Variegata	0.5	24	10	Hollows-
505	Eucalyptus siderophloia	0	12	4	
506	Corymbia citriodora subsp. Variegata	0.4	22	10	
507	Corymbia citriodora subsp. Variegata	0.2	18	6	
508	Corymbia citriodora subsp. Variegata	0.3	18	8	

509	Eucalyptus siderophloia	0.4	20	10	Hollows
510	Eucalyptus tereticornis	0.1	10	4	
511	Acacia concurrens	0.2	6	6	
512	Corymbia citriodora subsp. Variegata	0.5	22	10	Hollows
513	Corymbia citriodora subsp. Variegata	0.6	22	12	Hollows
514	Corymbia citriodora subsp. Variegata	0.3	16	6	
515	Corymbia citriodora subsp. Variegata	0.6	20	10	Hollows
516	Acacia concurrens	0.2	10	8	
517	Corymbia citriodora subsp. Variegata	0.4	18	8	Hollows
518	Eucalyptus tereticornis	0.9	24	14	Hollows
519	Lophostemon confertus	0.2	10	7	
520	Corymbia citriodora subsp. Variegata	0.1	14	4	
521	Lophostemon confertus	0.4	10	8	
522	Corymbia citriodora subsp. Variegata	0.1	12	4	
523	Corymbia citriodora subsp. Variegata	0.2	12	8	
524	Corymbia intermedia	0.3	16	6	
525	Acacia concurrens	0.2	6	4	
526	Corymbia citriodora subsp. Variegata	0.2	12	4	
527	Corymbia citriodora subsp. Variegata	0.7	26	12	Hollows
528	Corymbia intermedia	0.3	16	8	
529	Corymbia intermedia	0.3	16	8	Termite nest
530	Corymbia citriodora subsp. Variegata	0.2	16	4	
531	Corymbia citriodora subsp. Variegata	0.1	10	4	
532	Corymbia intermedia	0.4	12	8	

533	Corymbia intermedia	0.1	10	4	
534	Corymbia citriodora subsp. Variegata	0.4	22	10	Hollows
535	Euclayptus propinqua	0.3	16	6	
536	Corymbia intermedia	0.3	16	8	
537	Eucalyptus siderophloia	0.5	24	10	Termite nest, hollows
538	Corymbia intermedia	0.2	10	6	
539	Corymbia intermedia	0.3	10	6	
540	Corymbia citriodora subsp. Variegata	0.5	26	12	Holllows
541	Eucalyptus siderophloia	0.3	10	6	Termite nest, hollows
542	Eucalyptus siderophloia	0.3	20	8	
543	Eucalyptus siderophloia	0.3	16	8	Termite nest
544	Eucalyptus microcorys	0.2	10	6	
545	Corymbia intermedia	0.3	10	8	
546	Corymbia citriodora subsp. Variegata	0.3	10	8	
547	Corymbia intermedia	0.4	14	6	Hollows
548	Eucalyptus crebra	0.6	26	12	Hollows
549	Corymbia citriodora subsp. Variegata	0.3	18	8	
550	Corymbia intermedia	0.4	18	10	
551	Eucalyptus siderophloia	0.4	20	8	
552	Eucalyptus siderophloia	0.4	16	6	Hollows
553	Corymbia intermedia	0.2	12	6	
554	Eucalyptus tereticornis	0.5	20	8	Hollows
555	Melaleuca decora	0.2	10	8	
556	Eucalyptus tereticornis	0.4	20	6	Hollows
557	Melaleuca decora	0.2	8	6	
558	Eucalyptus tereticornis	0.4	18	6	Hollows
559	Corymbia citriodora subsp. Variegata	0.3	10	2	
560	Eucalyptus siderophloia	0.5	24	12	
561	Eucalyptus siderophloia	0.5	18	8	
562	Melaleuca decora	0.2	8	6	
563	Eucalyptus siderophloia	1.1	22	12	Hollows

564	Eucalyptus siderophloia	0.4	20	8	Hollows, termite nest
565	Eucalyptus siderophloia	0.7	24	10	
566	Corymbia citriodora subsp. Variegata	0.5	24	10	Hollows
567	Eucalyptus fibrosa	0.4	22	8	Hollows
568	Corymbia intermedia	0.9	22	10	Hollows
569	Corymbia citriodora subsp. Variegata	0.6	28	14	Nest
570	Eucalyptus fibrosa	0.6	22	10	Hollows
571	Eucalyptus siderophloia	0.6	22	10	Hollows
572	Corymbia citriodora subsp. Variegata	0.6	24	8	Hollows
573	Eucalyptus siderophloia	0.3	14	6	Hollows
574	Melaleuca decora	0.2	8	4	
575	Melaleuca decora	0.15	6	4	
576	Corymbia intermedia	0.2	14	6	
577	Eucalyptus fibrosa	0.3	12	6	
578	Eucalyptus fibrosa	0.2	10	6	
579	Melaleuca decora	0.2	8	6	
580	Melaleuca decora	0.1	7	6	
581	Eucalyptus fibrosa	0.3	16	8	
582	Eucalyptus siderophloia	0.7	26	12	Hollows
583	Eucalyptus siderophloia	0.4	14	6	
584	Eucalyptus siderophloia	0.2	10	6	
585	Eucalyptus siderophloia	0.3	10	8	
586	Eucalyptus siderophloia	0.2	14	6	
587	Eucalyptus siderophloia	0.6	24	12	Hollows
588	Eucalyptus siderophloia	0.4	8	10	Hollows
589	Corymbia intermedia	0.6	24	20	Hollows
590	Eucalyptus tereticornis	0.4	18	8	Hollows
591	DEAD	0.4	16	4	Hollows
592	Corymbia intermedia	0.3	16	6	Hollows
593	Eucalyptus siderophloia	0.5	16	8	Hollows
594	Corymbia citriodora subsp. Variegata	0.3	10	8	Hollows
595	Eucalyptus siderophloia	0.4	20	12	Hollows, termite nest

596	Ficus rubiginosa	0.2	10	8	
597	Eucalyptus tereticornis	0.5	24	12	Hollows
598	Eucalyptus siderophloia	0.2	16	6	
599	Eucalyptus siderophloia	0.3	14	8	
600	Eucalyptus siderophloia	0.6	26	14	Hollows
601	Eucalyptus tereticornis	0.3	22	10	
602	Eucalyptus siderophloia	0.5	20	10	
603	Eucalyptus fibrosa	0.5	20	10	Hollows
604	Corymbia citriodora subsp. Variegata	0.4	20	12	Hollows
605	Corymbia citriodora subsp. Variegata	0.4	20	8	Hollows
606	Eucalyptus siderophloia	0.2	16	6	Termite nest
607	Corymbia citriodora subsp. Variegata	0.15	12	6	
608	Eucalyptus siderophloia	0.5	22	10	Hollows
609	Corymbia intermedia	0.5	24	12	Hollows
610	Corymbia intermedia	0.6	28	12	Hollows
611	Corymbia intermedia	1	24	12	Hollows
612	Eucalyptus siderophloia	0.8	24	16	Termite nest, hollows
613	Eucalyptus siderophloia	0.4	18	10	
614	Corymbia intermedia	0.3	16	10	
615	Corymbia citriodora subsp. Variegata	0.3	10	4	Hollows
616	Eucalyptus siderophloia	0.5	24	12	Hollows
617	Eucalyptus siderophloia	0.4	14	6	Hollows
618	Eucalyptus siderophloia	0.5	26	14	Hollows
619	Eucalyptus siderophloia	0.3	18	8	Hollows
620	Corymbia intermedia	0.2	14	6	
621	Eucalyptus tereticornis	0.6	26	10	Hollows
622	Corymbia citriodora subsp. Variegata	0.4	20	10	Hollows
623	Corymbia intermedia	0.4	16	10	Hollows
624	Corymbia intermedia	0.5	26	16	Hollows
625	Corymbia intermedia	0.3	16	12	Hollows
626	Eucalyptus siderophloia	0.4	18	10	

627	Corymbia intermedia	0.3	16	10	
628	Eucalyptus fibrosa	0.5	18	10	Termite nest
629	Corymbia citriodora subsp. Variegata	0.15	14	6	
630	Eucalyptus siderophloia	0.1	10	6	
631	Eucalyptus microcorys	0.4	18	12	
632	Corymbia citriodora subsp. Variegata	0.5	24	12	Hollows
638	Ficus watkinsiana	1.3	10	12	Hollows
639	Corymbia intermedia	0.4	18	8	
640	Corymbia citriodora subsp. Variegata	0.5	17	10	Termite nest, hollows
641	Corymbia intermedia	0.4	16	8	
642	Corymbia intermedia	0.3	16	8	Termite nest
643	Corymbia intermedia	0.5	16	10	Hollows
644	Corymbia intermedia	0.5	18	12	Hollows
645	Corymbia citriodora subsp. Variegata	0.5	8	4	
646	Corymbia citriodora subsp. Variegata	0.1	6	2	
647	Corymbia citriodora subsp. Variegata	0.6	20	18	Hollows
648	Corymbia citriodora subsp. Variegata	0.1	6	2	
649	Corymbia citriodora subsp. Variegata	0.1	6	2	
650	Corymbia citriodora subsp. Variegata	0.2	8	5	
651	Corymbia citriodora subsp. Variegata	0.6	20	12	Termites nest, hollows
652	Eucalyptus microcorys	0.3	8	6	
653	Corymbia citriodora subsp. Variegata	0.8	20	18	Hollows
654	Eucalyptus tereticornis	1.2	20	12	Hollows
655	Corymbia citriodora subsp. Variegata	0.3	16	8	

656	Corymbia citriodora subsp. Variegata	0.1	8	3	
657	Corymbia citriodora subsp. Variegata	0.1	12	3	
658	Corymbia citriodora subsp. Variegata	0.15	12	3	
659	Corymbia citriodora subsp. Variegata	0.2	12	4	
660	Corymbia citriodora subsp. Variegata	0.2	12	4	
661	Corymbia citriodora subsp. Variegata	0.1	7	2	
662	Corymbia citriodora subsp. Variegata	0.15	10	2	
663	Corymbia citriodora subsp. Variegata	0.2	12	4	
664	Corymbia citriodora subsp. Variegata	0.1	8	3	
665	Corymbia citriodora subsp. Variegata	0.15	10	4	
666	Corymbia citriodora subsp. Variegata	0.1	6	4	
667	Corymbia citriodora subsp. Variegata	0.1	10	4	
668	Corymbia intermedia	0.3	10	8	Termite nest
669	Corymbia citriodora subsp. Variegata	0.4	12	8	
670	Corymbia citriodora subsp. Variegata	0.9	4	8	
671	Corymbia citriodora subsp. Variegata	0.15	10	4	
672	DEAD				Hollows
673	DEAD				Hollows
674	DEAD				Hollows
675	Eucalyptus siderophloia	0.3	18	8	Hollows
676	Eucalyptus siderophloia	0.4	18	10	Hollows
677	Eucalyptus siderophloia	0.3	22	8	Hollows

Lot 4 on RP6843					
1	Corymbia citriodora subsp. Variegata	0.4	12	12	
2	Corymbia citriodora subsp. Variegata	0.4	14	10	
3	Eucalyptus siderophloia	1	20	14	Hollows
4	Corymbia citriodora subsp. Variegata	0.3	10	8	
5	Corymbia citriodora subsp. Variegata	0.6	12	14	
6	ficus watkinsiana	0.8	10	20	Hollows
7	Eucalyptus tereticornis	1.0	20	20	Hollows
8	Eucalyptus siderophloia	1	20	20	
9	Melaleuca quinquenervia	0.4	8	8	
10	Eucalyptus tereticornis	1.50	26	20	Hollows
11	Eucalyptus tereticornis	1.50	26	20	
12	Eucalyptus siderophloia	0.6	20	16	Hollows
13	Eucalyptus tereticornis	1.20	26	20	Hollows, termite nest

SITE BASED STORMWATER MANAGEMENT PLAN

DEVELOPMENT APPLICATION FOR RECONFIGURATION OF LOT (38 INDUSTRIAL LOTS)

ADDRESS
31 Yellowood Road, 60 Stapylton Jacobs Well Road and 82 Christensen Road, Stapylton

REAL PROPERTY DESCRIPTION
Lot 4 on RP6843, Lot 1 on RP6882 and Lot 240 on W31320

PREPARED FOR
KS8 Pty. Ltd.

May 2018 (Rev. 2)

gassman development perspectives

project coordination
urban + regional planning
landscape + urban design
engineering services
environmental management
visualisation + spatial services
surveying services
advisory services

gassman development perspectives est 1985 planning environment landscape engineering survey

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Originating Office:	Gold Coast	Job Number:	5738
Physical Address:	76 Business Street Yatala. Q. 4207	Project Manager:	Mitchell Gassman
		Document Title:	Site Based Stormwater Management Plan
Postal Address:	PO Box 392 Beenleigh. Q. 4207		
Phone:	+61 7 3807 3333	Author:	Mitchell Gassman
Fax:	+61 7 3287 5461	Client:	KS8 Pty. Ltd.
Email:	mail@gassman.com.au	Client Contact:	Daniel Farquhar
Web:	www.gassman.com.au	Client Reference:	N/A

Revision / Checking History

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1.	Mitchell Gassman	Civil Project Engineer RPEQ 16939		4 February 2018
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Gold Coast City Council (Assessment Manager)	1 electronic copy
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1.0 INTRODUCTION

Gassman Development Perspectives (GDP) has been engaged by KS8 Pty. Ltd. (Client) to prepare a Site Based Stormwater Management Plan over land situated at 60 Stapylton Jacobs Well Road and 82 Christensen Road, Stapylton (Lot 1 on RP6882 and Lot 240 on W31320) being the 'subject site'.

This report has been prepared for submission to City of Gold Coast Council (Council) as part of a Development Application for Reconfiguration of Lot (38 industrial lots) with the intent of investigating and addressing the stormwater quantity and stormwater quality requirements for the proposed development in accordance with the applicable State and Local Government standards.

Stormwater quantity is addressed through pre and post development scenarios modelled in XPSTORM software utilising temporal pattern inputs from Council's Current Schedule 6.09 Land Development Guidelines Version 2.0. A strategy for managing post development peak flows discharging from the site and the required attenuation measures are provided to demonstrate that any increase in peak flows can be managed within the subject site as not to measurably impact neighbouring properties.

Stormwater quality analysis is also undertaken through the use of MUSIC software to confirm the adequacy of proposed Stormwater Quality Improvement Devices (SQIDs) required to meet the State Planning Policy's (SPP 2014) Water Quality Objectives (WQOs) and the pollutant removal targets set by City of Gold Coast Council.

A copy of the XPSTORM and MUSIC modelling data files are attached on a DVD for Council's records.

2.0 SITE CHARACTERISTICS

2.1 LOCATION

The subject site is located within the City of Gold Coast Council local government boundaries. The subject site is bounded by Stapylton Jacobs Well Road to the north, Christensen Road and existing industrial uses to the west and Council's land fill facility to the south-east.

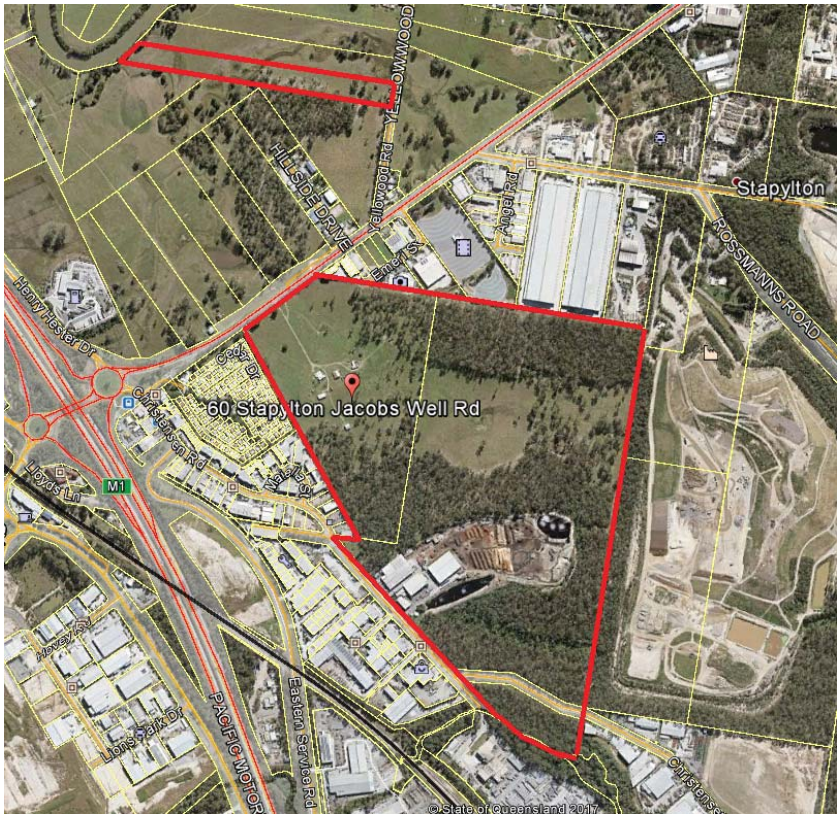


Figure 2.1: Site Locality Plan, Source: Google Earth 2017

2.2 SITE AREA

The current area of the site is 73.114 Ha of which the proposed bulk earthworks change to ground level works for Stage 1 makes up approximately 25.0 Ha, (16.1Ha development area).

2.3 EXISTING TOPOGRAPHY AND SITE DRAINAGE

Along the south-eastern boundary of the subject site is the existing high point of 29.23m AHD with a ridge line extending through to the properties' northern boundary. This existing topography defines the existing catchments of the site and current stormwater discharge locations along the northern and eastern boundaries. These low points are visible within

Appendix A – Site Survey Plan of the report with the pre development catchments defined within ***Appendix B – Pre and Post Development Catchment Plans.***

2.4 EXISTING LAND USAGE

The subject land is mainly improved by an existing rural homestead and accompanying farming sheds consisting of vacant land and agricultural uses for specifically cattle grazing.

Amgrow Pty. Ltd. (soil and fertilizer distributor) leases approximately 9.4ha of part Lot 240 on W31320, for the purpose of mixing, reconditioning and distributing soil and fertilizer, on a wholesale basis. Warehouse buildings and ancillary offices are located on the leased land with sole access from Christensen Road.

The property at No.31 Yellowood Road is currently used for the grazing of cattle mainly associated with the adjoining lands to the west. The land has a frontage to the Albert River to the rear of the property.

2.5 PLANNING PROVISIONS AND PROPOSED DEVELOPMENT

The subject site is zoned "Low Impact Industry, Future Precinct" and "Medium Impact Industry, Future Precinct" under Council's current City Plan. The current proposal involves creating further industrial lots created within the subject site which will require large scale bulk earthworks necessary to facilitate clear and flat earthwork pads suitable for this land use.

2.6 FLOODING

The subject site is located within the extent of the Flood Overlay as defined in Council's City Plan Interactive Mapping – Version 3.

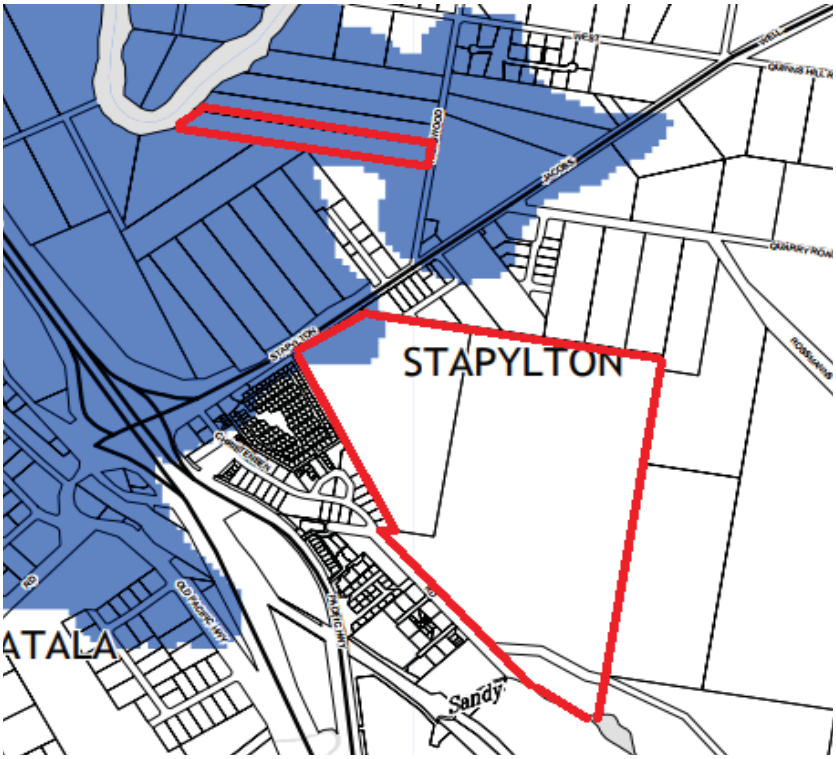
Compensatory cut within the Yellowood Road property is proposed to balance flood storage where fill within the subject site is proposed below the defined flood event level of RL8.60m AHD (Q100).

On-site regional flood storage volumes have been calculated for the site based on Council's provided flood level of 8.60m AHD and the existing surface levels within the property boundary. The volume of on-site regional flood storage is equal to **19,927 m3.** In summary, the compensatory balance flood storage proposal is as follows:

Site Address	**Available Q100 Flood Storage Volume**	
	Pre Developed	Post Developed
60 Stapylton Jacobs Well Road, Stapylton	19,927 m^3	15,766 m^3

Shortfall of Flood Storage at Subject Site	4,161 m^3
Earthworks below Q100 at Yellowood Rd	4,800 m^3

Refer ***Appendix D*** which provides detailed drawings of the planned earthworks and how a flood storage balance between the pre and post development scenario will be achieved.



3.0 CONVEYANCE MANAGEMENT AND PRE AND POST DEVELOPMENT CATCMENTS

3.1 LAWFUL POINT OF DISCHARGE

The *Queensland Urban Drainage Manual* (QUDM) has set criteria that define a lawful point of discharge for a proposed development. These being:

1) The location of the discharge is under the control of the Local Authority or other statutory authority from whom permission to discharge has been received. This will include park, drainage or road reserve, stormwater drainage easement; and

2) That in discharging in that location, the discharge will not cause actionable nuisance (i.e. a nuisance from which the current or some future neighbouring proprietor may bring an action or claim for damages arising out of the nuisance). In general terms this implies no worsening as a result of the discharge.

The proposed Stage 1 development will utilise one (1) lawful point of discharge being to the northern boundary (low point) of the site; utilising the existing drainage infrastructure under Stapylton Jacobs Well Road.

3.2 PRE DEVELOPMENT CATCHMENTS

The existing natural slope currently dictates the overland flow and drainage pattern of the subject site as illustrated in the pre development stormwater catchment plan within ***Appendix B***. The flow patterns generally follow the ridgeline out falling towards the existing low points of the site.

3.3 POST DEVELOPMENT CATCHMENTS

The intent of the proposed bulk earthworks outlined within this Stormwater Management Plan is to generally follow the pre development conditions to ensure no worsening of stormwater impacts downstream both during and post the construction period. Whilst the proposed bulk earthworks over the site generally flatten the existing steep grades of the land as part of creating the earthworked pads, the increase in impervious areas associated with the proposed land use mean that a hydrologic review is required to determine the changes in discharge characteristics (i.e. peak flow, water quality) from the site and identify suitable attenuation measures that need to be implemented to mitigate any potential downstream impacts. The post development catchments are illustrated within the post development catchment plan included within ***Appendix B***.

4.0 HYDROLOGICAL ASSESSMENT

4.1 TEMPORAL PATTERNS AND RAINFALL DATA

In accordance with Council's City Plan Current Schedule 6.09 Land Development Guidelines, Council's Standard Drawings have been utilised to generate rainfall data for the various design storm hydrographs which have been utilised in the below modelling of stormwater runoff from the subject site. The parameters outlined in ***Figure 4.10 and 4.11*** below were determined from Council's standard drawings and were confirmed by referencing the Polynomial Coefficients table sourced from the Bureau of Meteorology.

Parameter	Value (mm/hr where applicable)
Easting / Northing / Zone	523 493.88 E / 6 931 923.68 N / 56
Latitude / Longitude	27.725 S / 153.250 E
1-2	49.40
12-2	9.48
72-2	3.19
1-50	87.16
12-50	18.68
72-50	7.19
Geographical Factor (F2)	4.4
Geographical Factor (F50)	17.22
Map Skewness (G)	0.08

Figure 4.10: Temporal Pattern Summary, Sourced: CoGC City Plan Schedule 6.09

Home | IFD Table | IFD Chart | Coefficients | ARI | Print coeffs | Help coeffs

Polynomial Coefficients Table

Location: 27.725S 153.250E NEAR.. Christensen Road Issued: 23/8/2017

List of coefficients to equations of the form

$$\log_e(I) = A + B \times (\log_e(T)) + C \times (\log_e(T))^2 + D \times (\log_e(T))^3 + E \times (\log_e(T))^4 + F \times (\log_e(T))^5 + G \times (\log_e(T))^6$$

T = Time in hours and I = Intensity in millimetres per hour

YEARS	A	B	C	D	E	F	G
1	3.6469278336	-6.0686564E-1	-5.5041999E-2	6.3015437E-3	3.3632512E-3	-1.2433990E-5	-1.2587744E-4
2	3.8872156143	-6.0223556E-1	-5.3529371E-2	6.2028486E-3	3.2774508E-3	1.0265950E-5	-1.2686079E-4
5	4.1014680862	-5.8879173E-1	-5.0362550E-2	5.4709474E-3	3.2164040E-3	1.0069086E-4	-1.3808227E-4
10	4.2057771683	-5.8182871E-1	-4.8854984E-2	5.1193577E-3	3.2050603E-3	1.5118248E-4	-1.4532827E-4
20	4.3336167336	-5.7601953E-1	-4.7690600E-2	4.8211426E-3	3.2281585E-3	1.9292213E-4	-1.5297488E-4
50	4.4784755707	-5.6898135E-1	-4.6102673E-2	4.3319603E-3	3.2143758E-3	2.5029419E-4	-1.6076636E-4
100	4.576212883	-5.6462938E-1	-4.5186505E-2	4.1637770E-3	3.2132678E-3	2.7498681E-4	-1.6456563E-4

(Raw data: 49.4, 9.48, 3.19, 87.16, 18.68, 7.19, skew=0.08, F2=4.4, F50=17.22)

© Australian Government, Bureau of Meteorology

Copy Table

Figure 4.11: Temporal Pattern Summary Sourced from The BoM (Provided by XP Solutions)

4.2 CATCHMENTS

As discussed within Section 3 of this report the pre and post development stormwater catchments (refer ***Appendix B***) have been determined using a combination of the site based Contour and Detail survey undertaken by Gassman Development Perspectives (refer ***Appendix A***) along with Lidar survey of the surrounding area to identify any potential external catchments.

A summary of the parameters assigned to these sub-catchments used to assess the pre and post development flows is contained within ***Tables 4.2A, 4.2B and 4.2C*** below which aligns with the two scenarios assessed within this reporting.

Parameter	Sub-Catchments (Pre Development - *Total Site*)		
Name	CAT-X1	CAT-X2	CAT-1
Area (Ha)	1.637	2.182	12.715
Vectored Slope (%)	1.00	1.00	5.41
Impervious Area (%)	90.00	90.00	5.00
Pervious Area (%)	10.00	10.00	95.00
Roughness (n)	0.020	0.020	0.080
Parameter	**Catchments (Pre Development - *Total Site*)**		
Name	CAT-2	CAT-3	CAT-4
Area (Ha)	7.114	3.015	8.666
Vectored Slope (%)	5.95	5.54	5.80
Impervious Area (%)	1.00	0.00	0.00
Pervious Area (%)	99.00	100.00	100.00
Roughness (n)	0.050	0.080	0.100
Parameter	**Catchments (Pre Development - *Total Site*)**		
Name	CAT-5	CAT-6	CAT-6A
Area (Ha)	4.144	6.474	4.767
Vectored Slope (%)	4.02	3.91	3.50
Impervious Area (%)	0.00	0.00	35.00
Pervious Area (%)	100.00	100.00	65.00
Roughness (n)	0.050	0.100	0.030
Parameter	**Catchments (Pre Development - *Total Site*)**		
Name	CAT-7	CAT-7A	CAT-8
Area (Ha)	9.981	3.410	2.481
Vectored Slope (%)	3.51	2.50	3.00
Impervious Area (%)	0.00	85.00	0.00
Pervious Area (%)	100.00	15.00	100.00
Roughness (n)	0.060	0.020	0.060
Parameter	**Catchments (Pre Development - *Total Site*)**		
Name	CAT-9	CAT-10	
Area (Ha)	2.210	8.523	
Vectored Slope (%)	2.21	6.45	
Impervious Area (%)	0.00	8.20	
Pervious Area (%)	100.00	91.80	
Roughness (n)	0.060	0.030	

Table 4.2A: Pre Development Catchment Parameters

Parameter	Catchments (*Total Site*)		
Reporting Location	**LPOD-1**	**LPOD-2**	**LPOD-3**
Contributing Sub Catchments	CAT-1, CAT-2, CAT-3, CAT-X2, CAT-4, CAT-5, CAT-6, CAT-6A, and CAT-X1	CAT-7 and CAT-7A	CAT-8
Area (Ha)	50.714	13.391	2.481
Vectored Slope (%)	4.01	3.01	3.00
Impervious Area (%)	3.10	2.50	0.00
Pervious Area (%)	96.90	97.50	100.00
Roughness (n)	0.059	0.059	0.060
Initial Loss (mm)	5.00	5.00	5.00
Continuing Loss (mm/hr)	2.50	2.50	2.50

Parameter	Catchments (*Total Site*)	
Reporting Location	**LPOD-4**	**LPOD-5**
Contributing Sub Catchments	CAT-9	CAT-10
Area (Ha)	2.21	8.523
Vectored Slope (%)	2.21	6.45
Impervious Area (%)	0.00	8.20
Pervious Area (%)	100.00	91.80
Roughness (n)	0.060	0.030
Initial Loss (mm)	5.00	5.00
Continuing Loss (mm/hr)	2.50	2.50

Table 4.2B: Contributing Catchment Parameters to Reporting Locations

Parameter	Catchments (Post Development - *Stage 1*)	
Name	CAT-10A *Impervious*	CAT-10A *Pervious*
Total Area (Ha)	15.882	
Area Split (Ha)	14.294	1.588
Vectored Slope (%)	2.55	2.55
Impervious Area (%)	100.00	0.00
Roughness (n) for Impervious Area	0.020	-
Pervious Area (%)	0.00	100.00
Roughness (n) for Pervious Area	-	0.045
Initial Loss (mm)	0.00	5.00
Continuing Loss (mm/hr)	2.50	2.50

Table 4.2C: Post Development Catchment Parameters

4.3 LAND USE

Land uses were mapped within the pre and post development catchments with the varying hydraulic roughness and hydrological losses input into the XPSTORM model summarised in ***Table 4.3 below.***

Land Use Type	Initial Loss (mm)	Continuing Loss (mm/hr)
Pre Developed		
Pervious	5.0	2.5
Impervious	0.0	2.5

Land Use Type	Initial Loss (mm)	Continuing Loss (mm/hr)
Post Developed		
Pervious	5.0	2.5
Impervious	0.0	2.5

Table 4.3: Summary of Adopted Initial & Continuing Losses

4.4 PRE AND POST DEVELOPMENT FLOW CALCULATIONS

XPSTORM modelling software was utilised to determine the pre and post development discharge flow rate for each catchment based on the parameters listed above.

The computations were run for the standard Average Recurrence Intervals (ARI) 1, 2, 5, 10, 20, 50 and 100 years. Catchment runoff volumes to the respective existing lawful points of discharge (reporting locations) are summarised in ***Table 4.4.*** *Catchment: CAT-10 for LPOD-5 is the only catchment area influenced by the subject Stage 1 development proposal.*

Catchment	Peak Flow Rates for Average Recurrence Interval (m^3/s)						
Pre Developed Condition *(Critical Duration)*	Q_1	Q_2	Q_5	Q_{10}	Q_{20}	Q_{50}	Q_{100}
LPOD-1 *(60 min)*	3.722	5.264	7.162	8.366	10.051	12.006	13.574
LPOD-2 *(60 min)*	1.141	1.604	2.155	2.506	3.004	3.556	4.020
LPOD-3 *(60 min)*	0.268	0.372	0.498	0.578	0.688	0.801	0.902
LPOD-4 *(60 min)*	0.213	0.297	0.399	0.463	0.553	0.650	0.736
LPOD-5 (CAT-10) *(25 min)*	1.875	2.640	3.472	3.901	4.565	4.848	**5.403**
Catchment	**Peak Flow Rates for Average Recurrence Interval (m^3/s)**						
Post Developed Condition *(Critical Duration)*	Q_1	Q_2	Q_5	Q_{10}	Q_{20}	Q_{50}	Q_{100}
LPOD-5 (CAT-10A) *(15 min)*	4.798	6.083	7.484	8.272	9.369	10.138	**11.152**

Table 4.4: Flow Rates Calculated Using the Laurenson Method in XPSTORM

Figure 4.12 below contains the pre developed peak flow rate hydrographs per reporting location / lawful point of discharge:

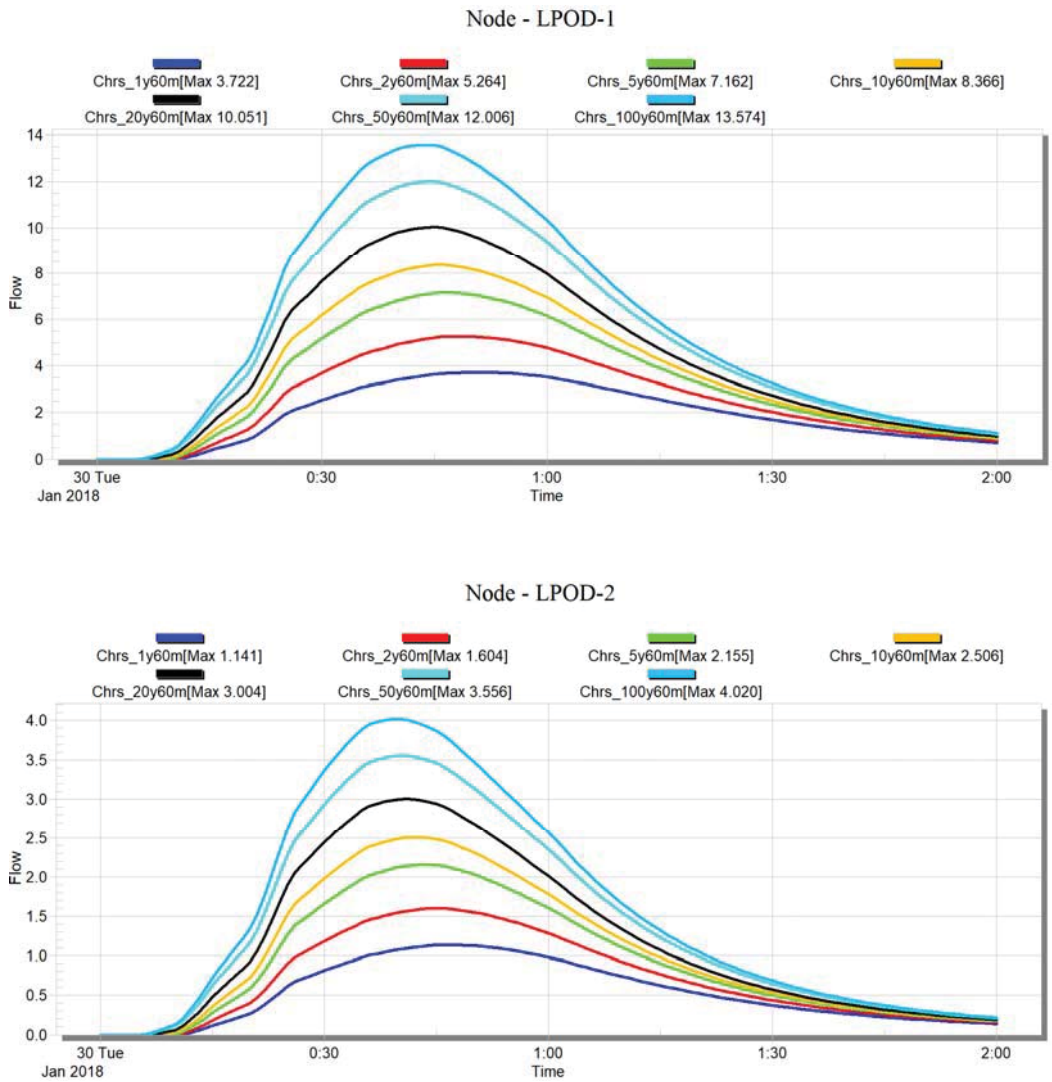


Figure 4.12: Pre Developed Peak Flow Rate Hydrographs

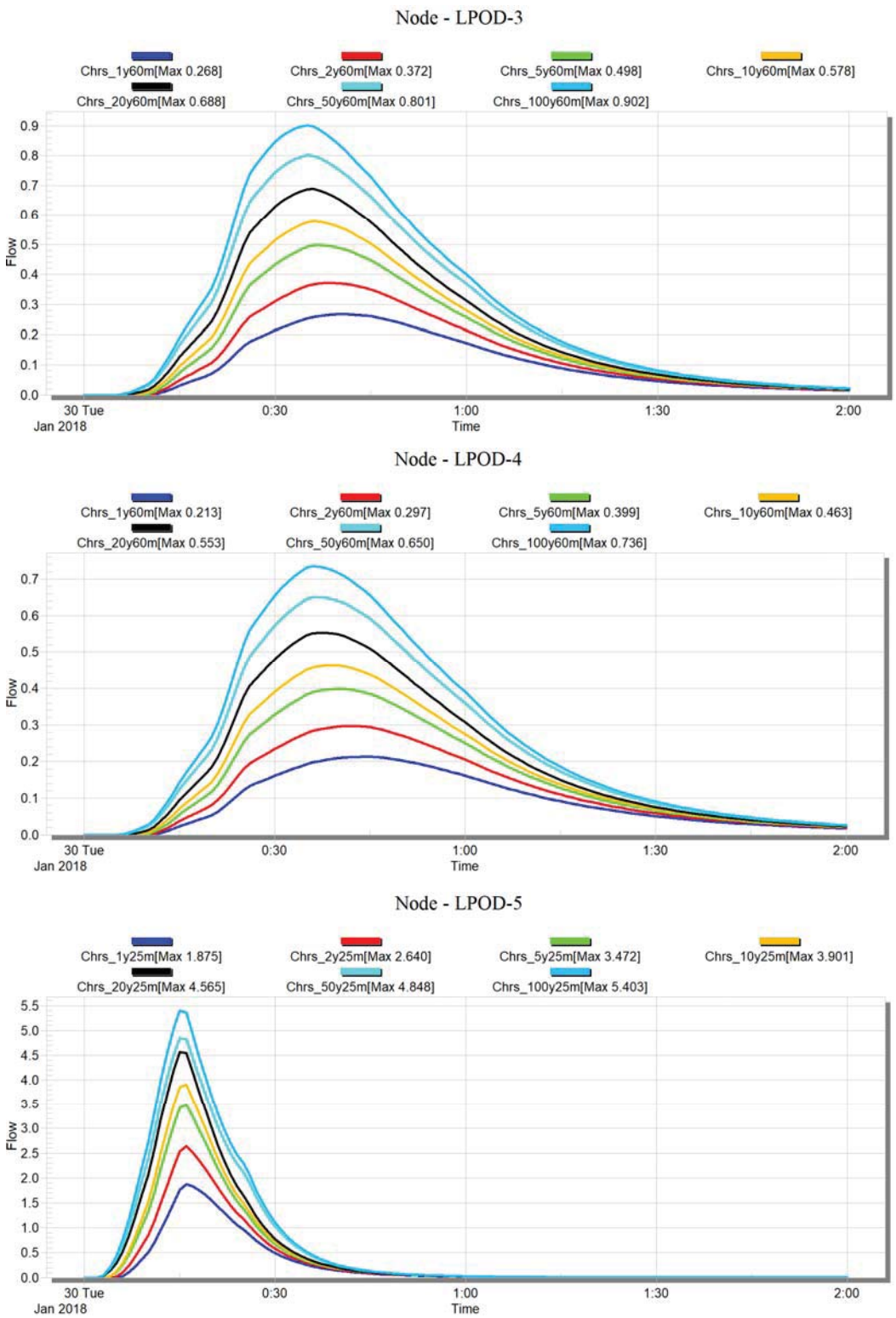


Figure 4.12: Pre Developed Peak Flow Rate Hydrographs (cont.)

Figure 4.13 below contains the post developed peak flow rate hydrograph at the reporting location / lawful point of discharge (CAT-10A / LPOD-5):

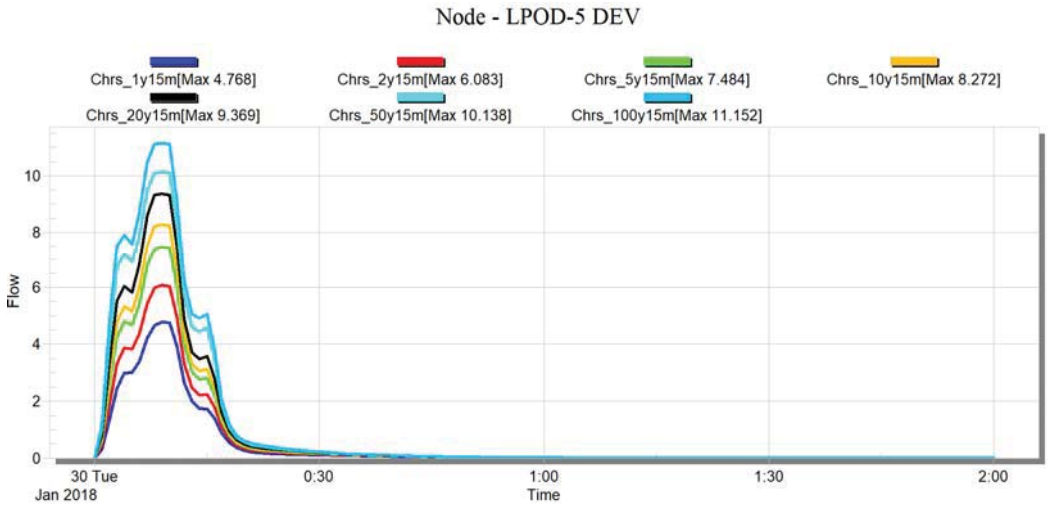


Figure 4.13: Post Developed Peak Flow Rate Hydrograph

5.0 STORMWATER QUANTITY, DENTENTION & HYDRAULIC DESIGN

5.1 ATTENUATION OF DEVELOPED FLOWS

To ensure that the increased flow rates from the developed site have minimal impact on downstream property, the following hydrological objective has been set for stormwater exiting the subject site;

- *No increase in peak discharge flow rates from the developed site to downstream infrastructure.*

To achieve this objective, stormwater discharge from the development must be detained to pre development flow rates for all storms events up to and including Q100. The following sections provides a summary of the procedure used to design the onsite detention system at subject site.

5.2 METHODOLOGY

For the site catchment identified as having increase in peak flow rates when developed, a hydrologic model was created using XPSTORM. The model was then used to route post-development runoff through various proposed detention structures to determine the most efficient on-site detention system.

5.2.1 MODEL CONDITIONS

In XPSTORM three (3) hydraulic conditions were modelled in order to demonstrate the stormwater quantity, detention and hydraulic objective;

1. Existing Condition - Current condition of site with all the external catchments to assess the natural hydrology.

2. Developed Condition - Future condition of site when developed with all the external catchments. The main changes in hydrology as part of development include; increase in impervious area of the subject site due to the construction of the hardstand and other impervious areas and reduction in Manning's roughness coefficient for sections of the site to be developed.

3. Mitigated Condition - Future condition of site when developed with proposed detention structures in place with all the external catchments where applicable.

5.2.2 CRITICAL STORM EVENT AND DURATIONS

An analysis of storm events ranging from Q1 to Q100 was undertaken to determine the critical storm event and the critical storm duration per catchment. The determined critical storm events for the pre developed and post developed condition are indicated in ***Table 5.2.2*** below.

MODEL CONDITION	CRITICAL STORM EVENT	CRITICAL STORM DURATION
Pre Developed	Storm	(mins)
LPOD-1	Q100	60
LPOD-2	Q100	60
LPOD-3	Q100	60
LPOD-4	Q100	60
LPOD-5	Q100	25

MODEL CONDITION	CRITICAL STORM EVENT	CRITICAL STORM DURATION
Post Developed	Storm	(mins)
LPOD-5	Q100	15

Table 5.2.2: Critical Storm Event and Duration Summary Table

Critical storm duration hydrographs per model condition are indicated in ***Figures 5.2.1 and 5.2.2.***

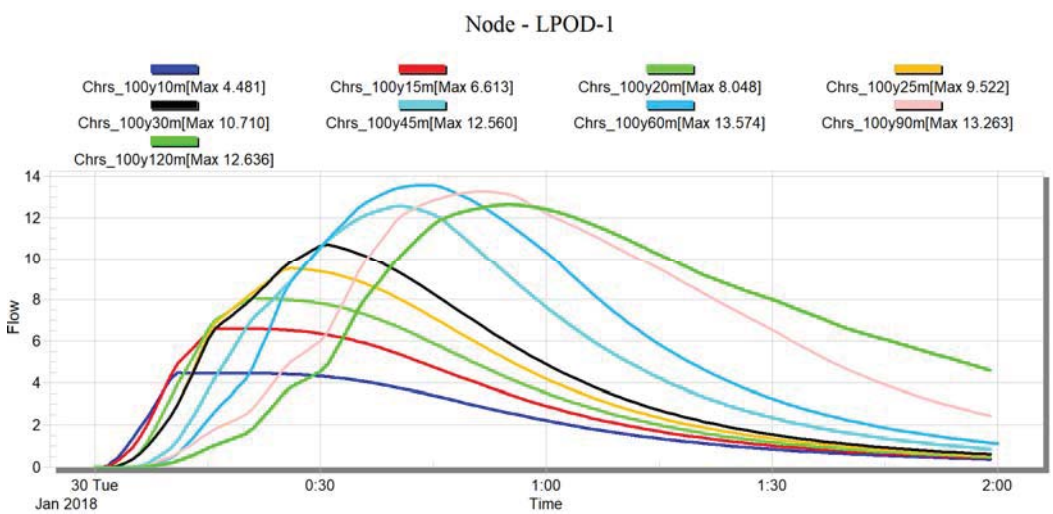
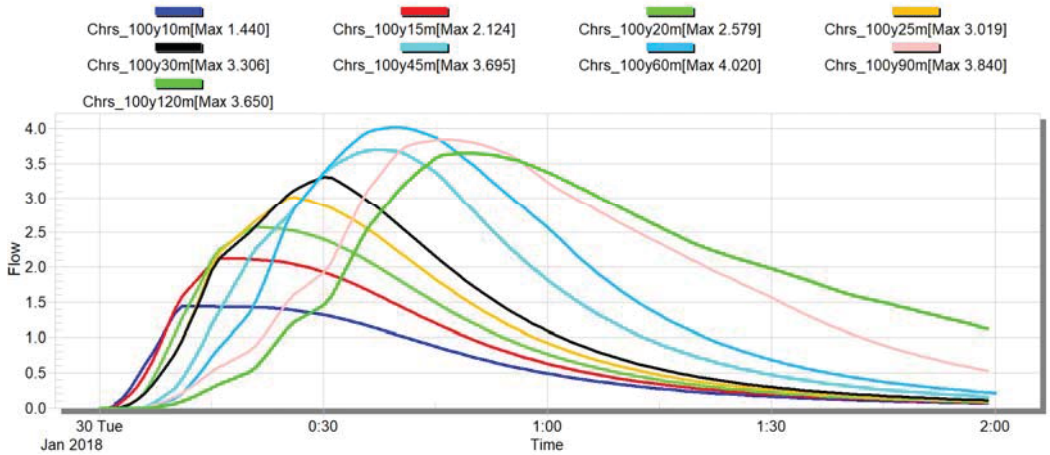
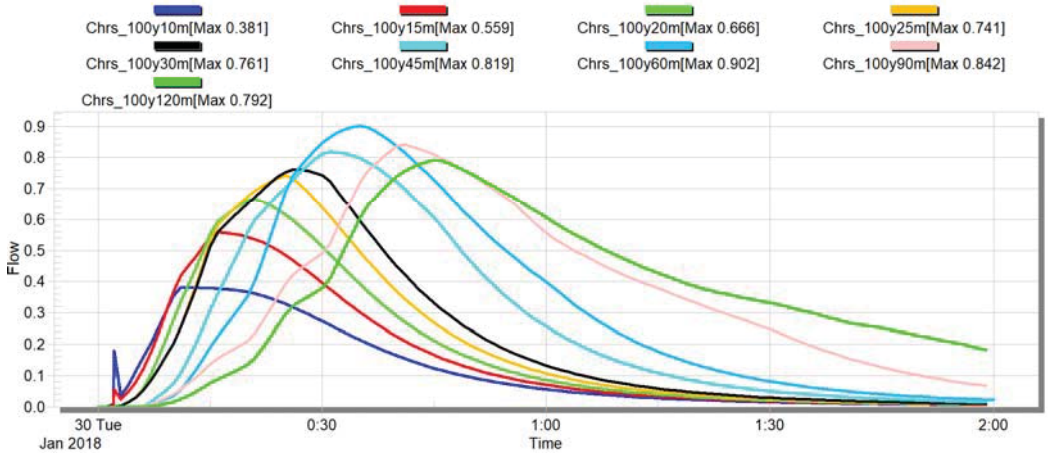


Figure 5.2.1: Critical Storm Event Durations for all *Pre Developed* Catchments (LPOD-1,2,3,4,5)

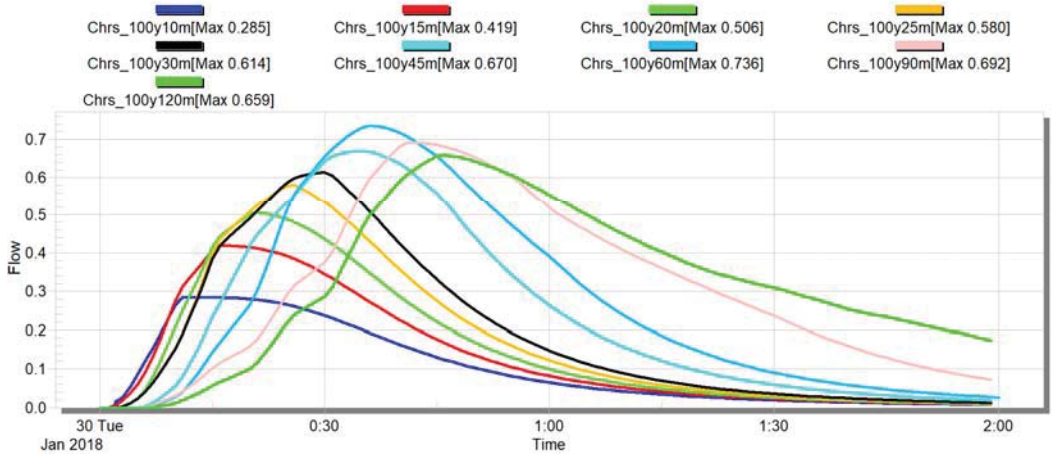
Node - LPOD-2



Node - LPOD-3



Node - LPOD-4



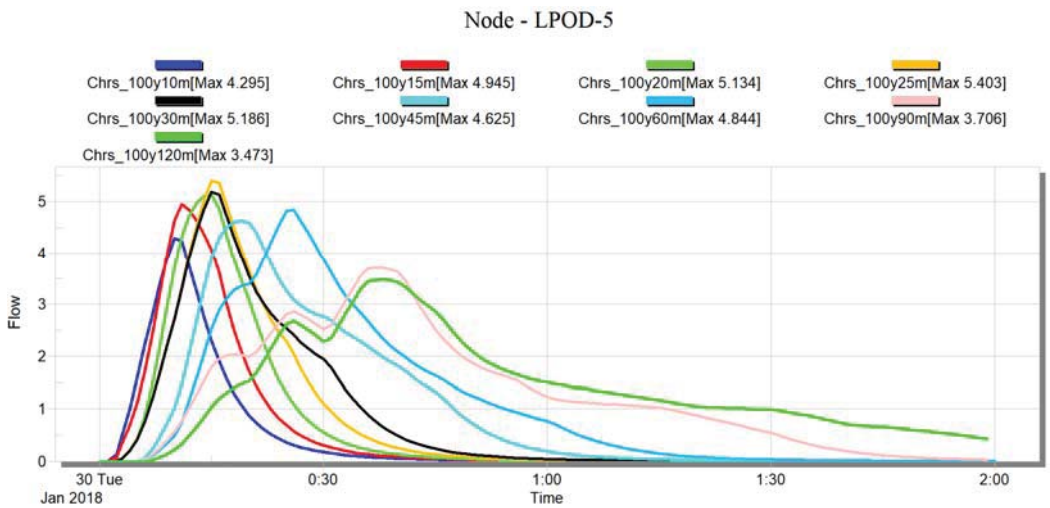


Figure 5.2.1: Critical Storm Event Durations for *Pre Developed* Catchments (LPOD-1,2,3,4,5)

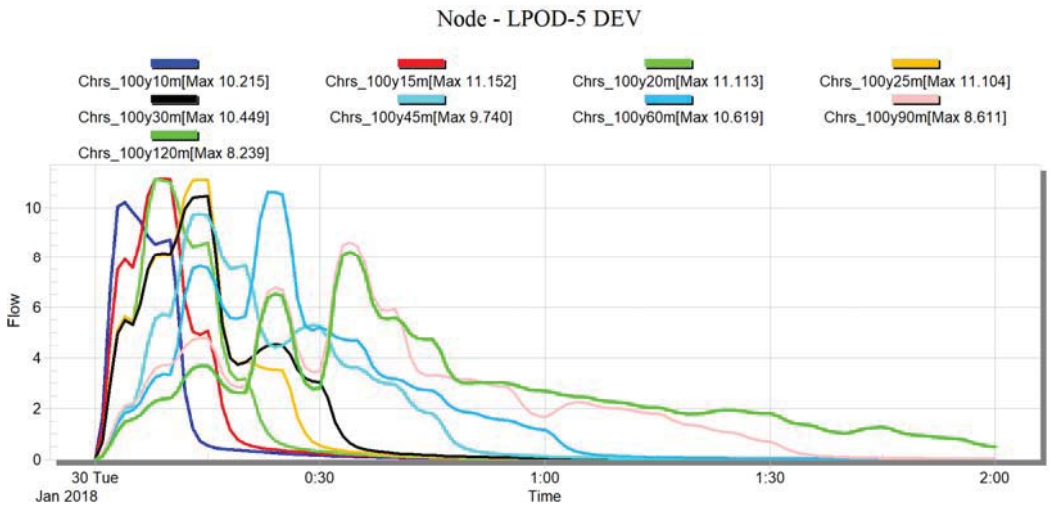


Figure 5.2.2: Critical Storm Event Durations for *Post Developed* Catchment (LPOD-5)

5.2.3 DETENTION SYSTEM DESIGN

Detention devices capture and temporarily store stormwater runoff during major / critical storm events and release to the Lawful Point of Discharge (LPoD) at a controlled rate. Hence, detention devices act to mitigate potential downstream flooding impacts and also provide minor water quality treatment.

Therefore, to achieve the objective of zero post development flow rate increase to pre-developed Q1 to Q100 year ARI flow rates at the downstream reporting location (outfall), on-site detention basins are introduced with low and high flow discharge devices.

Table 5.2.3 includes the design details for the proposed on-site detention system for Stage 1.

Parameter	Value
Catchment	**CAT-10A**
Type	Detention Basin (in ground)
Internal Batter Slope on Basin Sides	1 in 3
Basin Base RL	5.80 m AHD
Basin Embankment / Crown R.L	8.10 m AHD
Basin Weir RL	6.915 m AHD
Freeboard	300mm min.
Detention Volume Depth	1.440m to Q100 WSL *(measured from floor IL of basin)*
Detention Volume to Crown (m^3)	8,573 to RL 8.10m *(deducting 0.30m extended detention)*
Detention Volume to Q100 WSL (m^3)	4,344 to RL 7.240m *(deducting 0.30m extended detention)*
Detention Volume to Weir (m^3)	2,954 to RL 6.915m *(deducting 0.30m extended detention)*
Low Flow Outlet/s	900 x 900mm dome type field inlet pit with 375mm lower outlet orifice, pit grate at surface of extended detention @ 300mm above basin floor RL6.10m. Max. pipe grade 1.0%.
High Flow Outlet/s	2 x 600mm dia. circular conduit @ 300mm above basin floor (IL6.10m), maximum grade 0.40%
	7.60m wide broad crested weir 1.7 discharge coefficient at RL 6.915m 1.115m above basin base of RL 5.800m

Table 5.2.3: Summary of Design Parameters of Proposed Detention System for Stage 1

5.2.4 MODEL RESULTS

Table 5.2.4.1 presents the results obtained from XPSTORM modelling as a result of implementing the above detention system for flow mitigation.

Q100 STORM EVENT 25 MINUTE DURATION – **PRE-DEVELOPED FLOWS FOR CAT-10**							
ARI (Years)	**Q1**	**Q2**	**Q5**	**Q10**	**Q20**	**Q50**	**Q100**
LPOD-5 (CAT-10) *(25 min)*	1.875	2.640	3.472	3.901	4.565	4.848	**5.403**

Q100 STORM EVENT 15 MINUTE DURATION **- MITIGATED PEAK FLOWS FOR CAT-10A**							
ARI (Years)	**Q1**	**Q2**	**Q5**	**Q10**	**Q20**	**Q50**	**Q100**
Peak Flow (m3/sec)	1.664	1.957	2.283	2.712	3.401	4.344	**5.139**
Max Water Elevation RL	6.617	6.755	6.929	7.002	7.084	7.174	7.240
Critical Duration (min)	15	15	15	15	15	15	15
Depth of Water (m)	0.817	0.955	1.129	1.202	1.284	1.374	1.440

Table 5.2.4.1: Summary of XPSTORM Hydrologic / Hydraulic Results at Catchment *CAT-10A*

Figure 5.2.3 below presents the hydrograph results obtained from XPSTORM for the multiple outflow discharges from the proposed detention basin. **Table 5.2.4.2** sums the discharges and compares directly against the pre developed hydrology condition across a range of storm events.

MITIGATED DISCHARGE SUMMARY PROPOSED DETENTION BASIN							
ARI (Years)	**Q1**	**Q2**	**Q5**	**Q10**	**Q20**	**Q50**	**Q100**
High Flow Outlet (m3/s)	0.611	0.820	1.031	1.108	1.180	1.264	1.325
Low Flow Outlet (m3/s)	0.612	0.666	0.732	0.760	0.793	0.827	0.853
Orifice Flow (m3/s)	0.441	0.471	0.500	0.514	0.531	0.549	0.562
Weir Flow (m3/s)	0	0	0.020	0.330	0.897	1.704	2.399
TOTAL (m3/s)	**1.664**	**1.957**	**2.283**	**2.712**	**3.401**	**4.344**	**5.139**
Flow Mitigation from Existing Condition (m3/s)	0.211	0.683	1.189	1.189	1.164	0.504	0.264
Attenuation Achieved (Y/N)	Y	Y	Y	Y	Y	Y	Y

Table 5.2.4.2: Summary of Mitigated Discharges from XPSTORM Hydrologic / Hydraulic Results

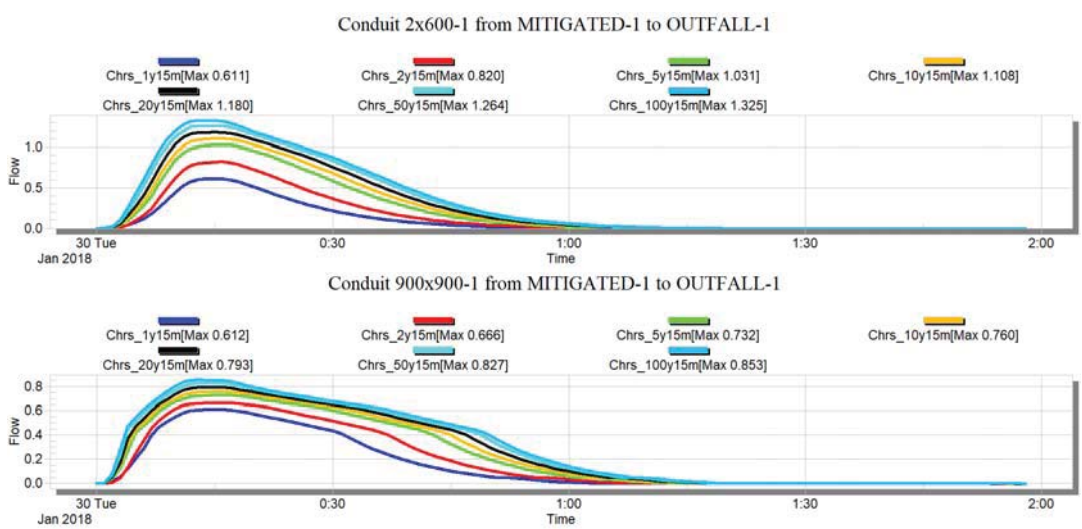


Figure 5.2.3-1: Mitigated Discharge Hydrographs from XPSTORM

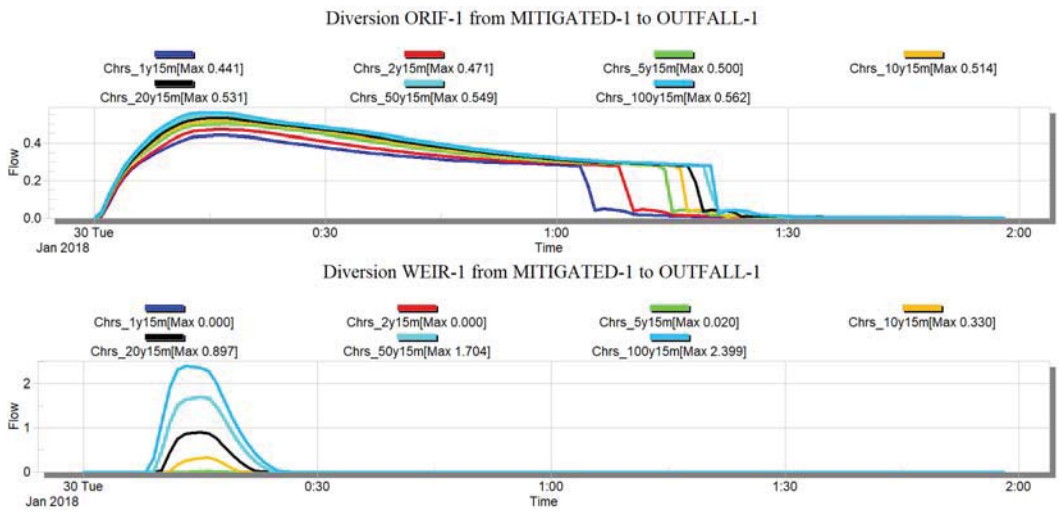


Figure 5.2.3-2: Mitigated Discharge Hydrographs from XPSTORM (cont.)

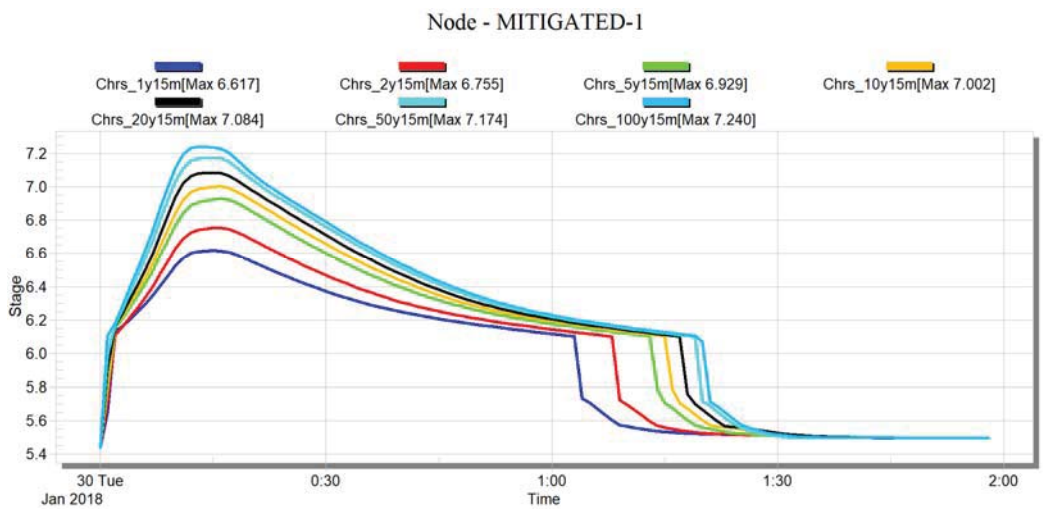


Figure 5.2.3-3: Stage Relationship Indicating Water Surface Elevations from XPSTORM

5.2.5 DISCUSSION ON MODELLING OUTCOMES

The above hydraulic modelling has confirmed that there is no increase in peak discharge flow rates from the development site to existing infrastructure or downstream / neighbouring properties by implementing the proposed designed detention measures. All ARI's ranging from Q1 to Q100 achieve mitigation.

An inundation depth of less than 1.50m in the Q100 storm event is maintained.

6.0 STORMWATER QUALITY

Stormwater quality analysis has been undertaken through the use of MUSIC software to confirm the adequacy of proposed Stormwater Quality Improvement Devices (SQIDs) required to meet the State Planning Policy's (SPP 2014) Water Quality Objectives (WQOs) and the pollutant removal targets set by the City of Gold Coast Council. A suitable treatment strategy addressing the typical pollutant types generated during construction and operation of an industrial development are outlined within this section of reporting.

6.1 POLLUTANTS OF CONCERN

There are a number of pollutants typically generated during the operational phase (following construction) of an industrial development. These include:

- **Litter / gross pollutants**
- **Sediment**
- Toxic materials
- Heavy metals
- Hydrocarbons
- **Nutrients (i.e. nitrogen & phosphorous)**
- Pathogens / faecal coliforms
- Oxygen demanding substance
- Surfactants
- Acid or alkaline substances
- Organochlorines & organophosphates
- Thermal pollution

The key pollutants highlighted in **bold** above represent those that will be further addressed within this report. This will be done through the use of MUSIC modelling software which will assist in estimating the generation of the pollutants in the developed condition and the associated treatment measures requiring implementation in order to meet the stormwater quality objectives as defined within Section 6.2 of this report.

6.2 STORMWATER QUALITY OBJECTIVES (OPERATIONAL PHASE)

City of Gold Coast Council have set stormwater quality objectives with the intent of "protecting receiving water quality by limiting the quantity (loads) of stormwater pollutants discharged into receiving waters from development" such as that proposed over the subject site. These are summarised in Table SC6.9.3-3 of Council's City Plan Version 2.0 Schedule 6.9 and outlined below.

Pollutant	Load Reduction Objective (in mean annual load)
Gross Pollutants (>5mm)	90%
Total Suspended Solids (TSS)	80%
Total Phosphorous (TP)	60%
Total Nitrogen (TN)	45%

Table 6.2: CoGC's Stormwater Quality Objectives (Source: City Plan, Schedule 6.9)

6.3 PROPOSED STORMWATER QUALITY MANAGEMENT STRATEGY

Development over the subject site has the potential to introduce increased pollutant loads and concentrate stormwater runoff into existing downstream waterways. To mitigate any potential increase in the export of pollutants from the subject site, suitable stormwater treatment devices will be utilised throughout the developed area as part of the integrated design of the road and stormwater drainage networks.

The implementation of a site specific stormwater treatment train prior to the discharge of stormwater from the site will ensure the quality objectives outlined in Section 6.2 of this report are achieved.

6.3.1 BIO RETENTION BASINS

Due to the spatial allowances over the subject site and the proposed development type, bio retention basins have been identified as a suitable Stormwater Quality Improvement Device (SQID) to reduce the off-site discharge of pollutants in line with the operational phase stormwater quality objectives identified within this report.

Bio retention basins are designed to treat conveyed stormwater by filtering the water through various layers of vegetation, biologically active sands and loam filter media which capture the pollutants as the water percolates down through the system.

The treated water is then conveyed through slotted / perforated pipes to downstream drainage systems *(Bioretention Technical Design Guidelines Version 1.1, October 2014).* A typical configuration of a bio retention system is outlined in Figure 6.3.1 below.

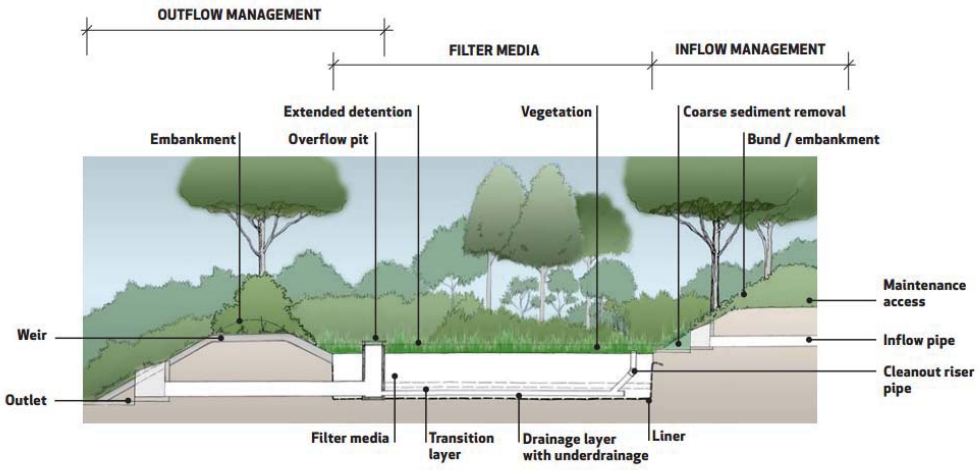


Figure 6.3.1: Components of a Typical Bio Retention System (Source: Water by Design, Bio Retention Technical Design Guidelines Version 1.1)

The bio retention basin for the subject site has been designed in accordance with Bio Retention Technical Design Guidelines (2012) with the properties as outlined in ***Table 6.3.1*** below.

Outlet structures within the basin are designed to ensure an extended detention depth of 300mm is maintained over the filter media. The required surface area and filter media profile required to adequately treat the contributing developed catchment is discussed within Section 6.4 of this report.

Parameter	Value
Geofabric Lining to Base	Yes
Hydraulic Conductivity	180 mm per hour
Orthophosphate Content	40 mg per kg
Filter Media's TN Content	800 mg per kg
Vegetation Properties	Basin to be vegetated with effective nutrient removal plants

Table 6.3.1: Summary of Adopted Bio Retention Properties

6.4 MUSIC MODELLING METHODOLOGY FOR THE DEVELOPMENT SITE

MUSIC Version 6.3.0 was utilised for the water quality modelling of the proposed development and was calibrated in accordance with Water by Design's MUSIC Modelling Guidelines for South East Queensland Version 1.0 (2010).

Modelling of the developed scenario with the nominated SQIDs in place was undertaken replicate the transfer of pollutants through a stormwater drainage system and to assist in determining the effectiveness of the proposed stormwater treatment train in meeting the City of Gold Coast Stormwater Quality Objectives (Section 6.2).

6.4.1 METEOROLOGICAL DATA

The meteorological data required for input into MUSIC software was obtained from the eWater website for Beenleigh Bowls Club Station (No. 040406). The data received is in the form of 6-minute pluviographic data for a 10-year period from 01st January 1990 to 31st December 1999. The mean average rainfall for this period was 1105mm.

Daily potential evapo-transpiration (PET) data (01/01/1990 to 31/12/1999) from the above mentioned station has been used.

A summary of the information is indicated below:

Catchment Name:	*5738 CoGC M38 Industrial Park, Yatala MUSIC Model*
Rainfall Station:	*40406 BEENLEIGH*
ET Station:	*User-defined monthly PET*
Start Date:	*1/01/1990 12:00 AM*
End Date:	*31/12/1999 11:54 PM*
Modelling Time Step:	*6 Minutes*

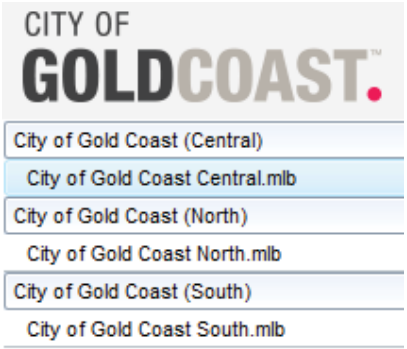
	Rainfall/6 Minutes	Evapo-Transpiration
mean	0.013	4.086
median	0.000	3.600
maximum	22.100	6.290
minimum	0.000	2.000
10 percentile	0.000	2.033
90 percentile	0.001	6.194

	Rainfall	Evapo-Transpiration
mean annual	1105	1492

6.4.2 SOURCE NODES

MUSIC modelling has utilised the *City of Gold Coast (North) MUSIC-Link data (Version 6.30)* to define the parameters assigned to the pollutant source node inputs for the MUSIC model.

Refer to ***Appendix E*** for the MUSIC Catchment Plan.



The intended industrial land use allows the developed catchment parameters to be conservatively assumed with the catchments broken down into a number of major surface types being ground level, roads (includes entire road reserve), roofs and drainage reserves. These surface types were allocated an effective impervious area (%) and further refined through the MUSIC modelling process via the "split" catchment approach.

The below table and figures summarise the imperviousness of the allocated source nodes within the MUSIC model.

External catchments that are conveyed through the site are assumed to be treated on site by the relevant lot owner prior to entering the subject site.

Catchment - MUSIC Source Node	Modelling Approach	Area (Ha)	Impervious %
CAT-10A TOTAL CATCHMENT = 15.882 Ha			
ROAD	SPLIT	2.800	90 *
ROOF	SPLIT	8.546	100 *
GROUND	SPLIT	3.663	90 *
DRAINAGE RESERVE	SPLIT	0.873	10 *
TOTAL		**15.882**	

* *Effective impervious areas were calibrated to ensure an overall site imperviousness of 90% was achieved. Refer to MUSIC Link Report in* ***Appendix F*** *for further details.*

Table 6.4: MUSIC Modelling Summary of Source Node Impervious Allocations

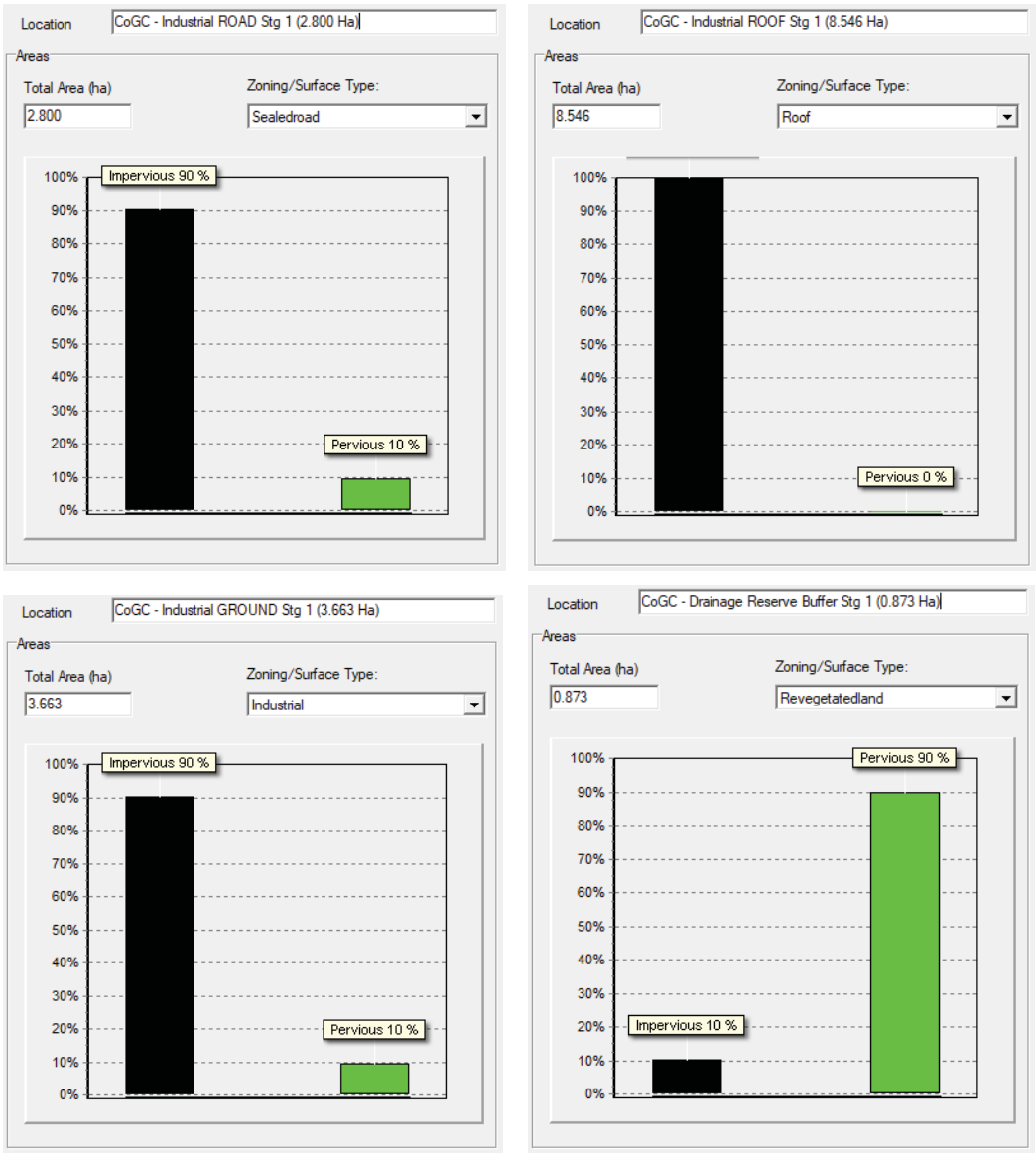


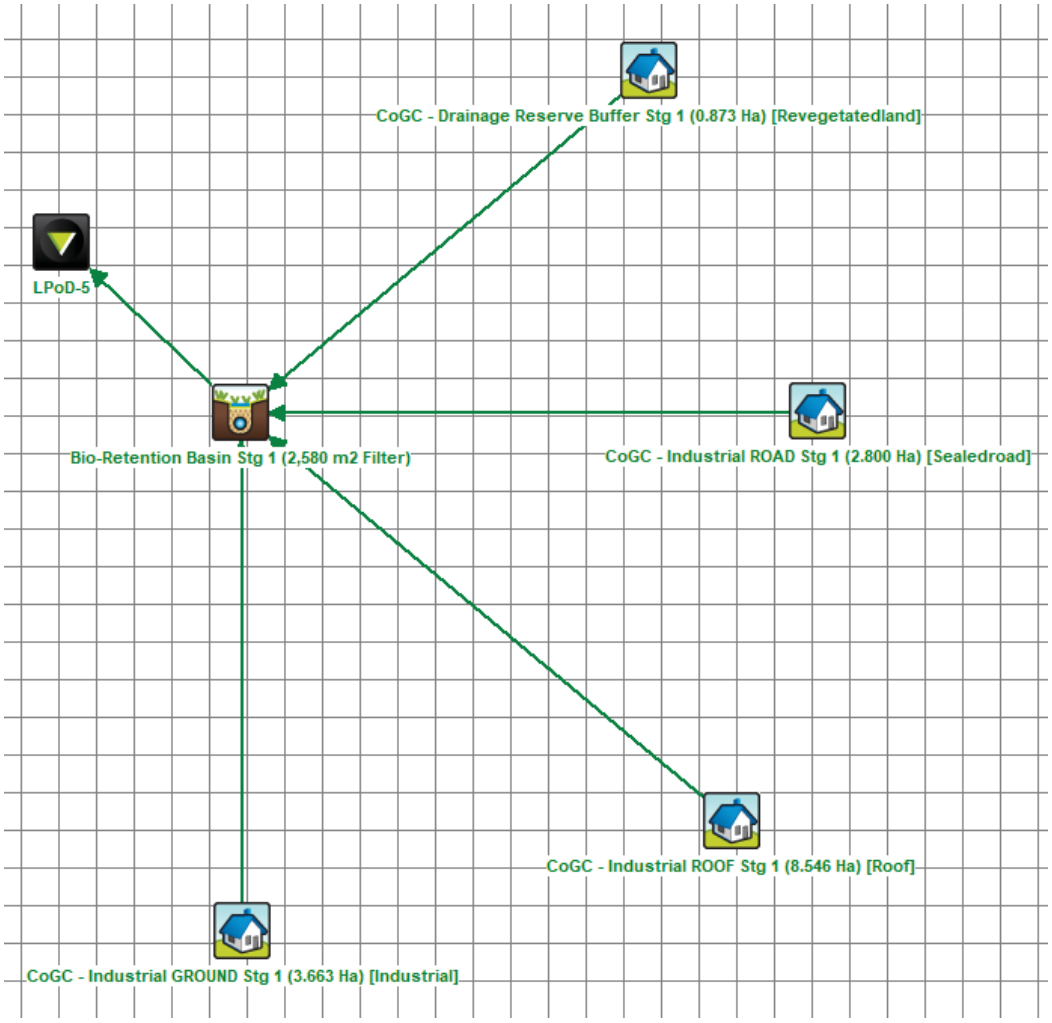
Figure 6.4.1: MUSIC Modelling Source Node Impervious Allocations

6.4.3 DRAINAGE LINKS

No routing has been adopted for the drainage links within the modelling that has been undertaken. This approach is believed to provide more conservative results.

6.4.4 MUSIC MODEL LAYOUT AND RESULTS

The diagrammatic representation of the source nodes, modelling configuration and results of pollutant reduction is outlined in Figure 6.4.4-1 below for the post developed catchment.



	Sources	Residual Load	% Reduction
Flow (ML/yr)	148	141	4.6
Total Suspended Solids (kg/yr)	18200	2050	88.8
Total Phosphorus (kg/yr)	44.1	12.9	70.7
Total Nitrogen (kg/yr)	316	134	57.6
Gross Pollutants (kg/yr)	3560	4.36	99.9

Figure 6.4.4-1: Catchment CAT-10A MUSIC Layout and Results

The reduction in target pollutants to meet City of Gold Coast Council's requirements are achieved based on the below bio retention measures being implemented for the catchment.

Parameter	Value
	CAT-10A
Filter Area (m2)	2,580
Filter Media Depth (m)	0.50
Extended Detention Depth (m)	0.30
Weir Width (m)	7.60

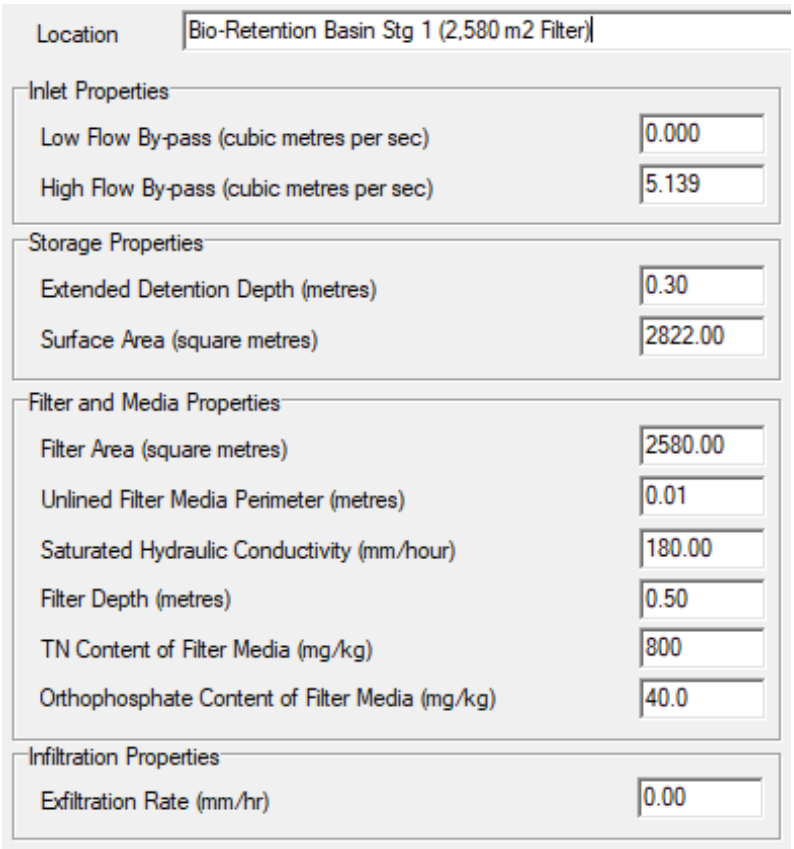


Table 6.4.4: Summary of Proposed Bio Retention Measures

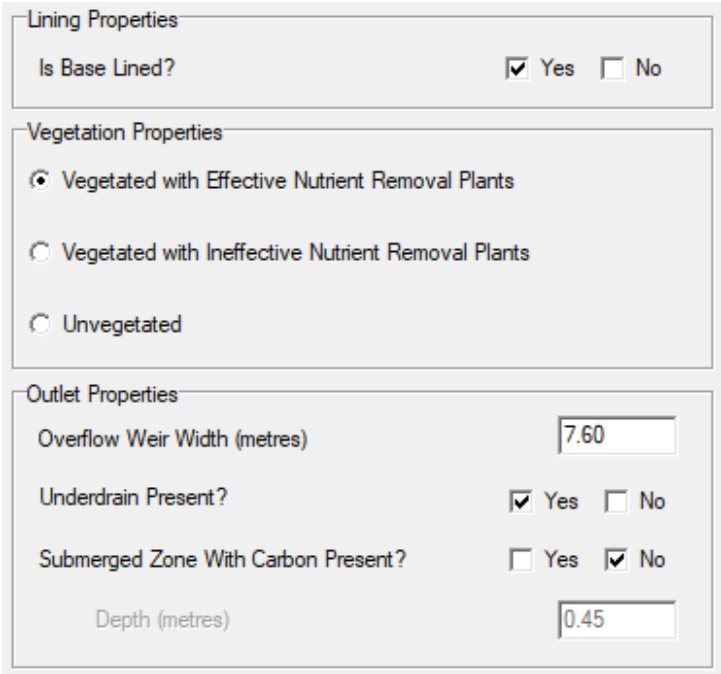


Table 6.4.4: Summary of Proposed Bio Retention Measures (cont.)

7.0 CONSTRUCTION, OPERATIONAL MANAGEMENT & MAINTENANCE

7.1 CONSTRUCTION PHASE SEDIMENT AND EROSION CONTROL

The operational phase detention basin is proposed to be utilised as a sediment basin during the construction phase of the development.

Where ultimate detention basin sizing does not align with the volumetric requirements of International Erosion Control Association's (IECA) Best Practice Guidelines, temporary construction phase sediment basins will be implemented.

Monitoring and maintenance of both the construction phase sediment basins and associated sediment and erosion control measures implemented over the site will be in accordance with IECA's Best Practice Guidelines and City of Gold Coast Council's standards.

7.2 ASSET OWNERSHIP AND HANDOVER

The SQIDs have been designed in accordance with QUDM standards and City of Gold Coast Council's Land Development Guidelines and in doing so aim to provide suitable and safe vehicular access for future maintenance. The current development proposal retains the SQIDs as assets of the developer though a formal handover from the Contractor to the Asset Owner will be required to ensure the SQIDs have been built in accordance with the requirements

7.3 MAINTENANCE OF BIO RETENTION BASINS DURING OPERATIONAL PHASE

Inspections and maintenance are to be carried out on a yearly basis to determine if the SQIDs are functioning as intended.

WSUD Technical Design Guidelines for South East Queensland have a Maintenance Checklist *(refer **Appendix G**)* covering the items to be inspected and should be utilised and kept on record to ensure that a mechanism is in place to log the continued effectiveness of the SQIDs. Inspections and any required maintenance will be the responsibility of the asset owner.

8.0 CONCLUSION

Gassman Development Perspectives have prepared this Site Based Stormwater Management Plan to support an application for *Reconfiguration of Lot* over Lot 1 on RP6882 (60 Stapylton Jacobs Well Road, Stapylton) and Lot 240 on W31320 (82 Christensen Road, Stapylton).

The purpose of which is to address and manage stormwater quantity and quality requirements of the proposed development over the subject site in accordance with the relevant State and Local Authority's legislation and regulatory guidelines.

The key outcomes achieved through the analysis and modelling undertaken within this report are demonstrated in the stormwater bio retention and sediment basin designs within ***Appendix C,*** and are as described below:

Stormwater Quantity

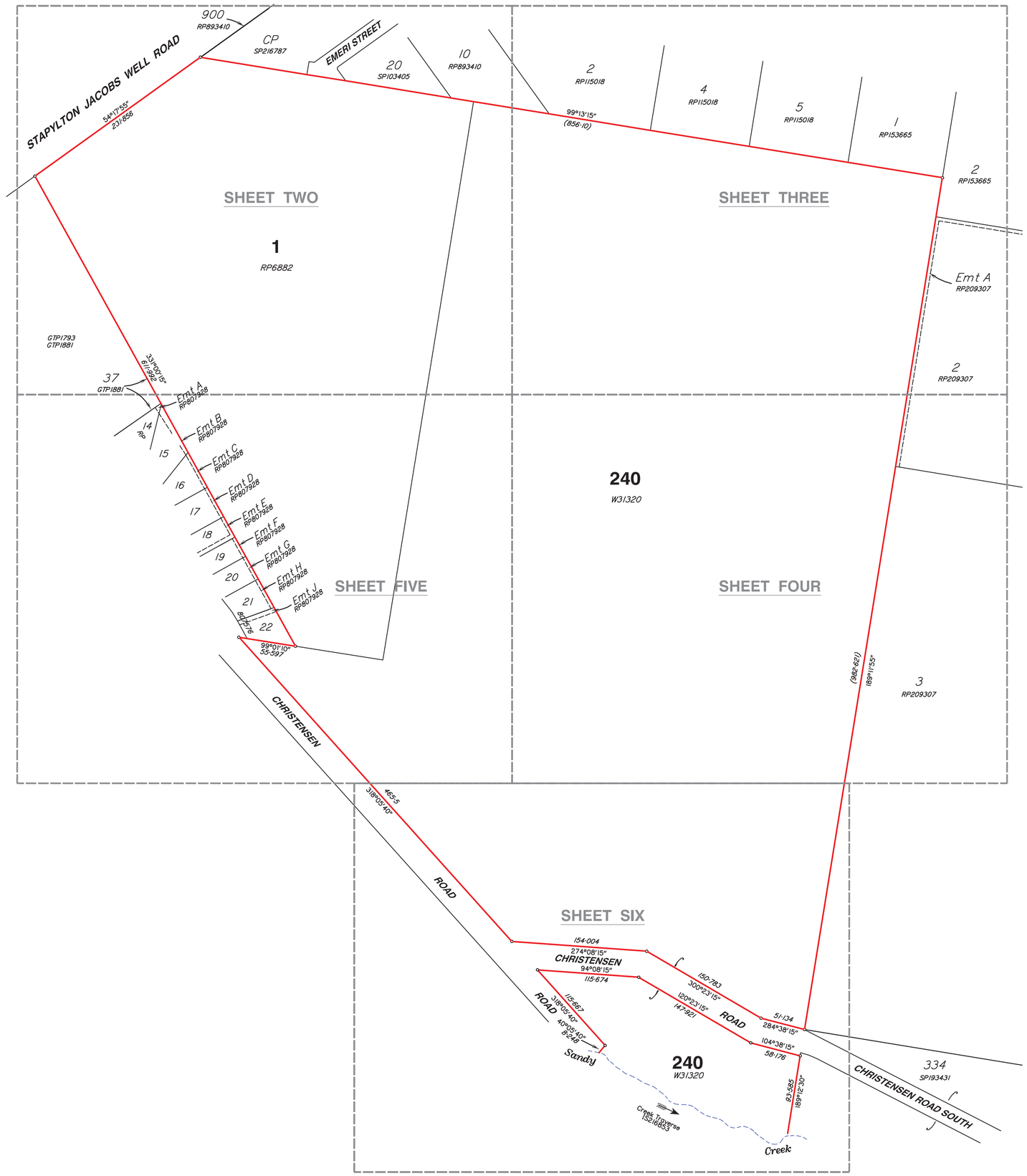
Suitable attenuation measures are able to be incorporated into the proposed development to ensure there is no adverse impacts to downstream properties, waterways or infrastructure as a result of an increase in peak stormwater flow rates discharging from the subject site upon development.

This is achieved through the design of an appropriately sized detention basin that complies with City of Gold Coast Council's Land Development Guidelines along with the Queensland Urban Drainage Manual (QUDM). Adequate provision has also been made within the earthworks design and associated reporting to cater for the conveyance of external upstream catchments through the subject site.

Stormwater Quality

Stormwater quality objectives for the subject site are achieved through the design of a suitable stormwater treatment train that implements all necessary steps to ensure that the quality of stormwater discharging from the subject site meets the necessary standards to comply with City of Gold Coast Council's Water Sensitive Urban Design (WSUD) requirements, Queensland Urban Drainage Manual (QUDM) and the performance objectives of the Queensland State Planning Policy (SPP).

Appendix A – Site Survey Plan



Scale 1:2500 - Lengths are in Metres.

0 20 40 60 80 100 120 140 160 180 200

SHEET 1 OF 6

Notes

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CONTOUR AND DETAIL PLAN

Over Lot 1 on RP6882 and Lot 240 on WD31320

Parish of ***ALBERT***
County of ***Ward***
Local Govt ***GOLD COAST CITY COUNCIL***

Level Datum	A.H.D.	Date Surveyed	Jan 2011
Meridian	IS216853	Surveyor	A. Macdonald
Contour Interval	0.2	Drawn	S. Holt
F.B.	No	Date Drafted	02–02–2011
Origin	PSM 133471	Checked	
	RL 22.169		
Scale (on A1 original)		Designed	
1:2500		Drawn	
		Date Designed	

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f: (07) 32217308
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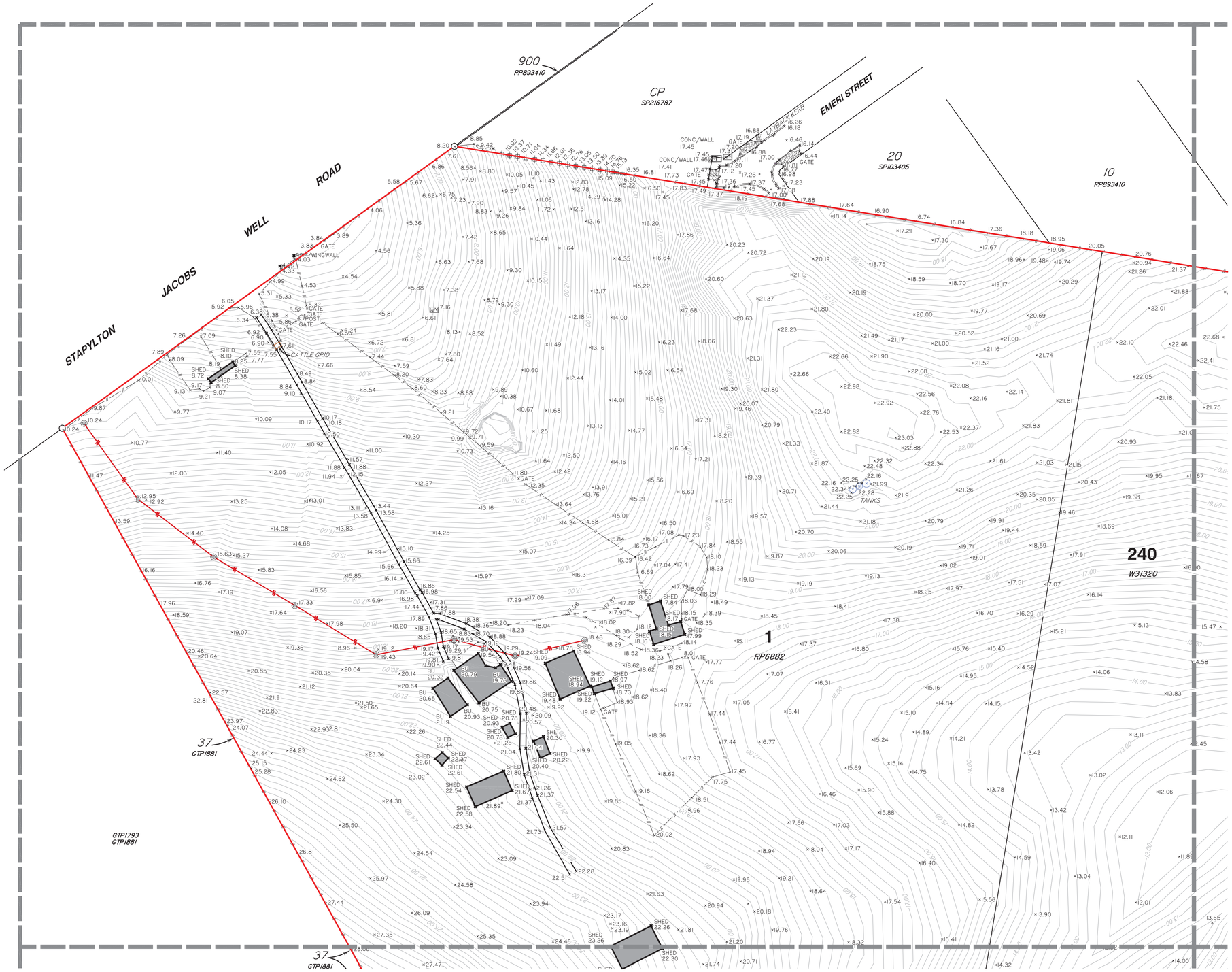
REFERENCE No. *5093-10*

PLAN No. ***5093 S CD 01***



Scale 1:1000 - Lengths are in Metres.

0 10 20 30 40 50 60 70 80

LEGEND

- PERMANENT MARK
- SEWER MANHOLE
- SEWER INSPECTION OUTLET
- ELECTRICITY PILLAR
- ELECTRICITY POLE
- ELECTRICITY POLE WITH LIGHT
- TELSTRA PIT
- MANHOLE
- STORMWATER MANHOLE
- GULLY TRAP
- WATER METER
- FIRE HYDRANT
- VALVE
- GATE
- BOLLARD
- CONCRETE
- EDGE OF BITUMEN
- FENCE
- OVERHEAD ELECTRICITY
- OPEN DRAIN
- RETAINING WALL
- EDGE OF GARDEN
- CONTOUR LEVEL

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CONTOUR AND DETAIL PLAN

Over Lot 1 on RP6882 and Lot 240 on WD31320

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Local Govt ***GOLD COAST CITY COUNCIL***

Level Datum	A.H.D.	Date Surveyed	Jan 2011
Meridian	IS133471	Surveyor	A. Macdonald
Contour Interval	0.2	Drawn	S. Holt
F.B.	No	Date Drafted	02-02-2011
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		Drawn	
		Date Designed	

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Access Business Park
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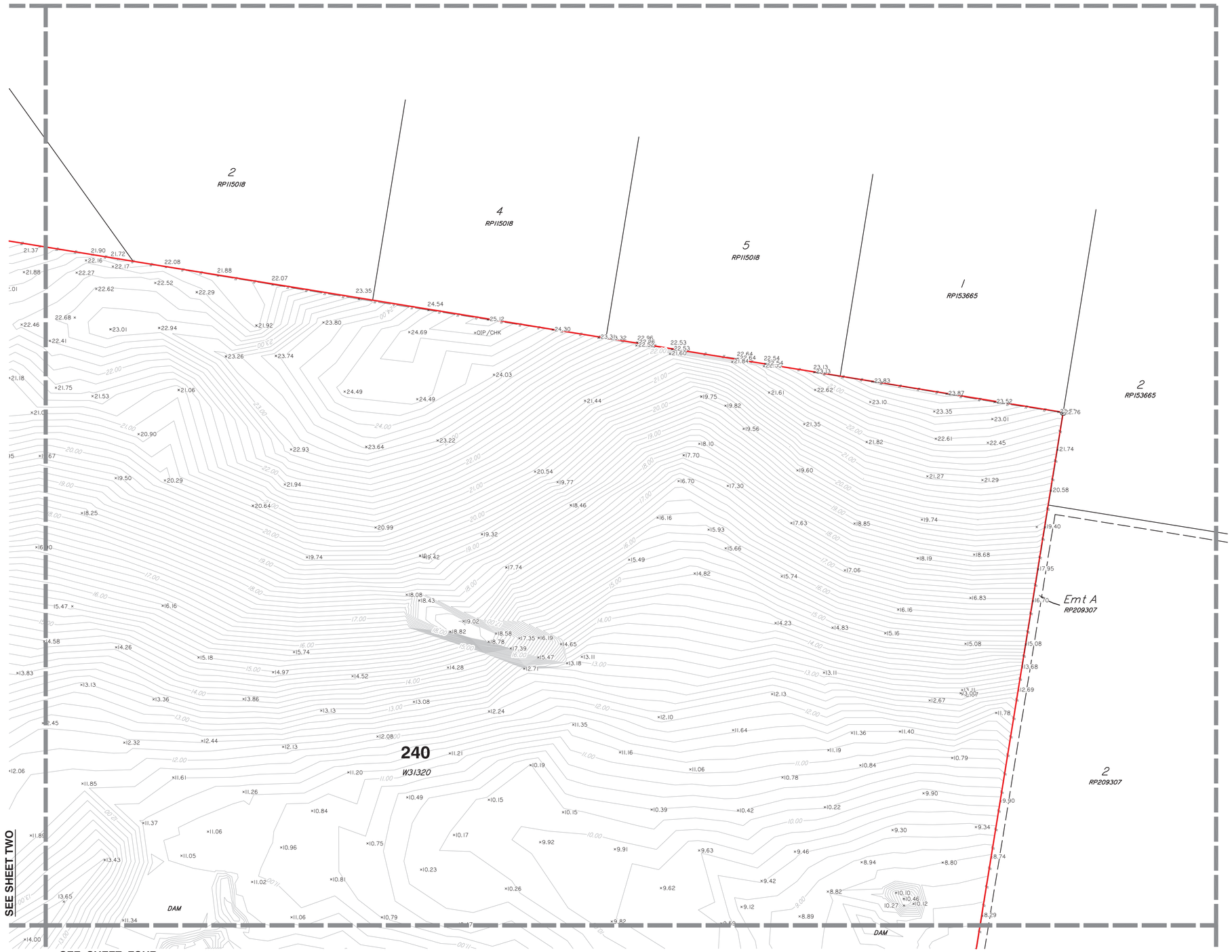
REFERENCE No. *5093-10*

PLAN No. ***5093 S CD 01***



Scale 1:1000 - Lengths are in Metres.

0 10 20 30 40 50 60 70 80

LEGEND

- . . . . PERMANENT MARK
- . . . . SEWER MANHOLE
- . . . . SEWER INSPECTION OUTLET
- . . . . ELECTRICITY PILLAR
- . . . . ELECTRICITY POLE
- . . . . ELECTRICITY POLE WITH LIGHT
- . . . . TELSTRA PIT
- . . . . MANHOLE
- . . . . STORMWATER MANHOLE
- . . . . GULLY TRAP
- . . . . WATER METER
- . . . . FIRE HYDRANT
- . . . . VALVE
- . . . . GATE
- . . . . BOLLARD
- . . . . CONCRETE
- EDGE OF BITUMEN
- FENCE
- OVERHEAD ELECTRICITY
- OPEN DRAIN
- RETAINING WALL
- EDGE OF GARDEN
- CONTOUR LEVEL

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CONTOUR AND DETAIL PLAN

Over Lot 1 on RP6882 and Lot 240 on WD31320

Parish of ***ALBERT***
County of ***Ward***
Local Govt ***GOLD COAST CITY COUNCIL***

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Meridian	IS216853	Surveyor	A. Macdonald
Contour Interval	0.2	Drawn	S. Holt
F.B.	No	Date Drafted	02-02-2011
Origin	PSM 133471 RL 22.169	Checked	
Scale (on A1 original)	**1:1000**	Designed	
		Drawn	
		Date Designed	

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Access Business Park
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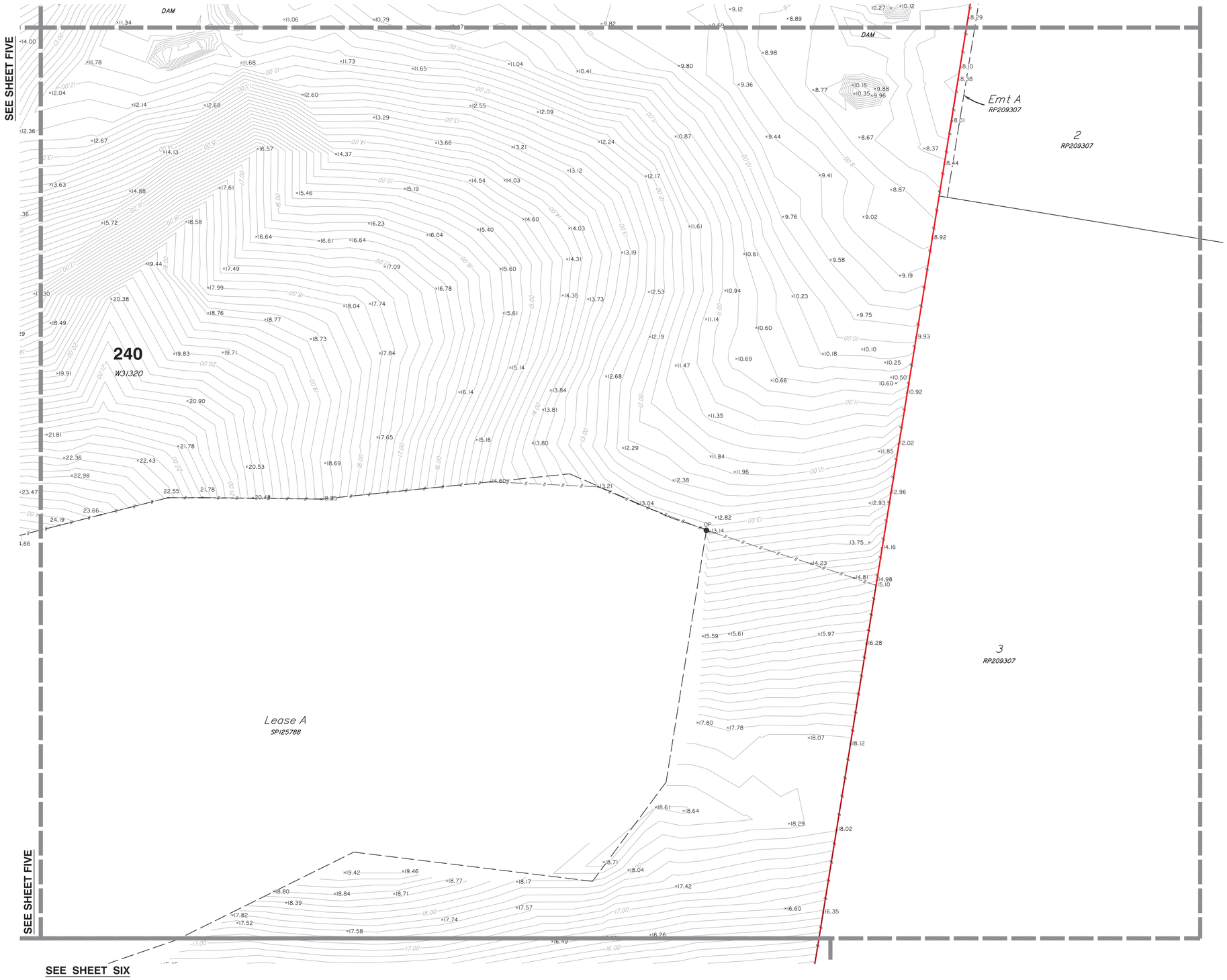
REFERENCE No. *5093-10*

PLAN No. ***5093 S CD 01***



Scale 1:1000 - Lengths are in Metres.

0 10 20 30 40 50 60 70 80

LEGEND

- . . . . PERMANENT MARK
- . . . . SEWER MANHOLE
- . . . . SEWER INSPECTION OUTLET
- . . . . ELECTRICITY PILLAR
- . . . . ELECTRICITY POLE
- . . . . ELECTRICITY POLE WITH LIGHT
- . . . . TELSTRA PIT
- . . . . MANHOLE
- . . . . STORMWATER MANHOLE
- . . . . GULLY TRAP
- . . . . WATER METER
- . . . . FIRE HYDRANT
- . . . . VALVE
- . . . . GATE
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- OPEN DRAIN
- RETAINING WALL
- EDGE OF GARDEN
- 14·0 CONTOUR LEVEL

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CONTOUR AND DETAIL PLAN

Over Lot 1 on RP6882 and Lot 240 on WD31320

Parish of ***ALBERT***
County of ***Ward***
Local Govt ***GOLD COAST CITY COUNCIL***

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F.B.	No	Date Drafted	02-02-2011
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1:1000		Drawn	
		Date Designed	

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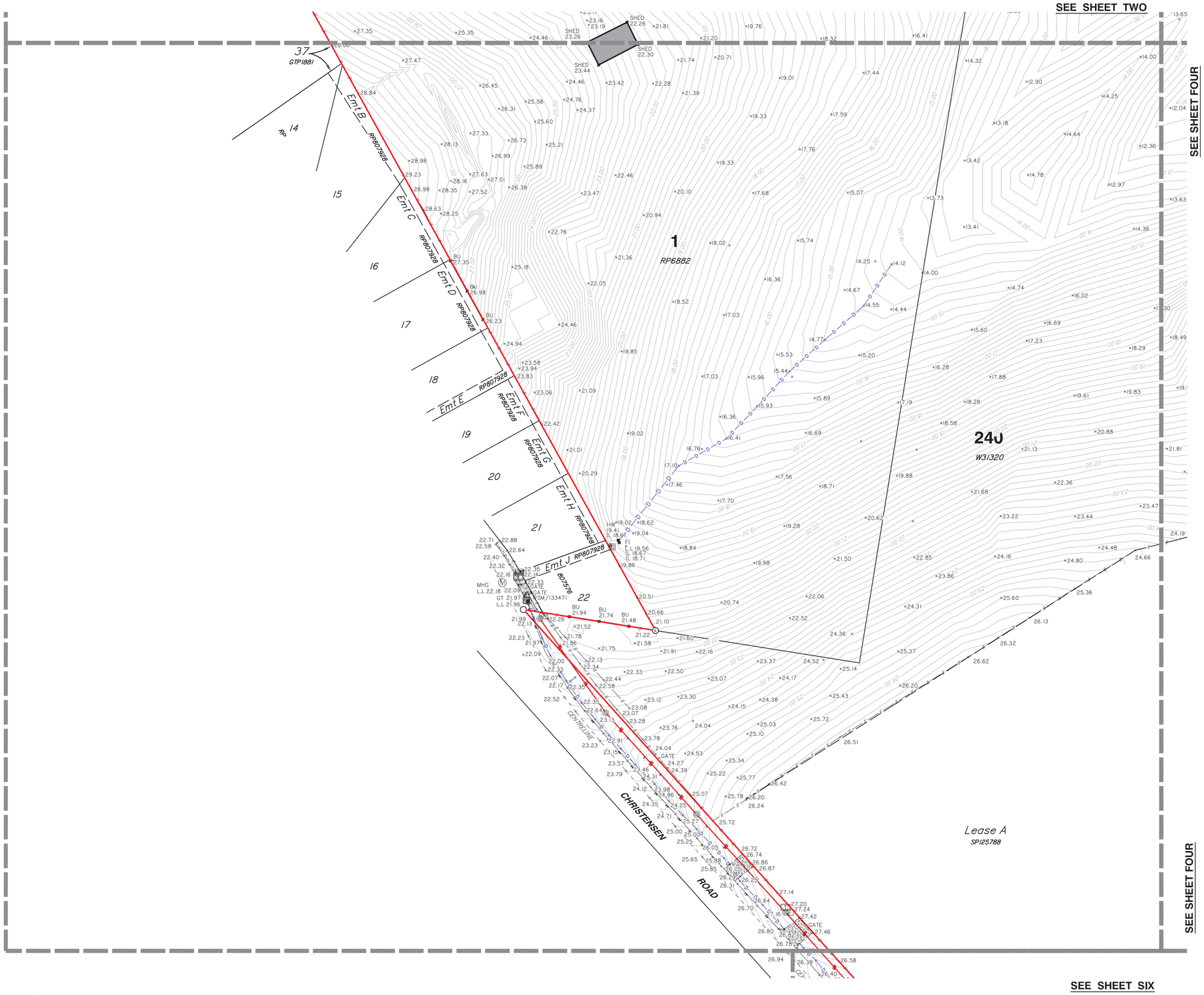

Scale 1:1000 - Lengths are in Metres.

0 10 20 30 40 50 60 70 80

SHEET 5 OF 6

LEGEND

- PERMANENT MARK
- SEWER MANHOLE
- SEWER INSPECTION OUTLET
- ELECTRICITY PILLAR
- ELECTRICITY POLE
- ELECTRICITY POLE WITH LIGHT
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- 14.0 CONTOUR LEVEL

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CONTOUR AND DETAIL PLAN

Over Lot 1 on RP6882 and Lot 240 on WD31320

Parish of ***ALBERT***
County of ***Ward***
Local Govt ***GOLD COAST CITY COUNCIL***

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Meridian	IS216853	Surveyor	A. Macdonald
Contour Interval	0.2	Drawn	S. Holt
F.B.	No	Date Drafted	02-02-2011
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		Drawn	
		Date Designed	

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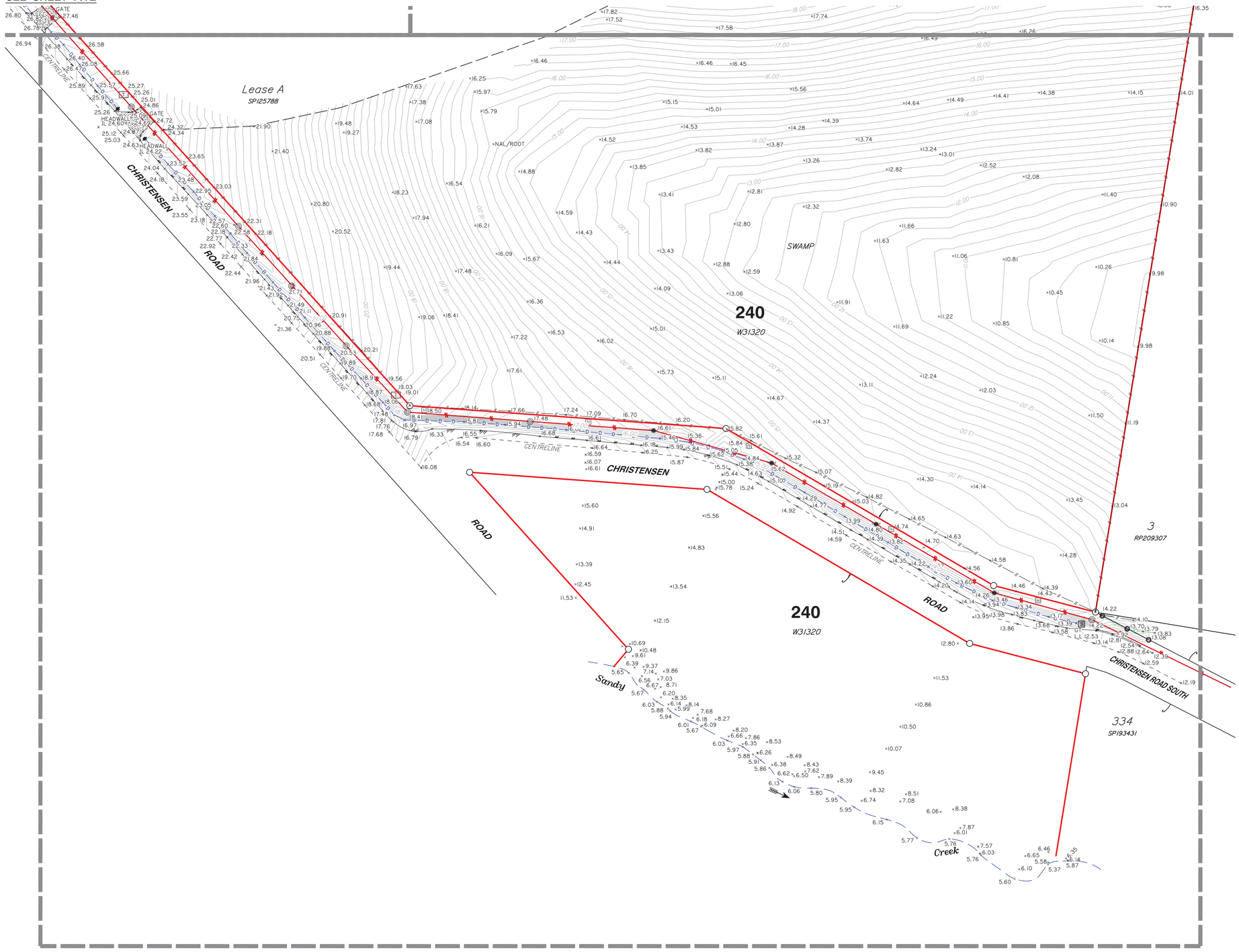

Scale 1:1000 - Lengths are in Metres.

0 10 20 30 40 50 60 70 80

SHEET 6 OF 6

LEGEND

- PERMANENT MARK
- SEWER MANHOLE
- SEWER INSPECTION OUTLET
- ELECTRICITY PILLAR
- ELECTRICITY POLE
- ELECTRICITY POLE WITH LIGHT
- TELSTRA PIT
- MANHOLE
- STORMWATER MANHOLE
- GULLY TRAP
- WATER METER
- FIRE HYDRANT
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- CONTOUR LEVEL

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CONTOUR AND DETAIL PLAN

Over Lot 1 on RP6882 and Lot 240 on WD31320

Parish of ***ALBERT***
County of ***Ward***
Local Govt ***GOLD COAST CITY COUNCIL***

Level Datum	A.H.D.	Date Surveyed	Jan 2011
Meridian	IS216853	Surveyor	A. Macdonald
Contour Interval	0.2	Drawn	S. Holt
F.B.	No	Date Drafted	02-02-2011
Origin	PSM 133471 RL 22.169	Checked	
Scale (on A1 original)	**1:1000**	Designed	
		Drawn	
		Date Designed	

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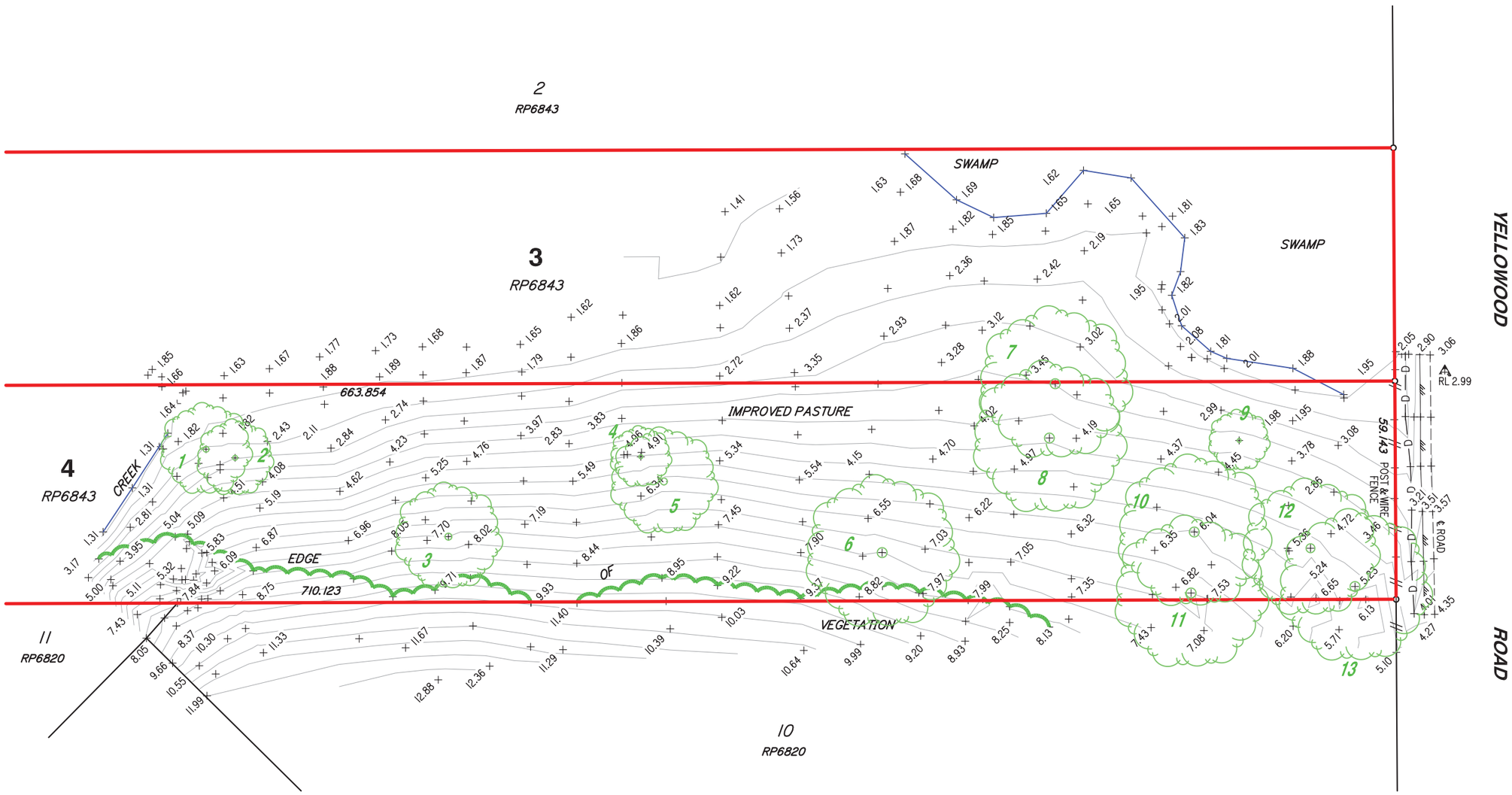
REFERENCE No. *5093-10*

PLAN No. ***5093 S CD 01***



LEGEND

- BENCH MARK
- OPEN DRAIN
- EDGE OF BITUMEN
- FENCE

Scale 1:250 - Lengths are in Metres.

0 10 20 30 40 50 60 70 80 90 100

TREE TABLE

TREE No.	Ø	SPREAD	HEIGHT
1	0.4Ø	12m	14m
2	0.4Ø	10m	14m
3	1.0Ø	14m	20m
4	0.3Ø	8m	10m
5	0.6Ø	14m	12m
6	0.8Ø	20m	10m
7	1.0Ø	20m	20m
8	1.0Ø	20m	20m
9	0.4Ø	8m	8m
10	1.5Ø	20m	26m
11	1.5Ø	20m	26m
12	0.6Ø	16m	20m
13	1.2Ø	20m	26m

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CONTOUR AND DETAIL PLAN
BORROW SITE
on Part of Lots 3 & 4 on RP6843

Parish of *ALBERT*
County of *Ward*
Local Govt *GOLD COAST CITY COUNCIL*

Level Datum	A.H.D.	Date Surveyed	21–07–2011
Meridian	RP6843	Surveyor	S. White
Contour Interval	0.5	Drawn	S. Holt
F.B.	No	Date Drafted	22–07–2011
Origin	PSM130468 7.744	Checked	
Scale (on A3 original)	1:1250	Designed	
		Drawn	
		Date Designed	

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t: (07) 32216732
f: (07) 32217308
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Access Business Park
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t: (07) 38073333
f: (07) 32875461
e: mail@gassman.com.au
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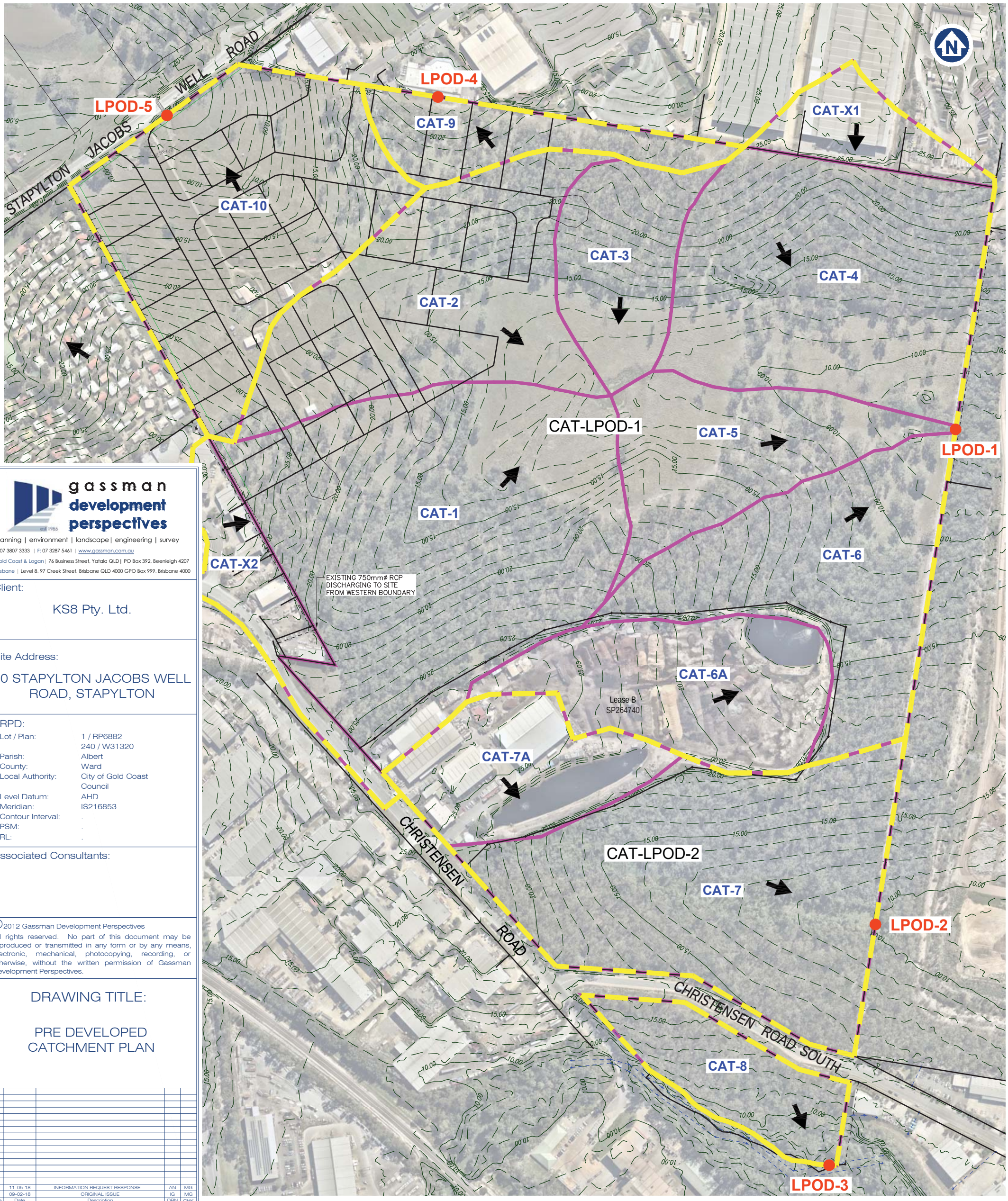
REFERENCE No. *5093-11*
PLAN No. **5093 S CD 03**

Appendix B – Pre and Post Development Catchment Plans



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Gold Coast & Logan | 76 Business Street, Yatala QLD | PO Box 392, Beenleigh 4207
Brisbane | Level 8, 97 Creek Street, Brisbane QLD 4000 GPO Box 999, Brisbane 4000

Client:

KS8 Pty. Ltd.

Site Address:

60 STAPYLTON JACOBS WELL ROAD, STAPYLTON

RPD:

Lot / Plan:	1 / RP6882 240 / W31320
Parish:	Albert
County:	Ward
Local Authority:	City of Gold Coast Council
Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	.
PSM:	.
RL:	.

Associated Consultants:

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DRAWING TITLE:

PRE DEVELOPED CATCHMENT PLAN

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	AN	MG
A	09-02-18	ORIGINAL ISSUE	IG	MG

SCALE IN METRES

0 40 80 120 160 200

1:2000 (FULL SIZE A1)
1:4000 (HALF SIZE A3)

Scale at A1:	1:2000
Designed:	IG
Drafted:	IG
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG SMP1 001 Rev. No: B

LEGEND

	LOT BOUNDARY
28.60	EXISTING CONTOURS (MINOR)
29.00	EXISTING CONTOURS (MAJOR)
	SUB-CATCHMENT BOUNDARY
CAT-3	CATCHMENT BOUNDARY
LPOD-3	LAWFUL POINT OF DISCHARGE
	OVERLAND FLOW DIRECTION

PRE DEVELOPED CATCHMENT PLAN

CATCHMENT TABLE

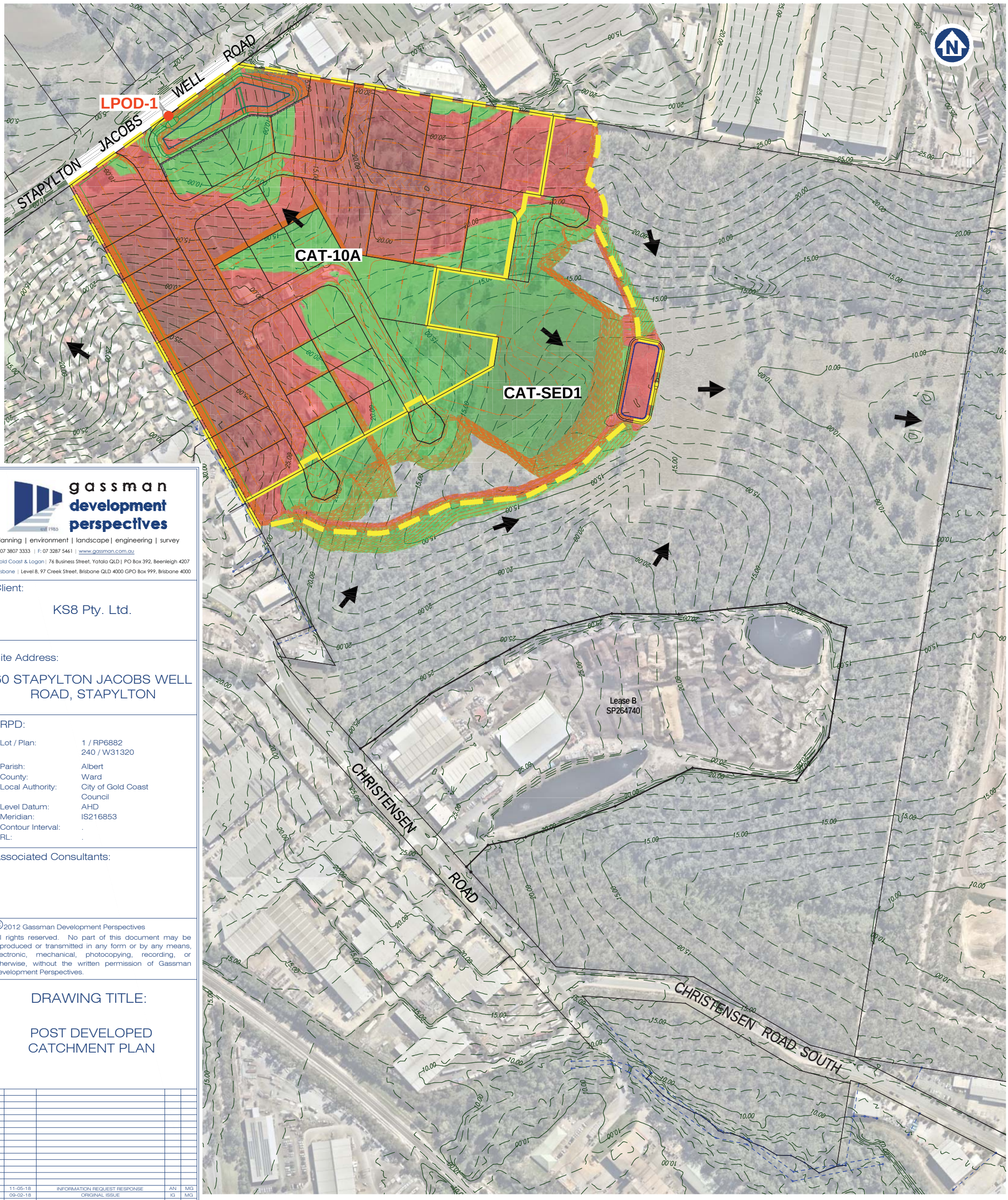
CATCHMENT	AREA (Ha)	IMP %	VECTORED SLOPE (%)
CAT-LPOD-1	50.714	3.10	4.01
CAT-LPOD-2	13.391	2.50	3.01
CAT-LPOD-3	2.481	0.00	3.00
CAT-LPOD-4	2.210	0.00	2.21
CAT-LPOD-5	8.523	8.20	6.45

CRITICAL STORM DURATION (Q100)

LAWFUL POINT OF DISCHARGE	DURATION (mins)
LPOD-1	60
LPOD-2	60
LPOD-3	60
LPOD-4	60
LPOD-5	25

SUB-CATCHMENT TABLE

CATCHMENT	AREA (Ha)	VECTORED SLOPE (%)
CAT-X1	1.637	1.00
CAT-X2	2.182	1.00
CAT-1	12.715	5.41
CAT-2	7.114	5.95
CAT-3	3.015	5.54
CAT-4	8.666	5.80
CAT-5	4.144	4.02
CAT-6	6.474	3.91
CAT-6A	4.767	3.50
CAT-7	9.981	3.51
CAT-7A	3.410	2.50
CAT-8	2.481	3.00
CAT-9	2.210	2.21
CAT-10	8.523	6.45



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Site Address:

60 STAPYLTON JACOBS WELL ROAD, STAPYLTON

RPD:

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County:	Ward
Local Authority:	City of Gold Coast Council
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Associated Consultants:

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DRAWING TITLE:

POST DEVELOPED CATCHMENT PLAN

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	AN	MG
A	09-02-18	ORIGINAL ISSUE	IG	MG

SCALE IN METRES

0 40 80 120 160 200

1:2000 (FULL SIZE A1)
1:4000 (HALF SIZE A3)

Scale at A1:	1:2000
Designed:	IG
Drafted:	IG
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG SMP1 002
Rev. No: B

LEGEND

	LOT BOUNDARY
28.60	EXISTING CONTOURS (MINOR)
29.00	EXISTING CONTOURS (MAJOR)
	DESIGN CONTOURS
CAT–10A	CATCHMENT BOUNDARY
LPOD	LAWFUL POINT OF DISCHARGE
	OVERLAND FLOW DIRECTION

CATCHMENT TABLE

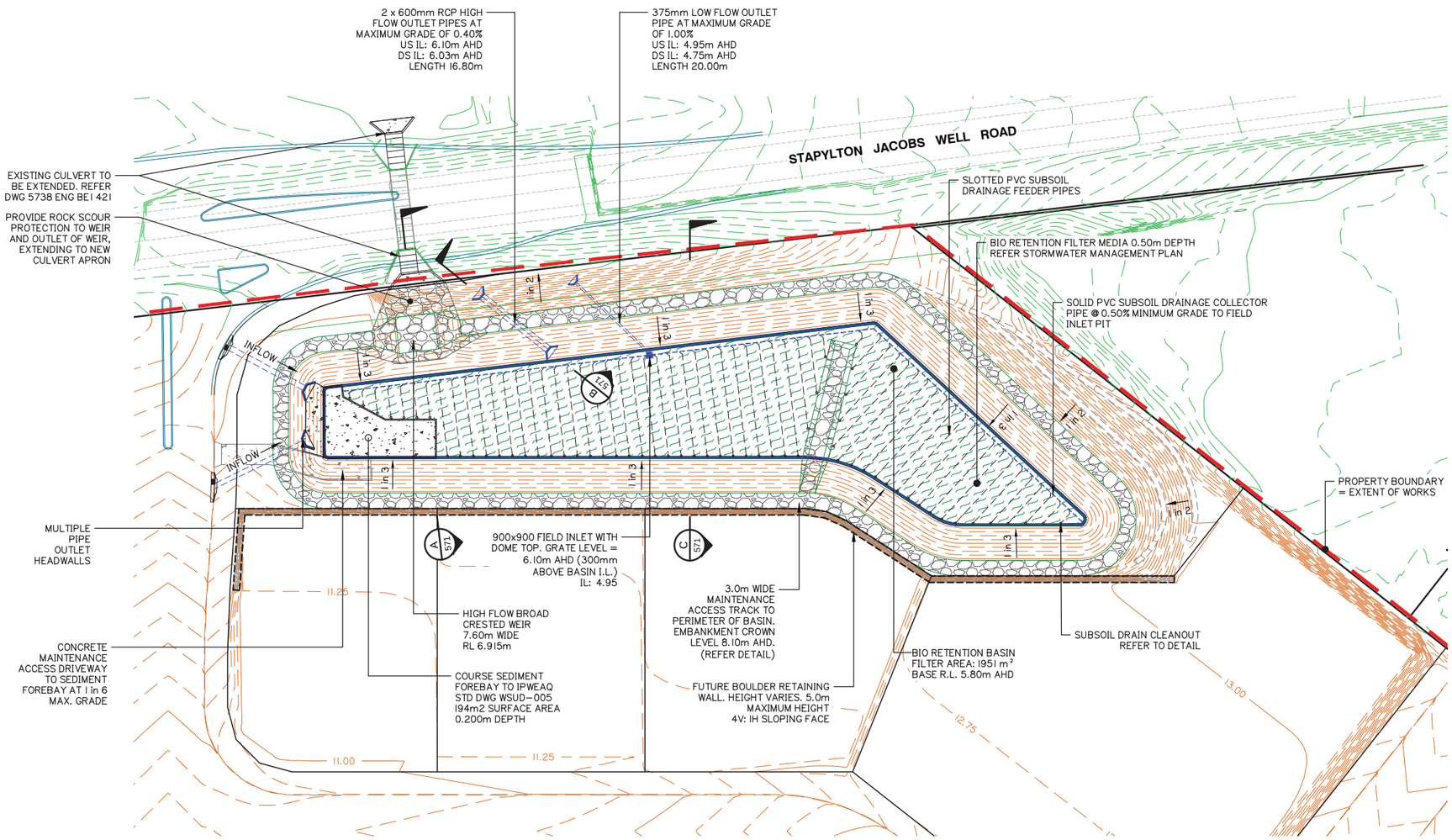
CATCHMENT	AREA (Ha)	IMP %	VECTORED SLOPE (%)
CAT–10A (IMP.)	14.294	100	2.55
CAT–10A (PER.)	1.588	0.0	2.55
CAT–SED1	8.175	N/A	N/A

CRITICAL STORM DURATION (Q100)

LAWFUL POINT OF DISCHARGE	DURATION (mins)
LPOD–1	15

POST DEVELOPED CATCHMENT PLAN

Appendix C – Design of Stormwater Quantity and Quality Basin



BIO RETENTION BASIN – LAYOUT PLAN

1:500 @ A1

Scale 1:500 - Lengths are in Metres.

0 5 10 15 20 25 30 35 40

BIO RETENTION COURSE SEDIMENT FOREBAY SIZING GUIDE CALCULATIONS

$V_s = A_c \times R \times L_o \times F$ = 7.624 m³

$R = 1 - \left[1 + \frac{1}{n} \times \frac{V_s}{Q/A_f}\right]^{-n}$

$0.8 = 1 - \left[\frac{1}{0.5} + \frac{0.100}{2.423/A_f}\right]^{-0.5}$ Af = 290.76 m²

$D_s = \frac{V_s}{A_f}$ $D_s = \frac{7.624}{290.76}$ = 0.026 m

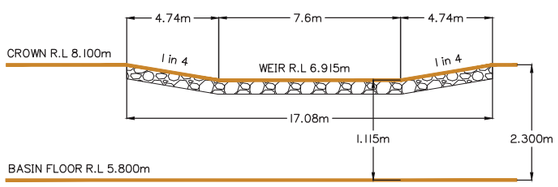
OPTIMIZATION OF MINIMUM FOREBAY SIZE:

$D_s = \frac{7.624 \text{ m3}}{194.00 \text{ m2}}$ = 0.039 m

V_s = 7.624 m³ (Workings Above)
A_c = 15.882 ha (Refer Catchment Plans)
Q = 2.423 m³/s (3 month ARI = 0.5 x Q1)
V_s = 0.1 m/s (Recommended for Imm Particle)
R = 0.8 (Recommended 80% Capture)
L_o = 0.6 (From Healthy Waterways Guide)
n = 0.5 (Recommended Turbulence)
F_c = 1.0 (Frequency of Clean Out / Yr)

REFER TO BIORETENTION TECHNICAL DESIGN GUIDELINES FOR FURTHER INFORMATION.

ARI YEARS	MAX. WATER ELEVATION (m) A.H.D	MAX. WATER DEPTH (m)
Q1	6.617	0.817
Q2	6.755	0.955
Q5	6.929	1.129
Q10	7.002	1.202
Q20	7.084	1.284
Q50	7.174	1.374
Q100	7.240	1.440



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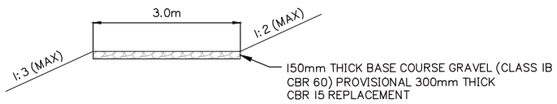

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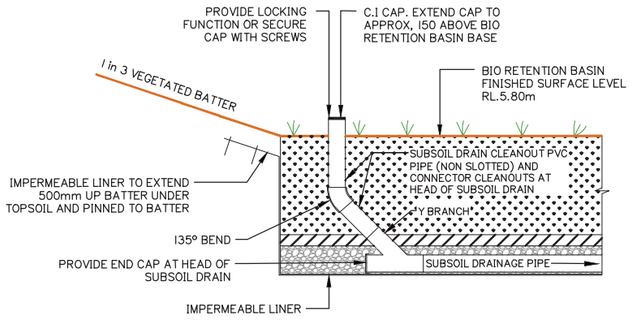

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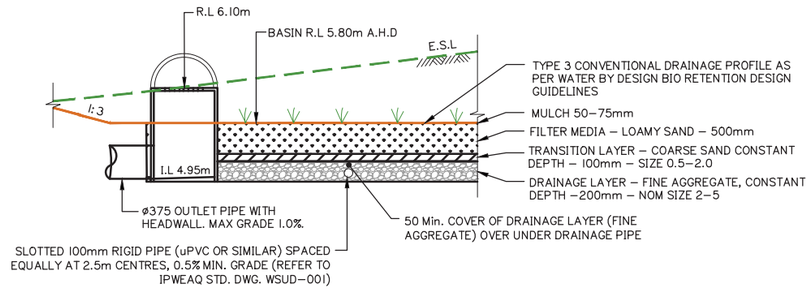

N.T.S

LEGEND

- LOT BOUNDARY
- LIMIT OF WORKS
- 28.60 EXISTING CONTOURS (MINOR)
- 29.00 EXISTING CONTOURS (MAJOR)
- 31.20 DESIGN CONTOURS (MINOR)
- 31.00 DESIGN CONTOURS (MAJOR)

OPERATIONAL PHASE BIO RETENTION BASIN LAYOUT PLAN AND DETAILS – SHEET 1 OF 2

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SCALE IN METRES

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Scale at A1:	AS SHOWN
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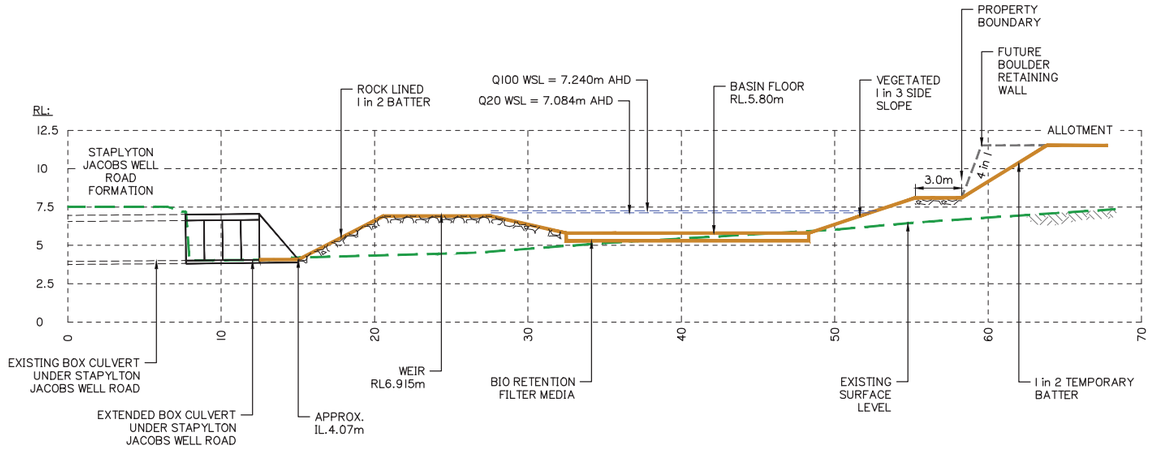
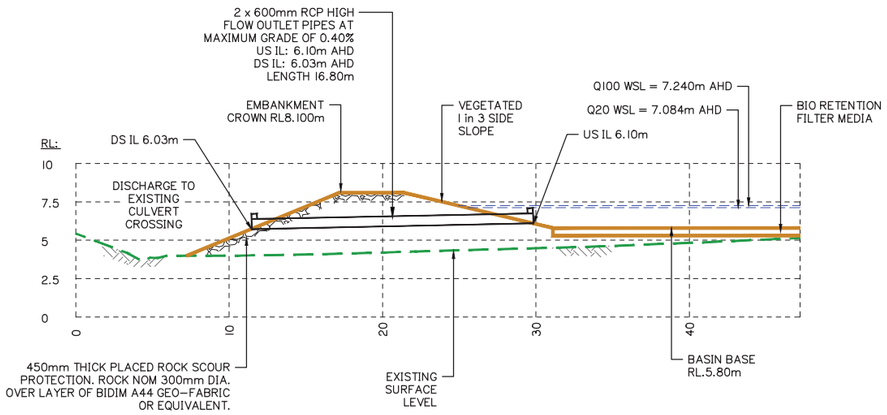
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 570
Rev. No: B



A 570 SECTION

NTS



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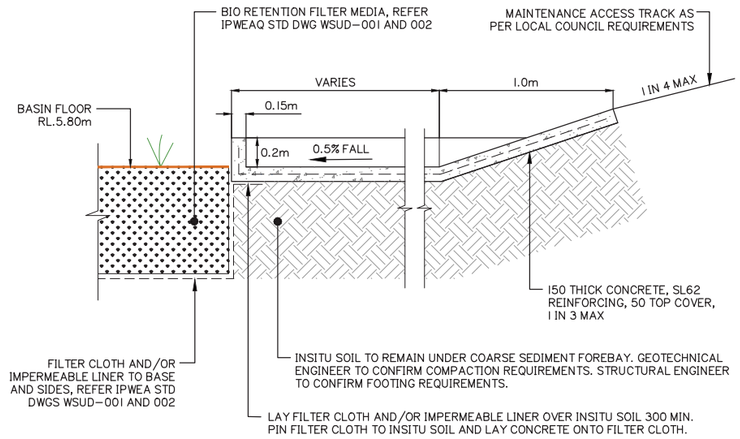
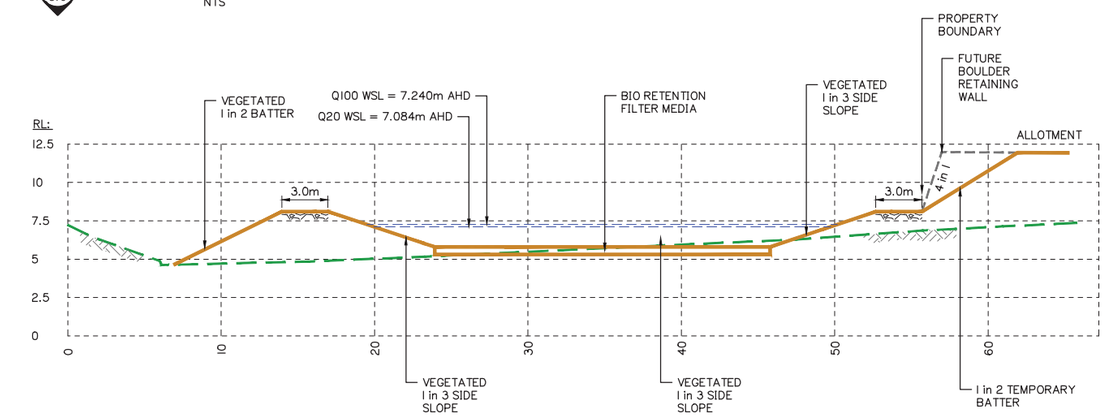


COURSE SEDIMENT FOREBAY TYPICAL SECTION

N.T.S



C 570 SECTION

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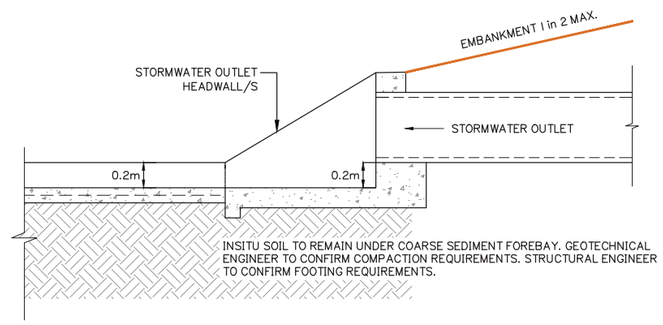

TYPICAL STORMWATER OUTLET TO SEDIMENT FOREBAY

N.T.S

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OPERATIONAL PHASE
BIO RETENTION BASIN
LAYOUT PLAN AND DETAILS
SHEET 2 OF 2

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

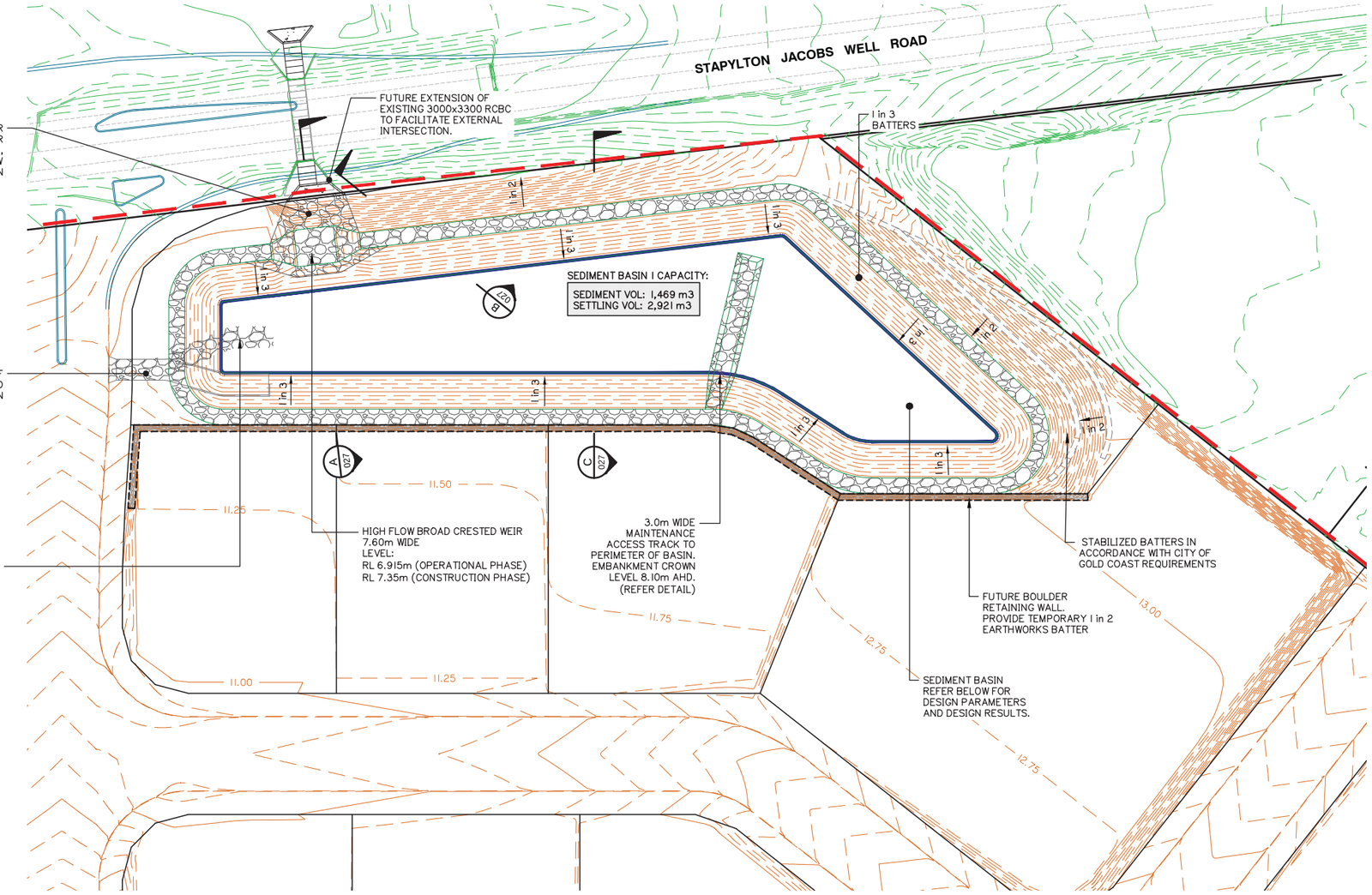
SCALE IN METRES

AS SHOWN

Scale at A1:	AS SHOWN
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 571

Rev. No: B



Scale 1:500 - Lengths are in Metres.

0 5 10 15 20 25 30 35 40

SEDIMENT BASIN 1 – LAYOUT PLAN

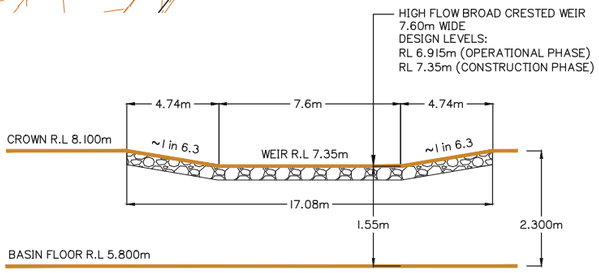
1:500 @ A1

NOTES

1. ALL ALLOTMENTS TO GRADE TOWARDS THE ROAD AT MINIMUM 1:150.
2. SEDIMENT AND EROSION CONTROL PLAN IS INDICATIVE ONLY. THE CONTRACTOR MUST TAKE ADDITIONAL MEASURES IF REQUIRED ONSITE DURING CONSTRUCTION AND MAINTENANCE PERIODS.
3. CONTRACTOR EROSION AND SEDIMENT CONTROL PLAN SHOULD COMPLY WITH ALL COUNCIL AND STATE REQUIREMENTS AND BE INLINE WITH IECA BEST PRACTICE GUIDELINES.
4. CONTRACTOR TO OBTAIN SEDIMENT AND EROSION CONTROL PLAN APPROVAL FROM RELEVANT AUTHORITY BEFORE THE COMMENCEMENT OF WORKS.

LEGEND

- LOT BOUNDARY
- LIMIT OF WORKS
- 28.60 EXISTING CONTOURS (MINOR)
- 29.00 EXISTING CONTOURS (MAJOR)
- 31.20 DESIGN CONTOURS (MINOR)
- 31.00 DESIGN CONTOURS (MAJOR)



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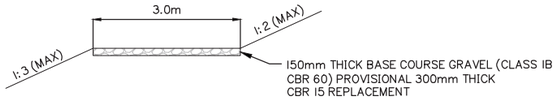

N.T.S

BASIN 1 – DESIGN PARAMETERS

I(1YR, 120hr)	1.46
K1	33.5
K2	14.2
R(Y%, 5-DAY)	63.11
Cv	0.29
A (Ha)	15.882
Settling Zone Vol: Vs	2907
Sediment Zone Vol: Vsed	1453

BASIN 1 – DESIGN RESULTS

SEDIMENT ZONE		
1:3 Batter Calc		
INPUT NOMINATED BASIN BASE AREA	2899	
INPUT NOMINATED SEDIMENT HEIGHT	0.47	
INPUT OUTSIDE BOUNDARY LENGTH OF BASIN	322	
SEDIMENT VOLUME CHECK, V_{SED} =	1469	OK

SETTLING ZONE		
1:3 Batter Calc		
INPUT NOMINATED BASE AREA	3357	
INPUT NOMINATED SETTLING HEIGHT	0.78	
INPUT OUTSIDE BOUNDARY LENGTH OF BASIN	331	
SETTLING VOLUME CHECK, Vs =	2921	OK

CONSTRUCTION PHASE SEDIMENT BASIN 1 LAYOUT PLAN AND DETAILS – SHEET 1 OF 2

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Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

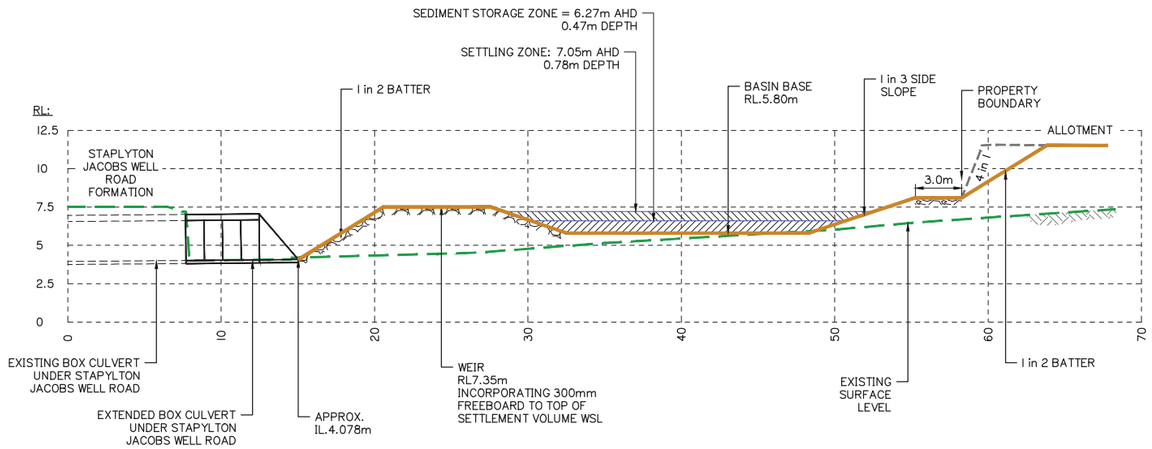
SCALE IN METRES

AS SHOWN

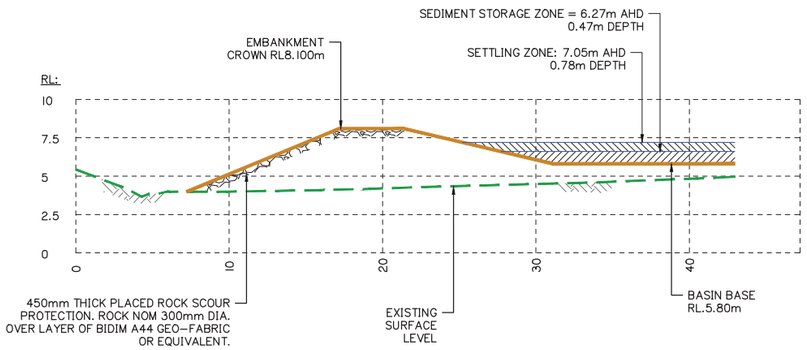
Scale at A1:	AS SHOWN
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 026

Rev. No: B



A 026 SECTION
NTS



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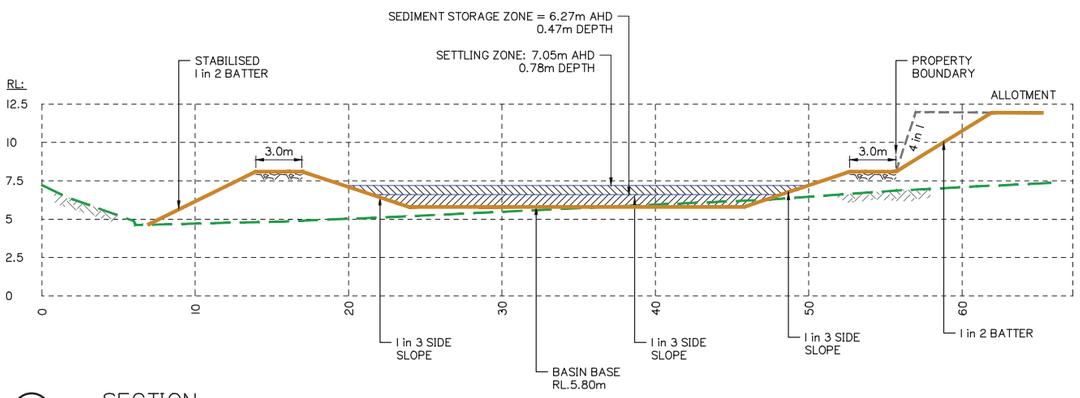

C 026 SECTION
NTS

CONSTRUCTION PHASE SEDIMENT BASIN 1 LAYOUT PLAN AND DETAILS – SHEET 2 OF 2

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CONSTRUCTION PHASE
SEDIMENT BASIN 1
LAYOUT PLAN AND
DETAILS SHEET 2 OF 2

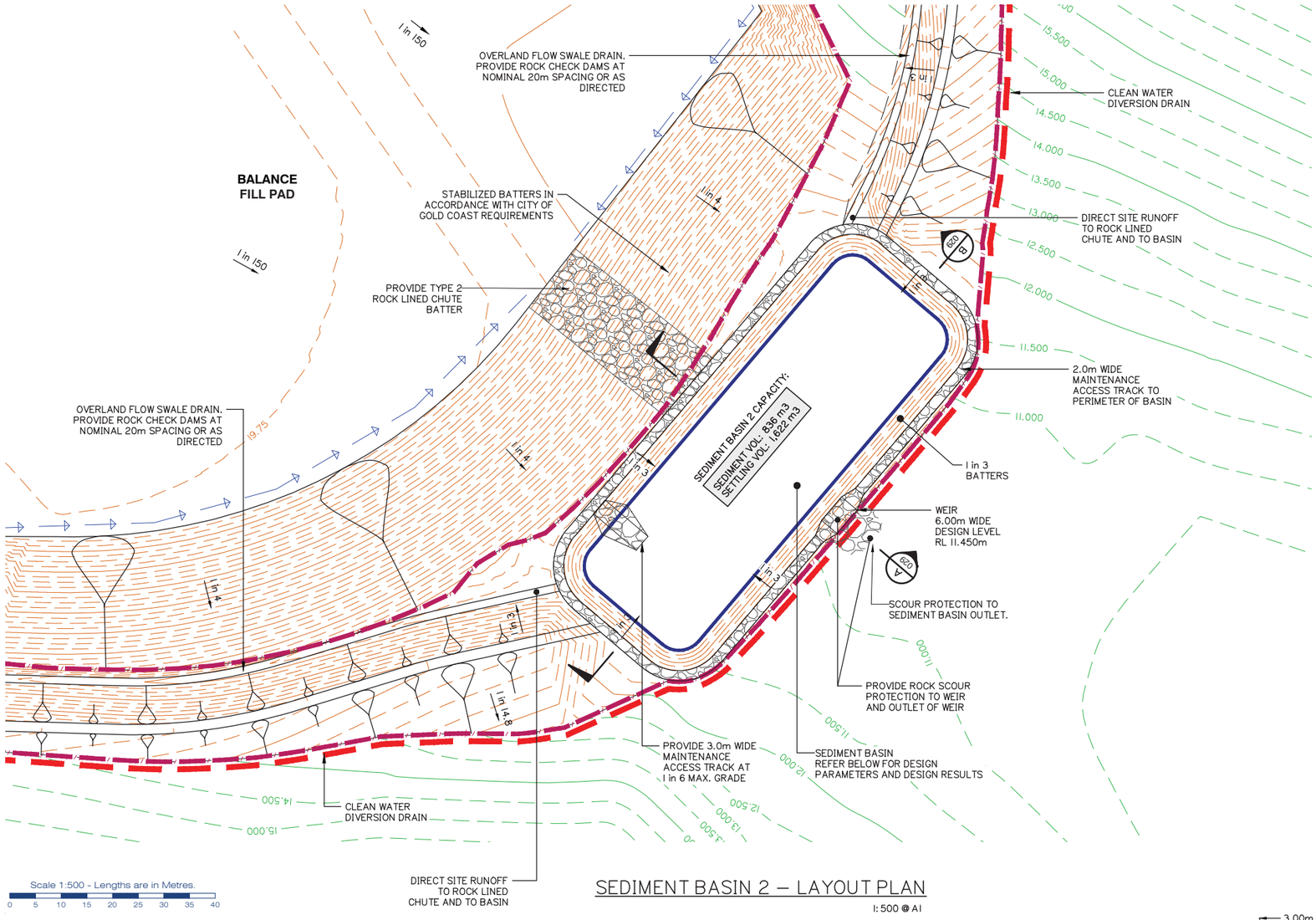
Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

SCALE IN METRES

AS SHOWN

Scale at A1:	AS SHOWN
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 027
Rev. No: B



SEDIMENT BASIN 2 – LAYOUT PLAN

1:500 @ A1

NOTES

1. ALL ALLOTMENTS AND FILL PADS TO GRADE TOWARDS THE ROAD OR BASIN AT MINIMUM 1:150.
2. SEDIMENT AND EROSION CONTROL PLAN IS INDICATIVE ONLY. THE CONTRACTOR MUST TAKE ADDITIONAL MEASURES IF REQUIRED ONSITE DURING CONSTRUCTION AND MAINTENANCE PERIODS.
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LEGEND

	LOT BOUNDARY
	LIMIT OF WORKS
28.60	EXISTING CONTOURS (MINOR)
29.00	EXISTING CONTOURS (MAJOR)
31.20	DESIGN CONTOURS (MINOR)
31.00	DESIGN CONTOURS (MAJOR)

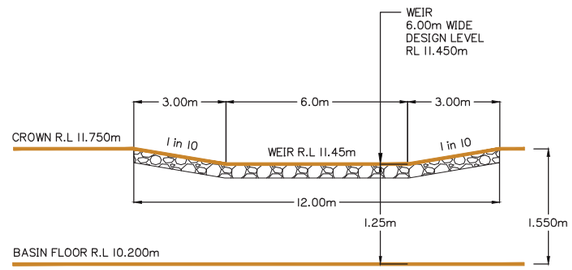
BASIN 2 – DESIGN PARAMETERS

I(1YR, 120hr)	1.46
K1	33.5
K2	14.2
R(Y%, 5-DAY)	63.11
Cv	0.29
A (Ha)	8.175
Settling Zone Vol: Vs	1496
Sediment Zone Vol: Vsed	748

BASIN 2 – DESIGN RESULTS

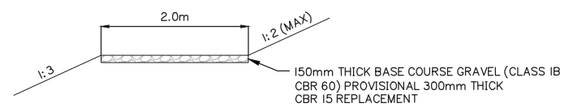
SEDIMENT ZONE		
1:3 Batter Calc		
INPUT NOMINATED BASIN BASE AREA	2274	
INPUT NOMINATED SEDIMENT HEIGHT	0.35	
INPUT OUTSIDE BOUNDARY LENGTH OF BASIN	219	
SEDIMENT VOLUME CHECK, VSED =	836	OK

SETTLING ZONE		
1:3 Batter Calc		
INPUT NOMINATED BASE AREA	2490	
INPUT NOMINATED SETTLING HEIGHT	0.6	
INPUT OUTSIDE BOUNDARY LENGTH OF BASIN	237	
SETTLING VOLUME CHECK, Vs =	1622	OK



OVERFLOW WEIR – TYPICAL ELEVATION

N.T.S



MAINTENANCE ACCESS TRACK – TYPICAL SECTION

N.T.S

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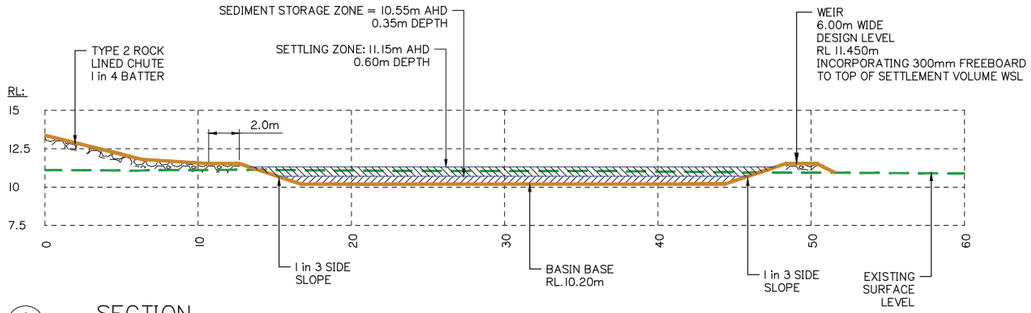
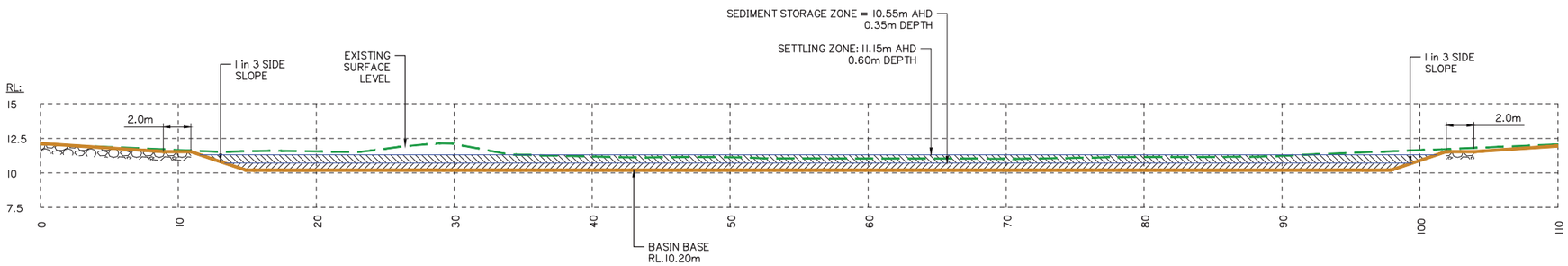
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 028

Rev. No: B



A
028
SECTION
NTS



B
028
SECTION
NTS

CONSTRUCTION PHASE SEDIMENT BASIN 2 LAYOUT PLAN AND DETAILS – SHEET 2 OF 2

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Client:

KS8 Pty. Ltd.

Site Address:

60 STAPLYTON JACOBS WELL ROAD, STAPYLTON

RPD:

Lot / Plan:	1 on RP6882 240 on W31320 4 on RP6843
Parish:	Albert
County:	Ward
Local Authority:	City of Gold Coast Council
Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	-
PSM:	
RL:	

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DRAWING TITLE

CONSTRUCTION PHASE
SEDIMENT BASIN 2
LAYOUT PLAN AND
DETAILS SHEET 2 OF 2

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

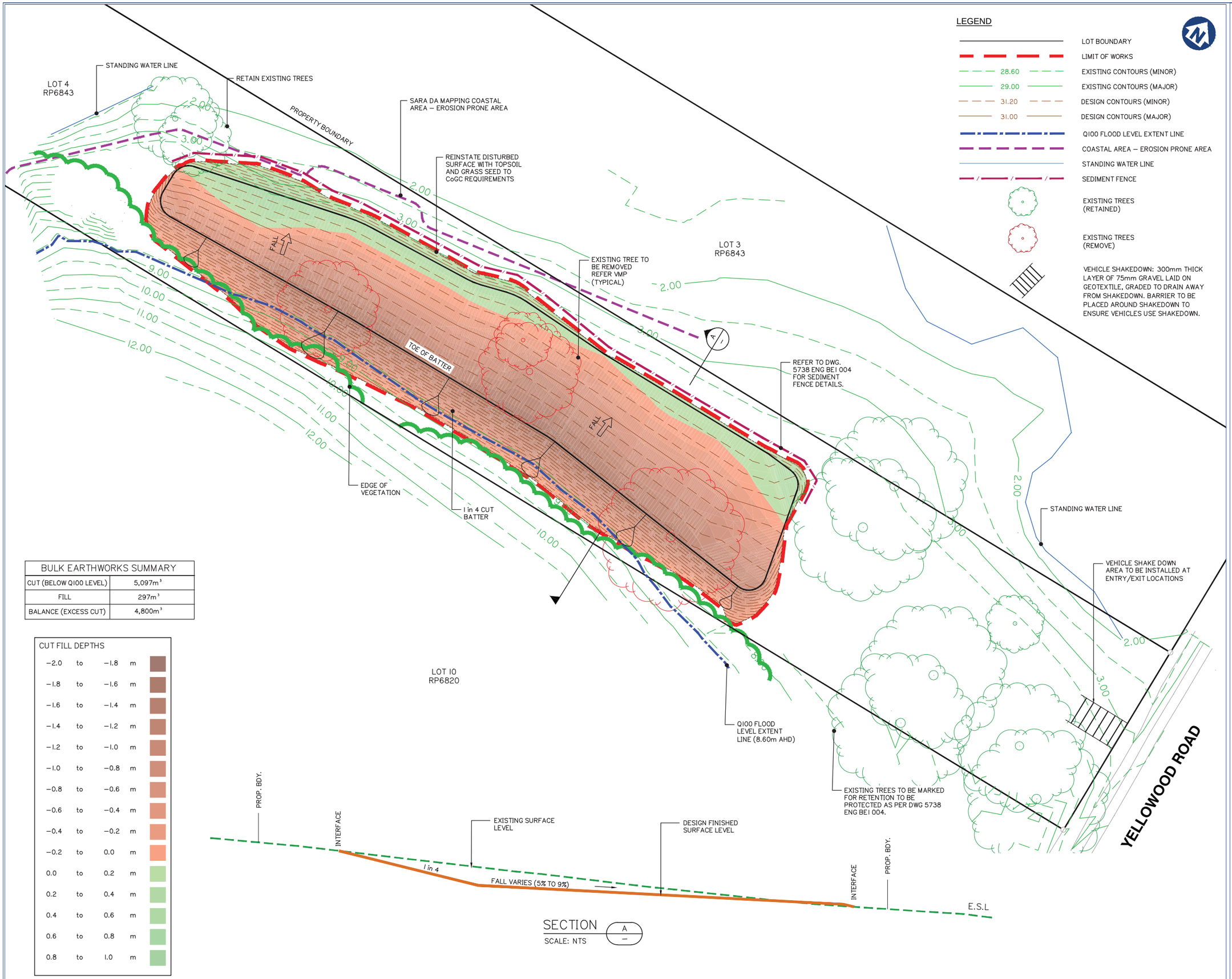
SCALE IN METRES

AS SHOWN

Scale at A1:	AS SHOWN
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 029
Rev. No: B

Appendix D – Balance Earthworks Below Defined Flood Event Level



BULK EARTHWORKS SUMMARY	
CUT (BELOW Q100 LEVEL)	5,097m³
FILL	297m³
BALANCE (EXCESS CUT)	4,800m³

CUT FILL DEPTHS				
−2.0	to	−1.8	m	
−1.8	to	−1.6	m	
−1.6	to	−1.4	m	
−1.4	to	−1.2	m	
−1.2	to	−1.0	m	
−1.0	to	−0.8	m	
−0.8	to	−0.6	m	
−0.6	to	−0.4	m	
−0.4	to	−0.2	m	
−0.2	to	0.0	m	
0.0	to	0.2	m	
0.2	to	0.4	m	
0.4	to	0.6	m	
0.6	to	0.8	m	
0.8	to	1.0	m	

BULK EARTHWORKS LAYOUT PLAN AND DETAILS

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Client:

KS8 Pty. Ltd.

Site Address:

31 YELLOWOOD ROAD, STAPYLTON

RPD:

Lot:	4 / RP6843
Plan:	-
Parish:	Albert
County:	Ward
Local Authority:	City of Gold Coast Council
Level Datum:	AHD
Meridian:	
Contour Interval:	0.20m
PSM:	
RL:	

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Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

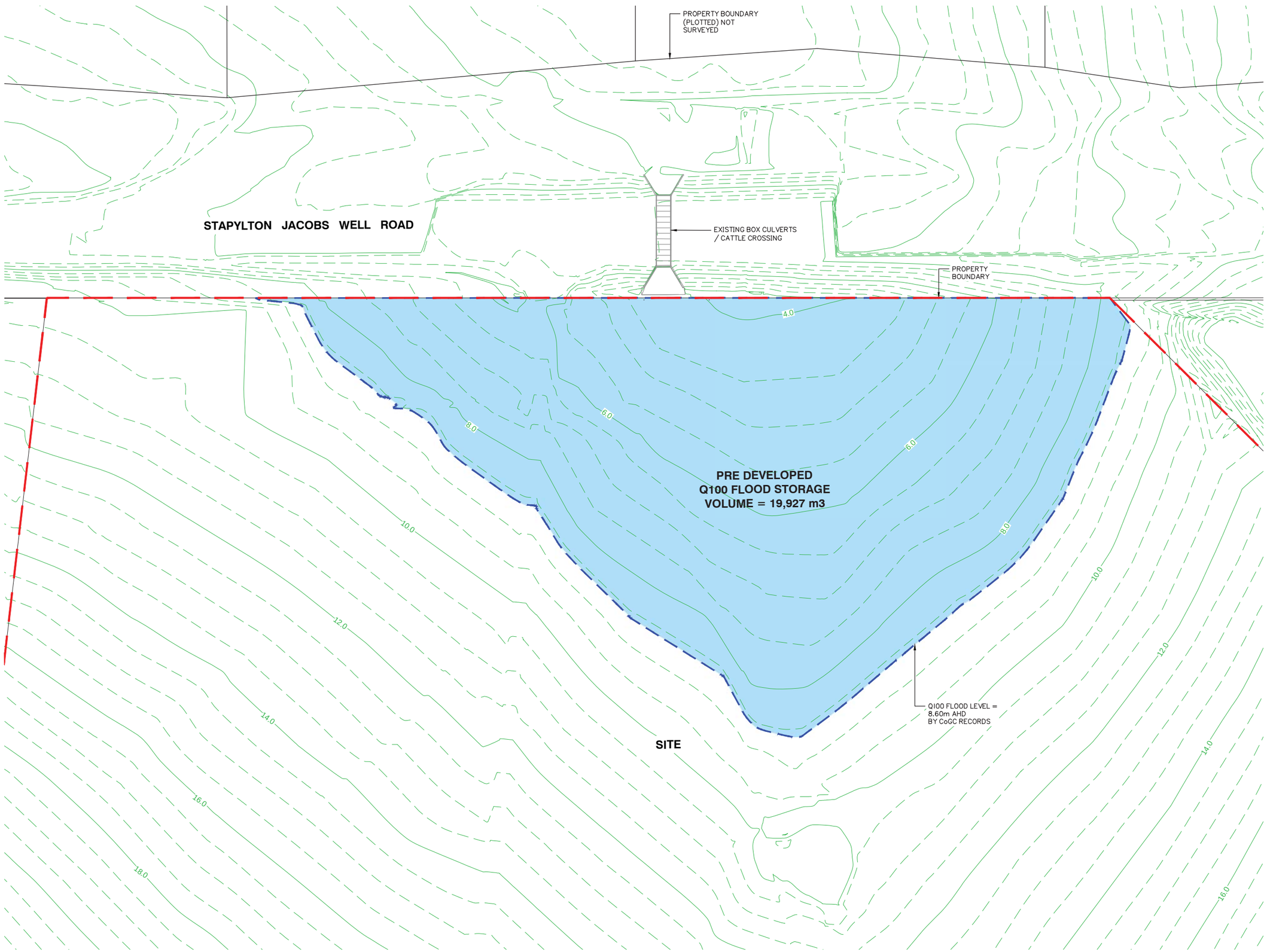
SCALE IN METRES

0 10 20 30 40 50

1:500 (FULL SIZE A1)
1:1000 (HALF SIZE A3)

Scale at A1:	1:500
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 056
Rev. No: B



PRE DEVELOPED Q100 FLOOD STORAGE VOLUME ASSESSMENT

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Client:

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Site Address:

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RPD:

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Parish:	Albert
County:	Ward
Local Authority:	City of Gold Coast Council
Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	-
PSM:	
RL:	

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PRE DEVELOPED
Q100 FLOOD STORAGE
VOLUME ASSESSMENT

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

SCALE IN METRES

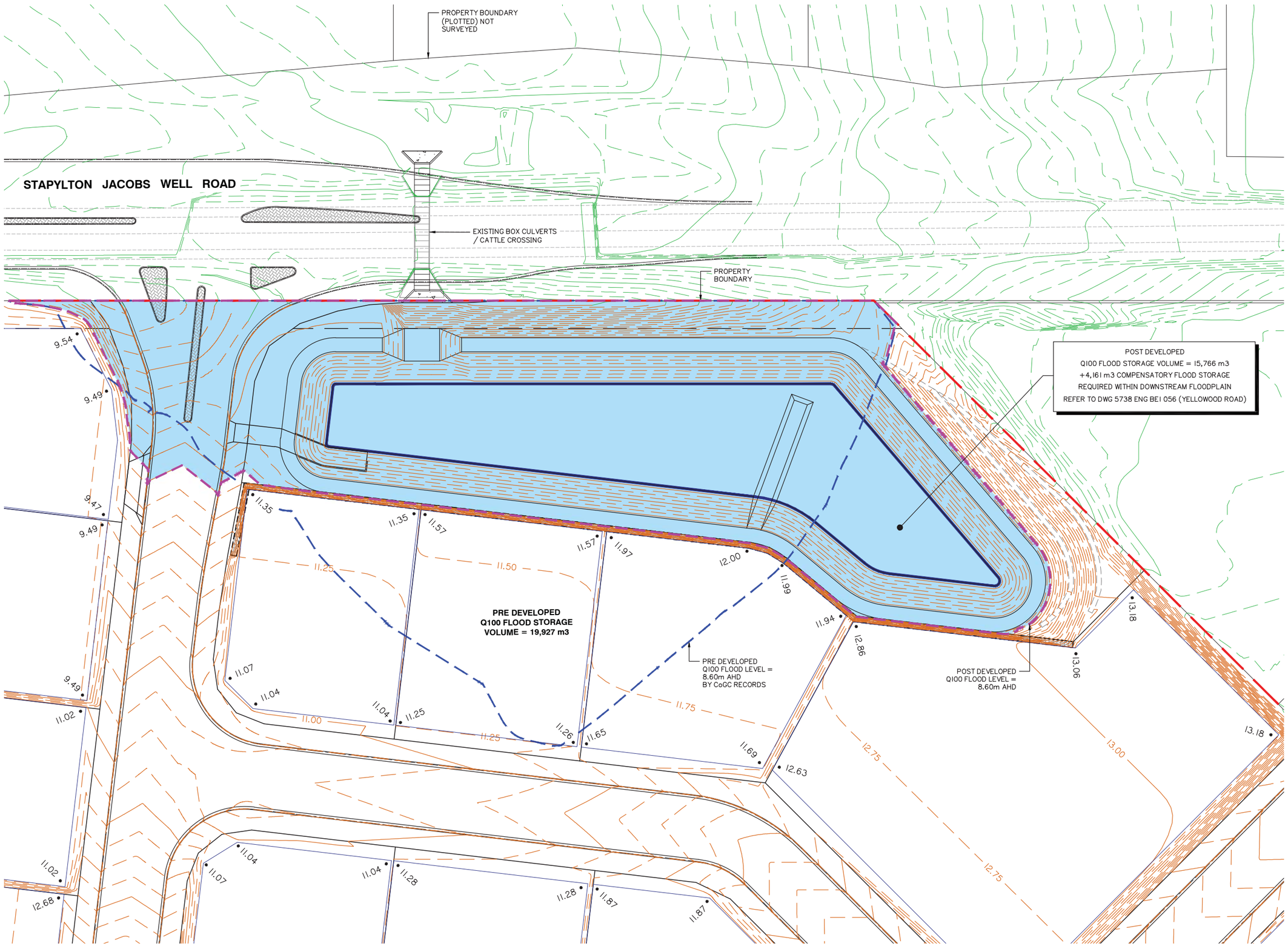
0 8 16 24 36 40

1:400 (FULL SIZE A1)
1:800 (HALF SIZE A3)

Scale at A1:	1:400
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 422

Rev. No: B



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Q100 FLOOD STORAGE
VOLUME ASSESSMENT

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

SCALE IN METRES

0 8 16 24 36 40

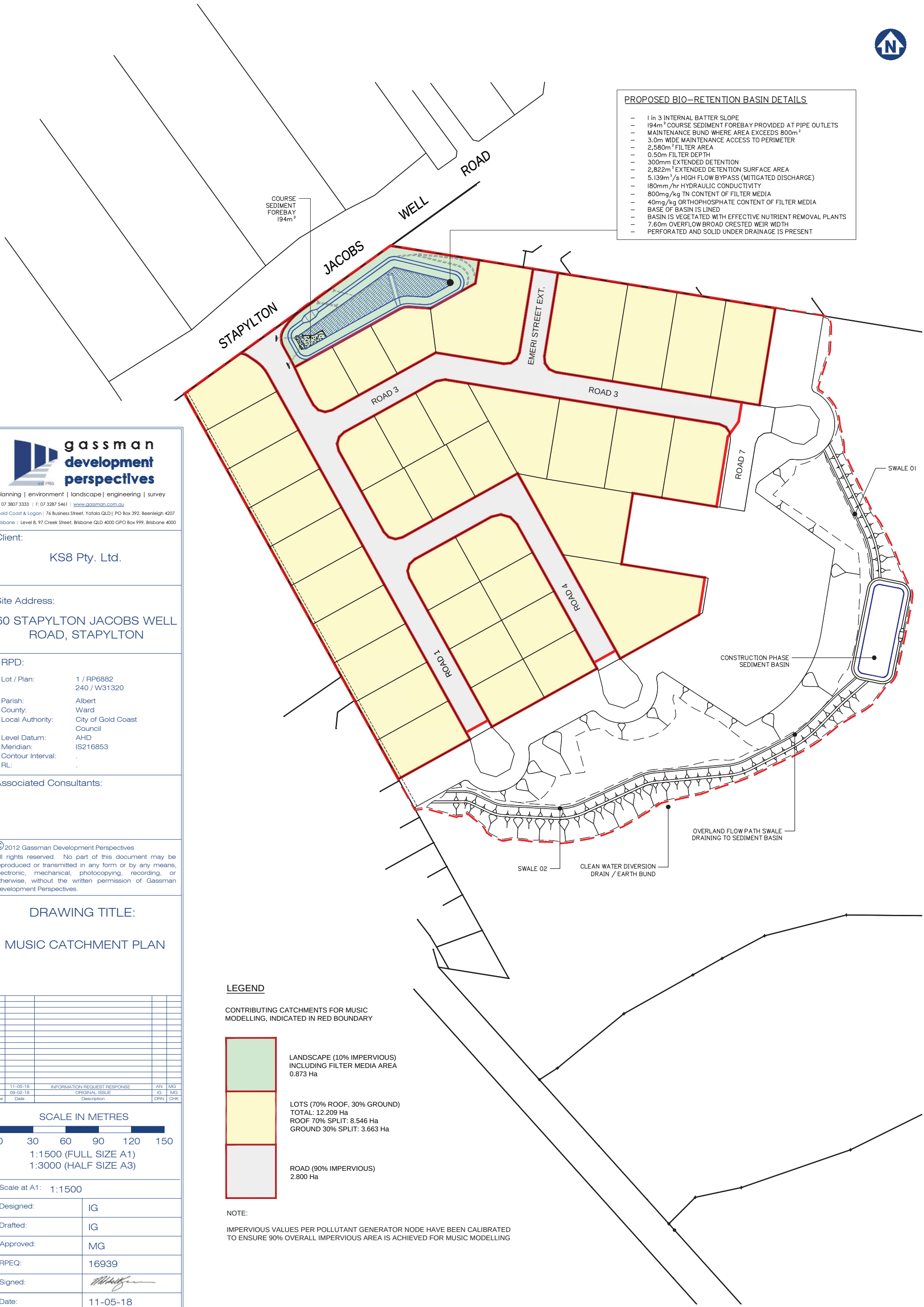
1:400 (FULL SIZE A1)
1:800 (HALF SIZE A3)

Scale at A1:	1:400
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 423

Rev. No: B

Appendix E – MUSIC Catchment Plan



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Brisbane | Level 8, 97 Creek Street, Brisbane QLD 4000 GPO Box 999, Brisbane 4000

Client:

KS8 Pty. Ltd.

Site Address:

60 STAPYLTON JACOBS WELL ROAD, STAPYLTON

RPD:

Lot / Plan:	1 / RP6882 240 / W31320
Parish:	Albert
County:	Ward
Local Authority:	City of Gold Coast Council
Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	.
RL:	.

Associated Consultants:

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DRAWING TITLE:

MUSIC CATCHMENT PLAN

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	AN	MG
A	09-02-18	ORIGINAL ISSUE	IG	MG

SCALE IN METRES

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1:1500 (FULL SIZE A1)
1:3000 (HALF SIZE A3)

Scale at A1:	1:1500
Designed:	IG
Drafted:	IG
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG SMP1 003

Rev. No: B

Appendix F – MUSIC Link Report

CITY OF GOLDCOAST

music link

MUSIC-*link* Report

Project Details

Project:	CoGC: M38 Industrial Park, Yatala
Report Export Date:	11/05/2018
Catchment Name:	5738 CoGC M38 Industrial Park
Catchment Area:	15.882ha
Impervious Area*:	91.12%
Rainfall Station:	40406 BEENLEIGH
Modelling Time-step:	6 Minutes
Modelling Period:	1/01/1990 - 31/12/1999 11:54:00 PM
Mean Annual Rainfall:	1105mm
Evapotranspiration:	1492mm
MUSIC Version:	6.3.0
MUSIC-link data Version:	6.30
Study Area:	City of Gold Coast (North)
Scenario:	City of Gold Coast (North)

Company Details

Company:	KS8 Pty. Ltd. c/o Gassman Development Perspectives Pty Ltd
Contact:	Mitchell Gassman
Address:	76 Business Street Yatala QLD 4207
Phone:	0738073333
Email:	mitchell@gassman.com.au

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness

Node: LPoD-5	Reduction
Flow	4.56%
TSS	88.8%
TP	70.7%
TN	57.6%
GP	99.9%

Treatment Nodes

Node Type	Number
Bio Retention Node	1

Source Nodes

Node Type	Number
Urban Source Node	4

Comments

- 1 in 3 INTERNAL BATTER SLOPE
- 194m2 COURSE SEDIMENT FOREBAY PROVIDED AT PIPE OUTLETS
- INTERNAL MAINTENANCE BUND WHERE AREA EXCEEDS 800m2
- 3.0m WIDE MAINTENANCE ACCESS TO PERIMETER
- 2,580m2 FILTER AREA, 0.50m FILTER DEPTH
- 300mm EXTENDED DETENTION, 2,822m2 EXTENDED DETENTION SURFACE AREA
- 5.139m3/s HIGH FLOW BYPASS (MITIGATED DISCHARGE)
- 180mm/hr HYDRAULIC CONDUCTIVITY
- 800mg/kg TN CONTENT OF FILTER MEDIA
- 40mg/kg ORTHOPHOSPHATE CONTENT OF FILTER MEDIA
- BASE OF BASIN IS LINED, BASIN IS VEGETATED WITH EFFECTIVE NUTRIENT REMOVAL PLANTS
- 7.60m OVERFLOW BROAD CRESTED WEIR WIDTH, UNDER DRAINAGE IS PRESENT

CITY OF GOLDCOAST

music link

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bio-Retention Basin Stg 1 (2_580 m2 Filter)	Exfiltration Rate (mm/hr)	None	None	0
Bio	Bio-Retention Basin Stg 1 (2_580 m2 Filter)	Extended detention depth (m)	None	1	0.3
Bio	Bio-Retention Basin Stg 1 (2_580 m2 Filter)	Filter depth (m)	0.4	1	0.5
Bio	Bio-Retention Basin Stg 1 (2_580 m2 Filter)	Hi-flow bypass rate (cum/sec)	None	None	5.139
Bio	Bio-Retention Basin Stg 1 (2_580 m2 Filter)	Orthophosphate Content in Filter (mg/kg)	None	None	40
Bio	Bio-Retention Basin Stg 1 (2_580 m2 Filter)	PET Scaling Factor	2.1	2.1	2.1
Bio	Bio-Retention Basin Stg 1 (2_580 m2 Filter)	Saturated Hydraulic Conductivity (mm/hr)	50	200	180
Bio	Bio-Retention Basin Stg 1 (2_580 m2 Filter)	Total Nitrogen Content in Filter (mg/kg)	None	None	800
Receiving	LPoD-5	% Load Reduction	None	None	4.56
Receiving	LPoD-5	GP % Load Reduction	90	None	99.9
Receiving	LPoD-5	TN % Load Reduction	45	None	57.6
Receiving	LPoD-5	TP % Load Reduction	60	None	70.7
Receiving	LPoD-5	TSS % Load Reduction	80	None	88.8
Urban	CoGC - Drainage Reserve Buffer Stg 1 (0.873 Ha)	Area Impervious (ha)	None	None	0.088
Urban	CoGC - Drainage Reserve Buffer Stg 1 (0.873 Ha)	Area Pervious (ha)	None	None	0.784
Urban	CoGC - Drainage Reserve Buffer Stg 1 (0.873 Ha)	Total Area (ha)	None	None	0.873
Urban	CoGC - Industrial GROUND Stg 1 (3.663 Ha)	Area Impervious (ha)	None	None	3.308
Urban	CoGC - Industrial GROUND Stg 1 (3.663 Ha)	Area Pervious (ha)	None	None	0.354
Urban	CoGC - Industrial GROUND Stg 1 (3.663 Ha)	Total Area (ha)	None	None	3.663
Urban	CoGC - Industrial ROAD Stg 1 (2.800 Ha)	Area Impervious (ha)	None	None	2.529
Urban	CoGC - Industrial ROAD Stg 1 (2.800 Ha)	Area Pervious (ha)	None	None	0.270
Urban	CoGC - Industrial ROAD Stg 1 (2.800 Ha)	Total Area (ha)	None	None	2.8
Urban	CoGC - Industrial ROOF Stg 1 (8.546 Ha)	Area Impervious (ha)	None	None	8.546
Urban	CoGC - Industrial ROOF Stg 1 (8.546 Ha)	Area Pervious (ha)	None	None	0
Urban	CoGC - Industrial ROOF Stg 1 (8.546 Ha)	Total Area (ha)	None	None	8.546

Only certain parameters are reported when they pass validation

Appendix G – WSUD Bio Retention Basin Maintenance Checklists

BIORETENTION BASIN DESIGN ASSESSMENT CHECKLIST			
Asset I.D.		DA No.	
Basin Location:			
Hydraulics:	Minor Flood (m^3/s):	Major Flood (m^3/s):	
Area:	Catchment Area (ha):	Bioretention Area (ha):	

TREATMENT	Y	N
Treatment performance verified from curves?		
BIORETENTION MEDIA AND UNDER-DRAINAGE	**Y**	**N**
Design documents bioretention area and extended detention depth as defined by treatment performance requirements.		
Overall flow conveyance system sufficient for design flood event(s)?		
Where required, bypass sufficient for conveyance of design flood event?		
Where required scour protection provided at inflow point to bioretention?		
Bioretention media specification includes details of filter media, drainage layer and transition layer (if required)?		
Design saturated hydraulic conductivity included in specification?		
Transition layer provided where drainage layer consists of gravel (rather than coarse sand)?		
Perforated pipe capacity > infiltration capacity of filter media?		
Selected filter media hydraulic conductivity > 10 x hydraulic conductivity of surrounding soil?		
Liner provided if selected filter media hydraulic conductivity < 10 x hydraulic conductivity of surrounding soil?		
Maximum spacing of collection pipes <1.5m?		
Collection pipes extended to surface to allow inspection and flushing?		
*Maximum upstream flood conveyance complies with QUDM?		
*Overflow pit has set down of at least 50mm below kerb invert? (where conventional gully/lintel used downstream of bioretention then no overflow pit required)		
BASIN	**Y**	**N**
Bioretention area and extended detention depth documented to satisfy treatment requirements?		
Overflow pit crest set at top of extended detention?		
Maximum ponding depth will not impact on public safety?		
Maintenance access provided to surface of bioretention system (for larger systems)?		
Protection from coarse sediments provided (where required) with a sediment forebay?		
Protection from gross pollutants provided (where required)?		
LANDSCAPE	**Y**	**N**
Plant species selected can tolerate extended dry periods, periodic inundation and design velocities?		
Bioretention design and plant species selected integrate with surrounding landscape or built environment design?		
*Planting design conforms with acceptable sight line and safety requirements?		
COMMENTS		

*Streetscape application only

BIORETENTION BASIN CONSTRUCTION INSPECTION CHECKLIST

Asset I.D.		Inspected By:	
Site:		Date:	
		Time:	
Constructed By:		Weather:	
		Contact During Visit:	

Items inspected	Checked		Satisfactory		Items inspected	Checked		Satisfactory	
	Y	N	Y	N		Y	N	Y	N
DURING CONSTRUCTION & ESTABLISHMENT									
A. FUNCTIONAL INSTALLATION					Structural components				
Preliminary Works					15. Location and configuration of inflow systems as designed				
1. Erosion and sediment control plan adopted					16. Location and levels of overflow pits as designed				
2. Temporary traffic/safety control measures					17. Under-drainage connected to overflow pits as designed				
3. Location same as plans					18. Concrete and reinforcement as designed				
4. Site protection from existing flows					19. Set down to correct level for flush kerbs (streetscape applications only)				
Earthworks and Filter Media					20. Kerb opening width as designed				
5. Bed of basin correct shape and slope									
6. Batter slopes as plans					B. SEDIMENT & EROSION CONTROL (IF REQUIRED)				
7. Dimensions of bioretention area as plans					21. Stabilisation immediately following earthworks and planting of terrestrial landscape around basin				
8. Confirm surrounding soil type with design					22. Silt fences and traffic control in place				
9. Confirm filter media specification in accordance with Step 4					23. Temporary protection layers in place				
9. Provision of liner (if required)									
10. Under-drainage installed as designed					C. OPERATIONAL ESTABLISHMENT				
11. Drainage layer media as designed					24. Temporary protection layers and associated silt removed				
12. Transition layer media as designed (if required)					Vegetation				
14. Extended detention depth as designed					25. Planting as designed (species and densities)				
					26. Weed removal and watering as required				

FINAL INSPECTION									
1. Confirm levels of inlets and outlets					6. Check for uneven settling of banks				
2. Confirm structural element sizes					7. Under-drainage working				
3. Check batter slopes					8. Inflow systems working				
4. Vegetation as designed					9. Maintenance access provided				
5. Bioretention filter media surface flat and free of clogging									

COMMENTS ON INSPECTION
ACTIONS REQUIRED
Inspection officer signature:

BIORETENTION BASIN MAINTENANCE CHECKLIST			
Inspection Frequency:	1 to 6 monthly	Date of Visit:	
Location:			
Description:			
Asset I.D.			
Site Visit by:			

INSPECTION ITEMS:	Y	N	Action Required (details)
Sediment accumulation at inflow points?			
Litter within basin?			
Erosion at inlet or other key structures?			
Traffic damage present?			
Evidence of dumping (e.g. building waste)?			
Vegetation condition satisfactory (density, weeds etc)?			
Watering of vegetation required?			
Replanting required?			
Mowing/slashing required?			
Clogging of drainage points (sediment or debris)?			
Evidence of ponding?			
Damage/vandalism to structures present?			
Surface clogging visible?			
Drainage system inspected?			
Resetting of system required?			

COMMENTS

BIORETENTION BASIN ASSET TRANSFER CHECKLIST		
Asset I.D.		
Asset Location:		
Construction by:		
'On-maintenance' Period:		
TREATMENT	Y	N
System appears to be working as designed visually?		
No obvious signs of under-performance?		
MAINTENANCE	Y	N
Maintenance plans and indicative maintenance costs provided for each asset?		
Vegetation establishment period completed (2 years)?		
Inspection and maintenance undertaken as per maintenance plan?		
Inspection and maintenance forms provided?		
ASSET INSPECTED FOR DEFECTS AND/OR MAINTENANCE ISSUES AT TIME OF ASSET TRANSFER	Y	N
Sediment accumulation at inflow points?		
Litter within basin?		
Erosion at inlet or other key structures?		
Traffic damage present?		
Evidence of dumping (e.g. building waste)?		
Vegetation condition satisfactory (density, weeds etc)?		
Watering of vegetation required?		
Replanting required?		
Mowing/slashing required?		
Clogging of drainage points (sediment or debris)?		
Evidence of ponding?		
Damage/vandalism to structures present?		
Surface clogging visible?		
Drainage system inspected?		
COMMENTS/ACTIONS REQUIRED FOR ASSET TRANSFER		
ASSET INFORMATION	Y	N
Design Assessment Checklist provided?		
As constructed plans provided?		
Copies of all required permits (both construction and operational) submitted?		
Proprietary information provided (if applicable)?		
Digital files (e.g. drawings, survey, models) provided?		
Asset listed on asset register or database?		

ENGINEERING SERVICES REPORT

DEVELOPMENT APPLICATION FOR RECONFIGURATION OF LOT (38 INDUSTRIAL LOTS)

ADDRESS
31 Yellowood Road, 60 Stapylton Jacobs Well Road and 82 Christensen Rod, Stapylton

REAL PROPERTY DESCRIPTION
Lot 4 on RP6843, Lot 1 on RP6882 and Lot 240 on W31320

PREPARED FOR
KS8 Pty. Ltd.

MAY 2018 (REV 2.)

gassman development perspectives

project coordination
urban + regional planning
landscape + urban design
engineering services
environmental management
visualisation + spatial services
surveying services
advisory services

gassman development perspectives est 1985 planning environment landscape engineering survey

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Postal Address:	PO Box 392 Beenleigh. Q. 4207	Document Title:	Engineering Services Report
Phone:	+61 7 3807 3333	Author:	Mitchell Gassman
Fax:	+61 7 3287 5461	Client:	KS8 Pty. Ltd.
Email:	mail@gassman.com.au	Client Contact:	Daniel Farquhar
Web:	www.gassman.com.au	Client Reference:	N/A

Revision / Checking History

No.	Author	Reviewer
INTERNAL DRAFT	Mitchell Gassman	Ian Grieves
1.	Mitchell Gassman	Ian Grieves
2.	Mitchell Gassman	Ian Grieves

Approval for Issue

Rev. No.	Name	Position	Signature	Date
2.	Mitchell Gassman	Civil Project Engineer RPEQ 16939		11 May 2018

Final Distribution

KS8 Pty Ltd (Client)	1 electronic copy
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GDP File	1 electronic copy

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1.0 INTRODUCTION

Gassman Development Perspectives (GDP) has been engaged by KS8 Pty Ltd (Applicant) to prepare an Engineering Services Report over land situated at 60 Stapylton Jacobs Well Road and 82 Christensen Road, Stapylton (Lot 1 on RP6882 and Lot 240 on W31320) being the 'subject site'.

This report has been prepared for submission to City of Gold Coast Council (Council) as part of a development application for Reconfiguration of Lot (38 Industrial Lots) (refer ***Appendix A – Reconfiguration of Lot Plan***)

The purpose of this report is to supply information relating specifically to civil engineering infrastructure, services and issues over the subject site.

2.0 SITE DESCRIPTION

2.1 SITE LOCATION

The subject site is located within the City of Gold Coast Council's (Council) local government boundaries, in Council's "Future Low Impact Industry" and "Future Medium Impact Industry" zone precinct. The subject site is bounded by Stapylton Jacobs Well Road to the north, Christensen Road and existing industrial uses to the west and Council's land fill facility to the south-east (refer to **Figure 2.1**). Land proposed to be utilised for compensatory cut to balance flood storage over the development site is located along Yellowood Road (Lot 4 on RP6843) to the north of the subject site

Figure 2.1: Site Locality Plan, Source: Google Earth 2017

2.2 LAND ENCUMBRANCES

There are no existing encumbrances over the subject site.

2.3 EXISTING LAND USES

The subject land is mainly improved by an existing rural homestead and accompanying farming sheds consisting of vacant land and agricultural uses for specifically for cattle grazing.

Amgrow Pty. Ltd. (soil and fertilizer distributor) leases approximately 9.4ha of part Lot 240 on W31320, for the purpose of mixing, reconditioning and distributing soil and fertilizer, on a wholesale basis. Warehouse buildings and ancillary offices are located on the leased land with sole access from Christensen Road.

The property at No.31 Yellowood Road is currently used for the grazing of cattle mainly associated with the adjoining lands to the west. The land has a frontage to the Albert River to the rear of the property.

2.4 TOPOGRAPHY

Along the south-eastern boundary of the subject site is the existing high point of 29.23m AHD with a ridge line extending through to the properties' northern boundary. This existing topography defines the existing catchments of the site and current stormwater discharge locations along the northern and eastern boundaries

2.5 EXISTING VEGETATION

The subject site has a number of existing vegetation groups on site ranging from well-maintained grassed areas through to more heavily vegetated areas and regrowth. The areas nominated for clearing are discussed in further detail within the Vegetation Management Plan prepared by Gassman Development Perspectives submitted to Council as part of this application.

2.6 CONTAMINATED LAND

The subject site is not known to be contaminated.

3.0 EARTHWORKS

Due to the existing topography of the subject site (refer **Appendix B**) major bulk earthworks will be required to provide generally flat pads suitable for the intended industrial use.

A bulk earthworks strategy has been developed by Gassman Development Perspectives over the subject site (refer **Appendix C**) to facilitate the creation of suitable flat earthworked pads (minimum grade of 1:150) capable of being serviced to City of Gold Coast Council standards.

4.0 ROADWORKS AND ACCESS

Stage 1 of the proposed development will gain access via construction of a signalised intersection along the subject site's frontage to Stapylton Jacobs Well Road. Due to the subject site's proximity to Exit 38 of the M1 Motorway the conceptual design of the external intersection has included access provisions for A-Double vehicular movements into the development. As Stapylton Jacobs Well Road is State-controlled, approval of the intersection layout and the subsequent detailed design will be subject to review by the Department of Transport and Main Roads (TMR). Please refer the ***Appendix D*** for the layout of the proposed signalised external intersection. It is noted that the signalised intersection works include dual lanes to Stapylton Jacobs Well Road in accordance with TMR's ultimate design for the frontage of the subject site. Adequate provision for these external works and any land dedication within the subject site to accommodate the ultimate design have been made within the ROL Plan for Stage 1 (refer ***Appendix A***).

In accordance with the superseded planning scheme approval in place over the subject site, the internal road network will be constructed in accordance with the typical cross section shown on Council standard drawing 05-02-004 for an Industrial Collector Street (refer ***Figure 4.1*** below). It is noted this road reserve configuration has been applied to internal roads that would typically be classed as "Industrial Access Streets" to maintain greater access and manoeuvrability throughout the proposed development. In line with the design intent of the external signalised intersection, the radii of kerb returns throughout the estate have also been designed to accommodate A-Double vehicular movements. The truncations to lot boundaries necessary to maintain minimum road verge widths through these kerb returns have been incorporated into the Reconfiguration of Lot plan for Stage 1

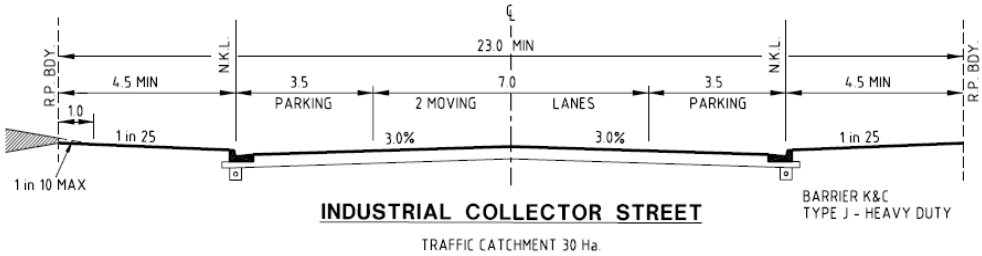


Figure 4.1: Proposed Internal Roads Cross Section, Source: CoGC Std Dwg 05-02-004

5.0 INFRASTRUCTURE SERVICES

5.1 SEWERAGE

Consultation has been undertaken with Gold Coast Water's Sewer Catchment Planning officers to establish the Sewer Network Analysis Report that accompanies this ROL application. This involved the creation of an overall sewer strategy internal to the site along with outlining the key trunk sewer infrastructure upgrades required along Stapylton Jacobs Well Road through to the existing Sewer Pump Station (BE35) on the western side of the M1 Motorway.

As per the submitted Sewer Network Analysis Stage 1 will be serviced via a gravity sewer connection to the proposed trunk upgrade of existing Council mains along Stapylton Jacobs Well Road with provision for future stages being pumped via rising main back through Stage 1 and gravity fed down to the Council trunk sewer extension.

5.2 WATER SUPPLY

A copy of Council's water reticulation as constructed plans has been obtained for roads within the vicinity of the subject site. These plans confirm that Stage 1 of the development will be serviced off Council's existing 225mm diameter potable water main located within the Stapylton Jacobs Well Road reserve.

GDP have also completed a detailed Water Network Analysis in accordance with Council's requirements to confirm minimum service supply and fire demand can be met for the proposed lots. A copy of this reporting is attached to the ROL application documentation.

5.3 ELECTRICITY AND TELECOMMUNICATIONS

A Dial-before-you-dig (DBYD) search was undertaken over the subject site (refer **Appendix F**) which confirmed the presence of electrical and communications reticulation to the subject site's road frontage.

The adequacy of this infrastructure in its current form along with the necessity for any augmentation or upgrades to cater for the proposed use will be confirmed through the detailed design process by the appointed electrical consultant.

6.0 SITE BASED STORMWATER MANAGEMENT

6.1 STORMWATER QUANTITY

A stormwater drainage network will be designed to ensure the proposed lot configuration adequately drains to a Lawful Point of Discharge. A Site Based Stormwater Management Plan has been prepared by Gassman Development Perspectives that demonstrates that attenuation measures are able to be incorporated into the proposed development to ensure there is no adverse impacts to downstream properties, waterways or infrastructure as a result of an increase in peak stormwater flow rates discharging from the subject site upon development. This is achieved through the conceptual design of appropriately sized detention basins that comply with City of Gold Coast Council's Land Development Guidelines along with the Queensland Urban Drainage Manual (QUDM).

6.2 STORMWATER QUALITY

A suitable stormwater treatment train will need to be implemented to ensure service both the proposed industrial lots and surrounding public road reserves.

A site based stormwater management plan for the subject site outlining how all necessary steps to ensure that the quality of stormwater discharging from the subject site meets the necessary standards to comply with City of Gold Coast Council's Water Sensitive Urban Design (WSUD) requirements, Queensland Urban Drainage Manual (QUDM) and the performance objectives of the Queensland State Planning Policy (SPP) has been prepared by Gassman Development Perspectives and lodged under separate cover for Compliance Assessment by Council.

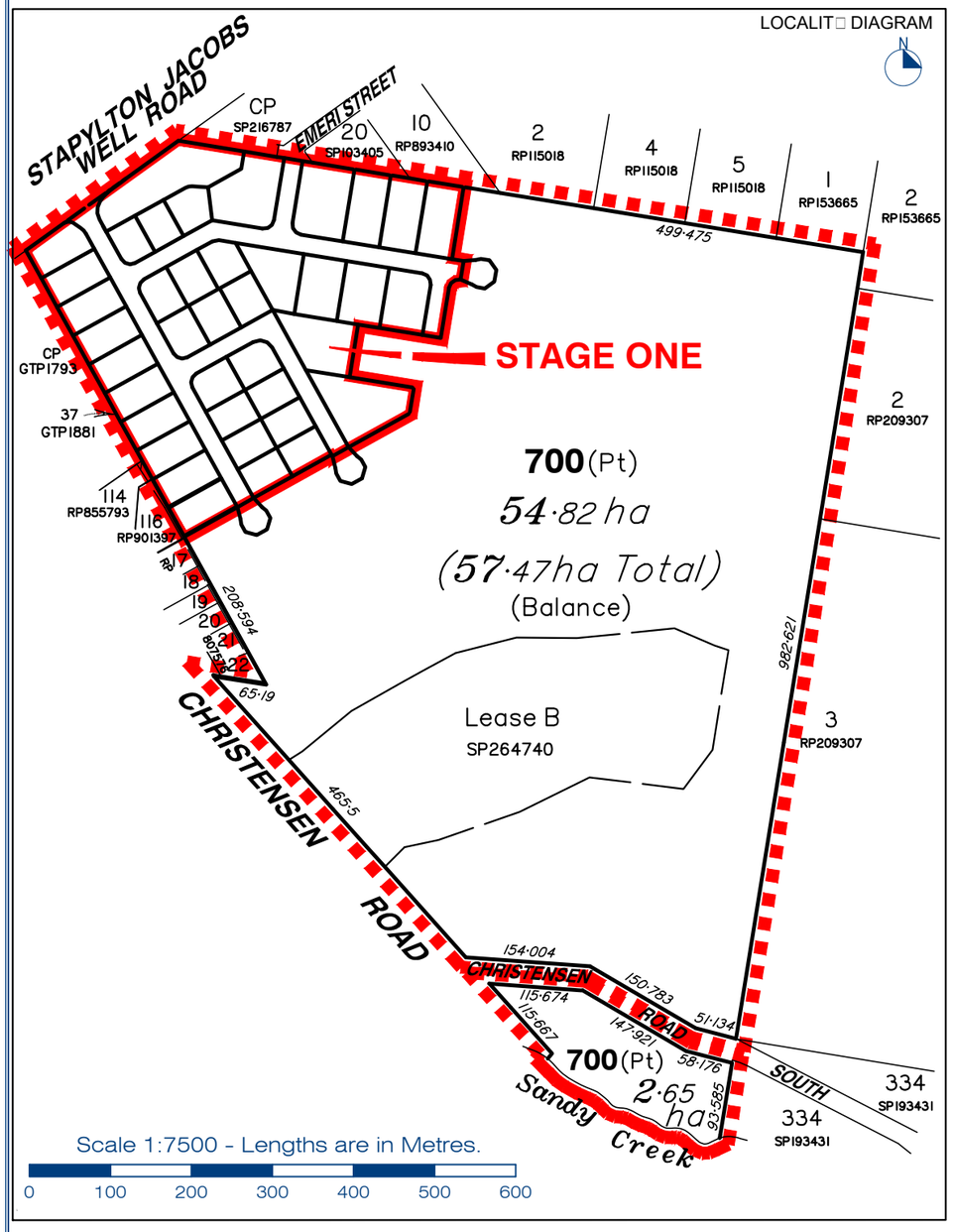
7.0 CONCLUSION

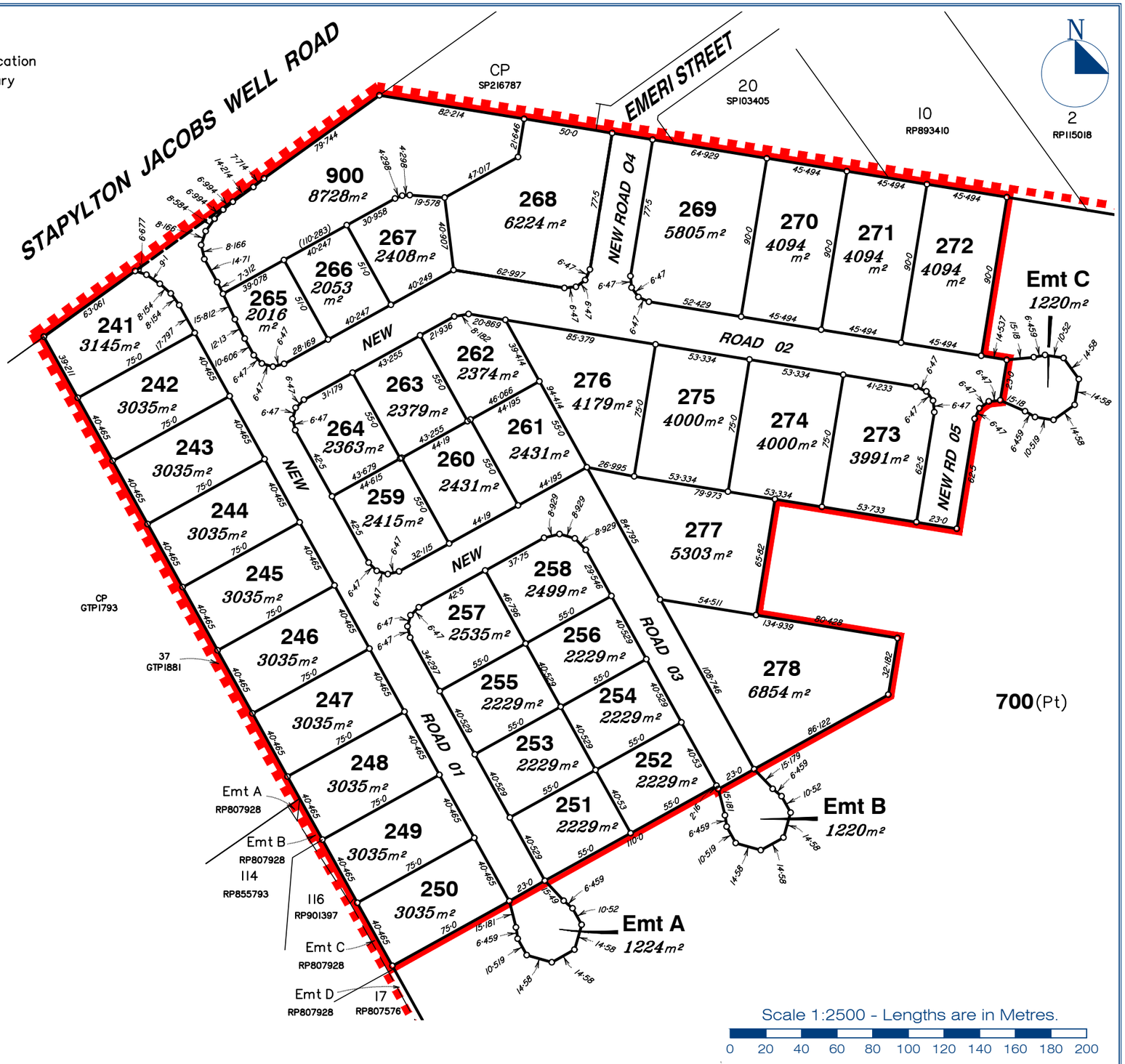
The above reporting demonstrates that proposed development can be undertaken through the construction of civil engineering infrastructure and services that meet the requirements of City of Gold Coast City Council's Land Development Guidelines and associated Australian Standards.

Appendix A – Stage 1 Reconfiguration of Lot Plan

DE□ELOPMENT S□MMAR□				
T□□□S□□ Ar□□ □3□6□H□				
LOT □IELD	STAGE AREA	LOT DENSIT□	A□ERAGE LOT SI□E	APPRO□□AREA O□ NEW ROAD
38 L□□□	16□20 H□	2□43 L□□/H□	31□3□□ 2	3□086 H□

Limit of Application
Stage Boundary





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T: 3807 3333 | F: 3287 5461 | www.gassman.com.au

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Brisbane | Level 8, 97 Creek Street, Brisbane QLD 4000 | GPO Box 999, Brisbane 4000

Scale at A3:	1:2500
Date:	09-02-18
Design:	.
Drawn:	SJH
Checked:	AWG

Issue	Date	Description	DRN	CHK
A	10/05/18	Minor Lot changes	SJH	AWG
	09/02/18	ORIGINAL ISSUE	SJH	AWG

Project:

M38 INDUSTRIAL PARK
YATALA

Client:

KS8 PTY LTD

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Drawing Title:

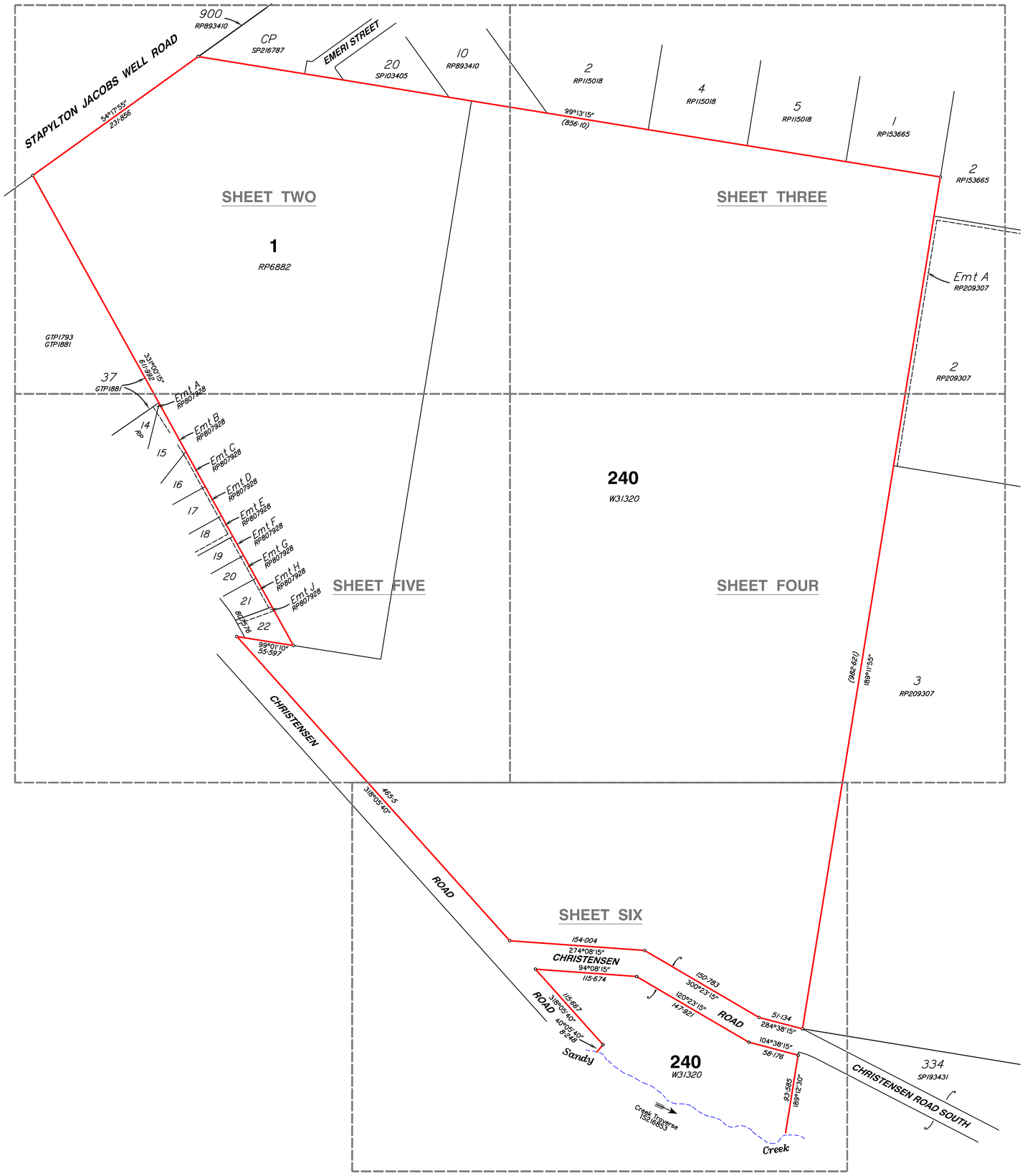
Proposed Staged Reconfiguration of Land STAGE ONE

Canceling Lot 1 on RP6882 & Lot 240 on W31320

Drawing No: 5738 P ROL 01A

Revision No:

Appendix B – Site Survey



Scale 1:2500 - Lengths are in Metres.

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SHEET 1 OF 6

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Meridian	IS216853	Surveyor	A. Macdonald
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F.B.	No	Date Drafted	02-02-2011
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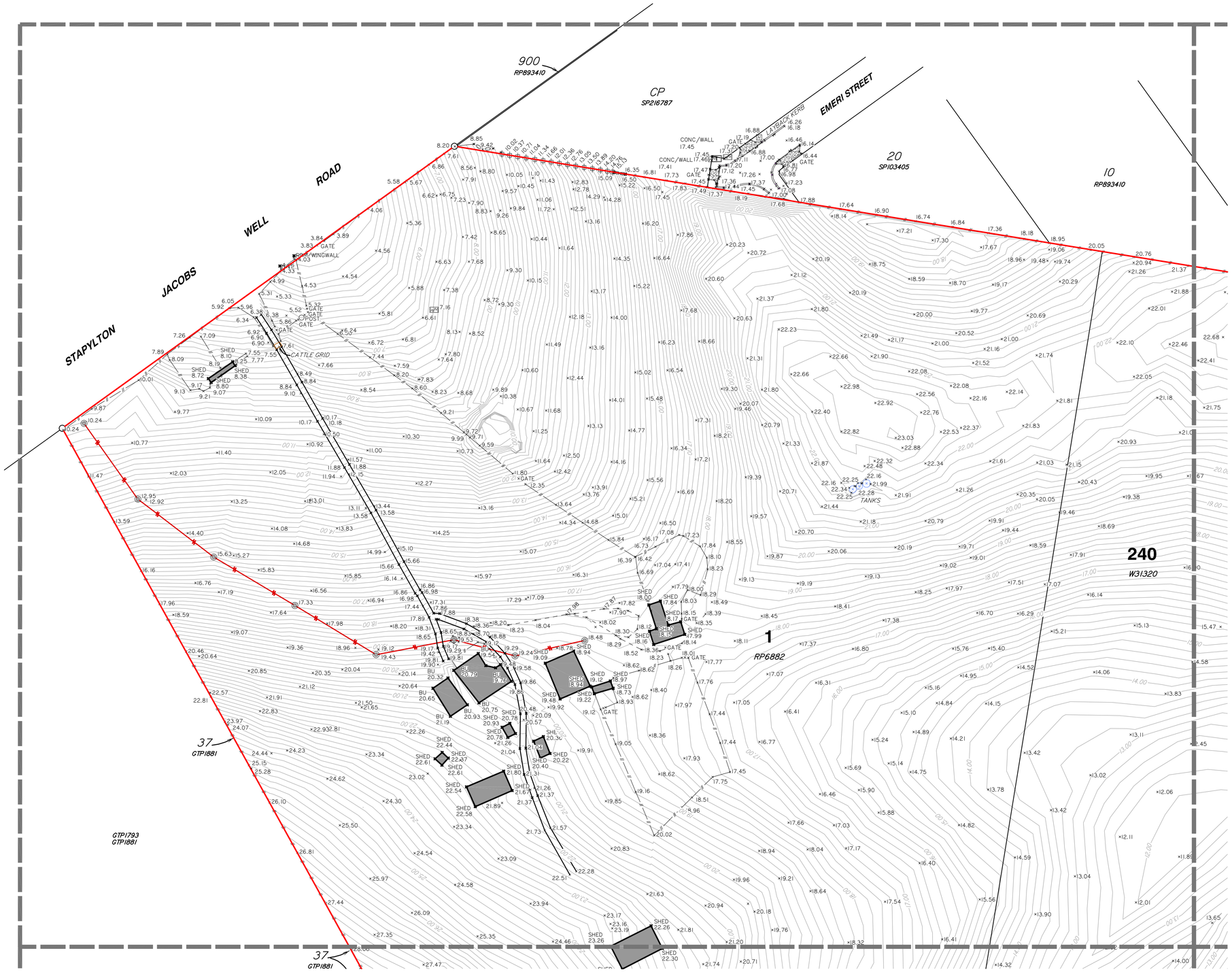

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LEGEND

- PERMANENT MARK
- SEWER MANHOLE
- SEWER INSPECTION OUTLET
- ELECTRICITY PILLAR
- ELECTRICITY POLE
- ELECTRICITY POLE WITH LIGHT
- TELSTRA PIT
- MANHOLE
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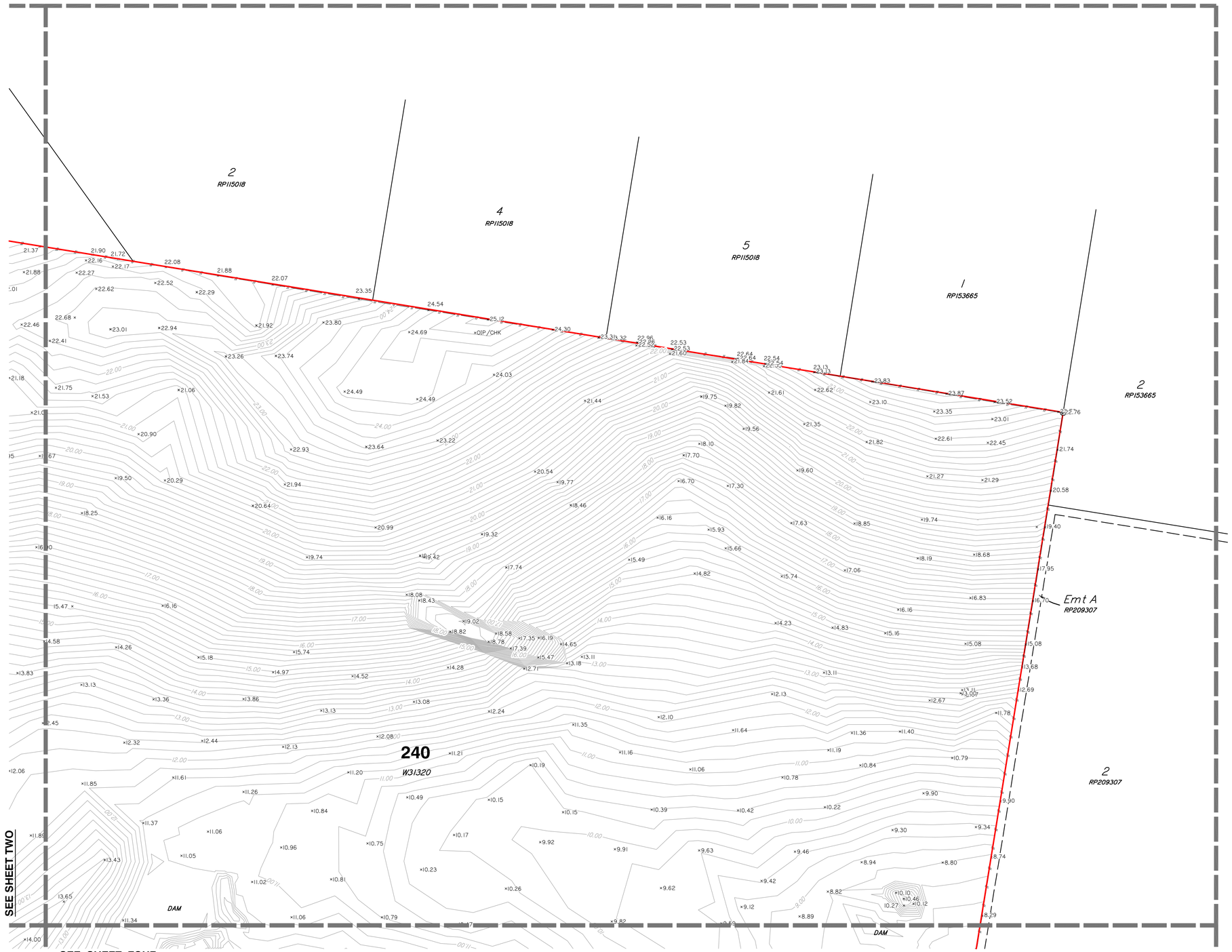

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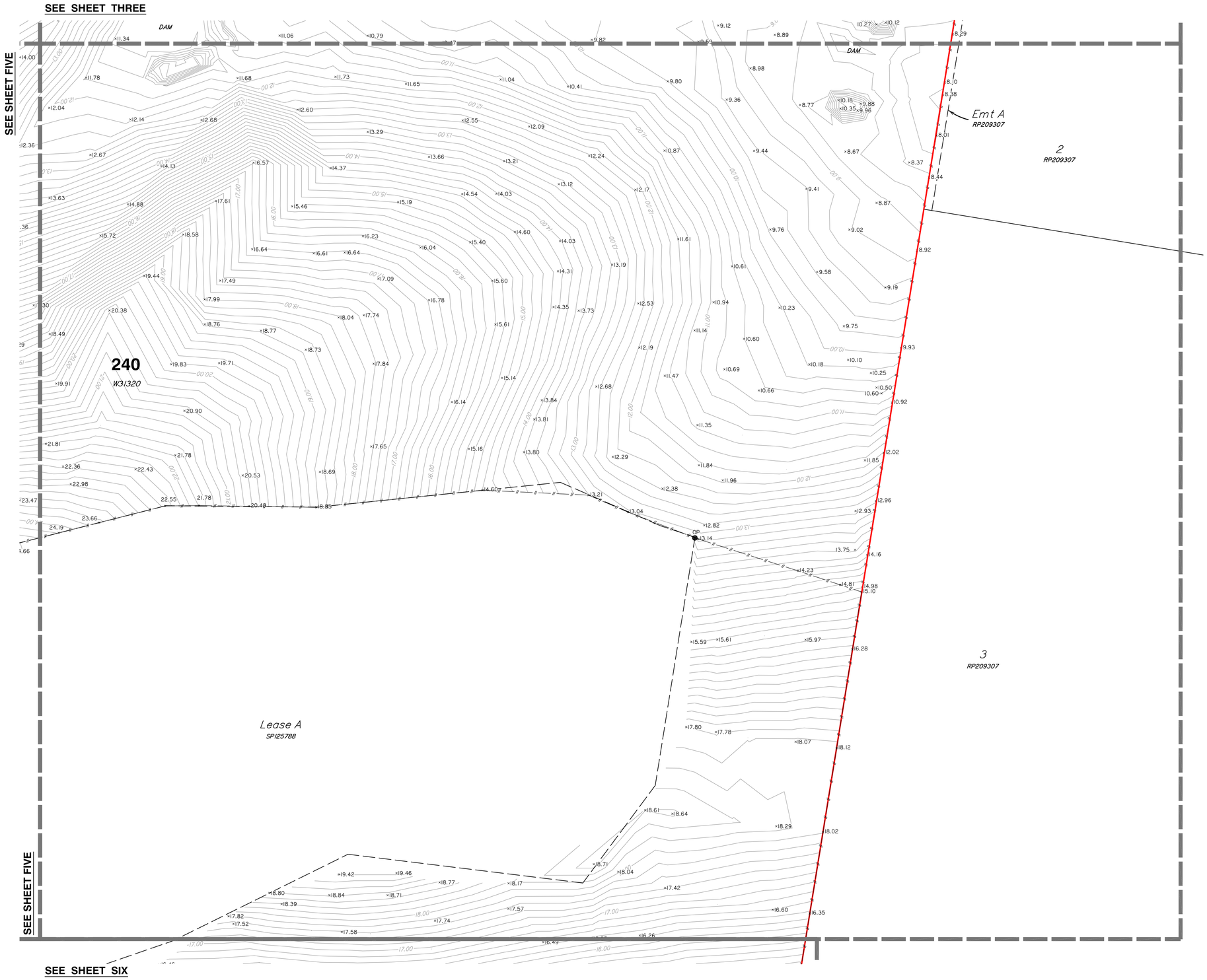

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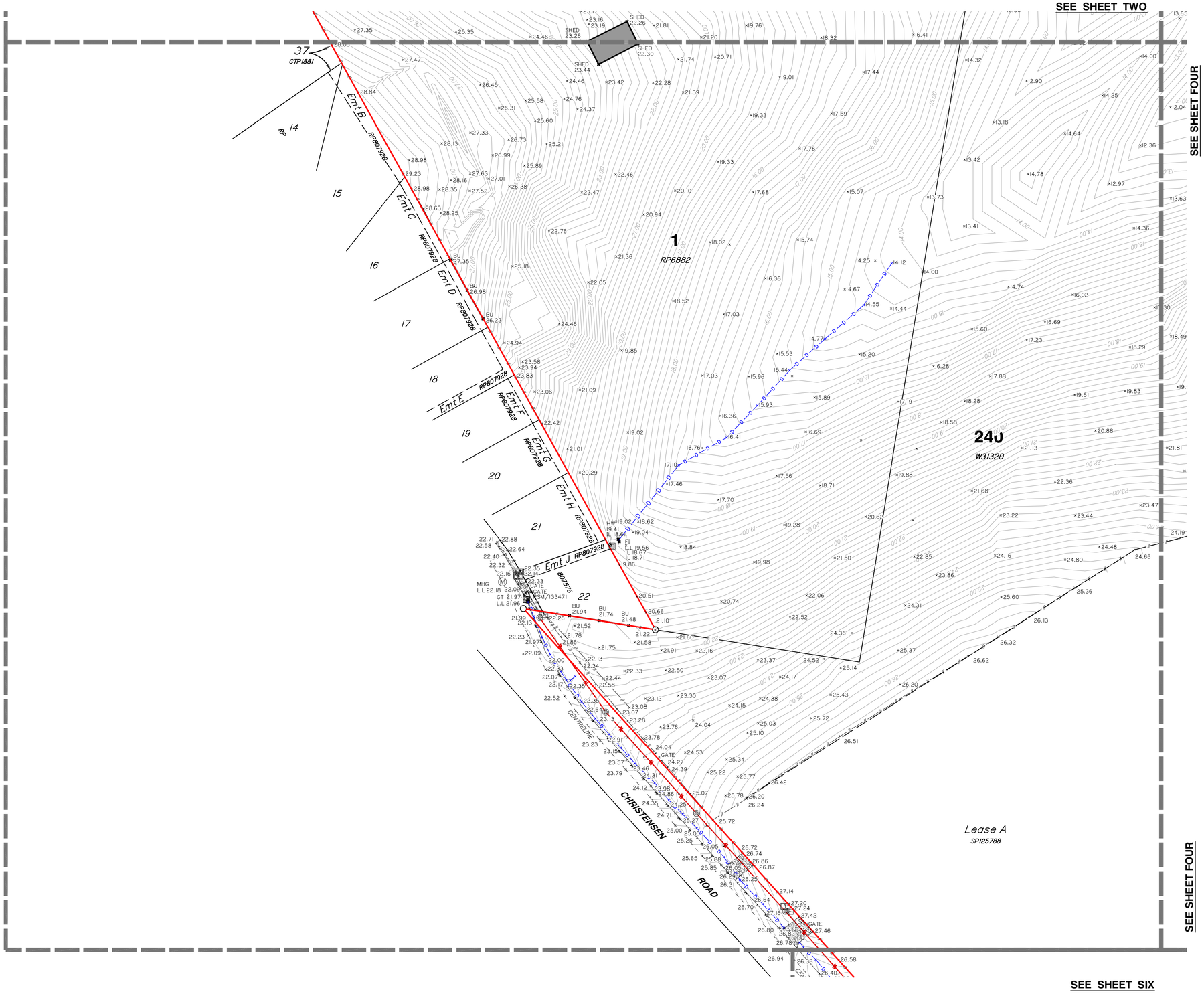

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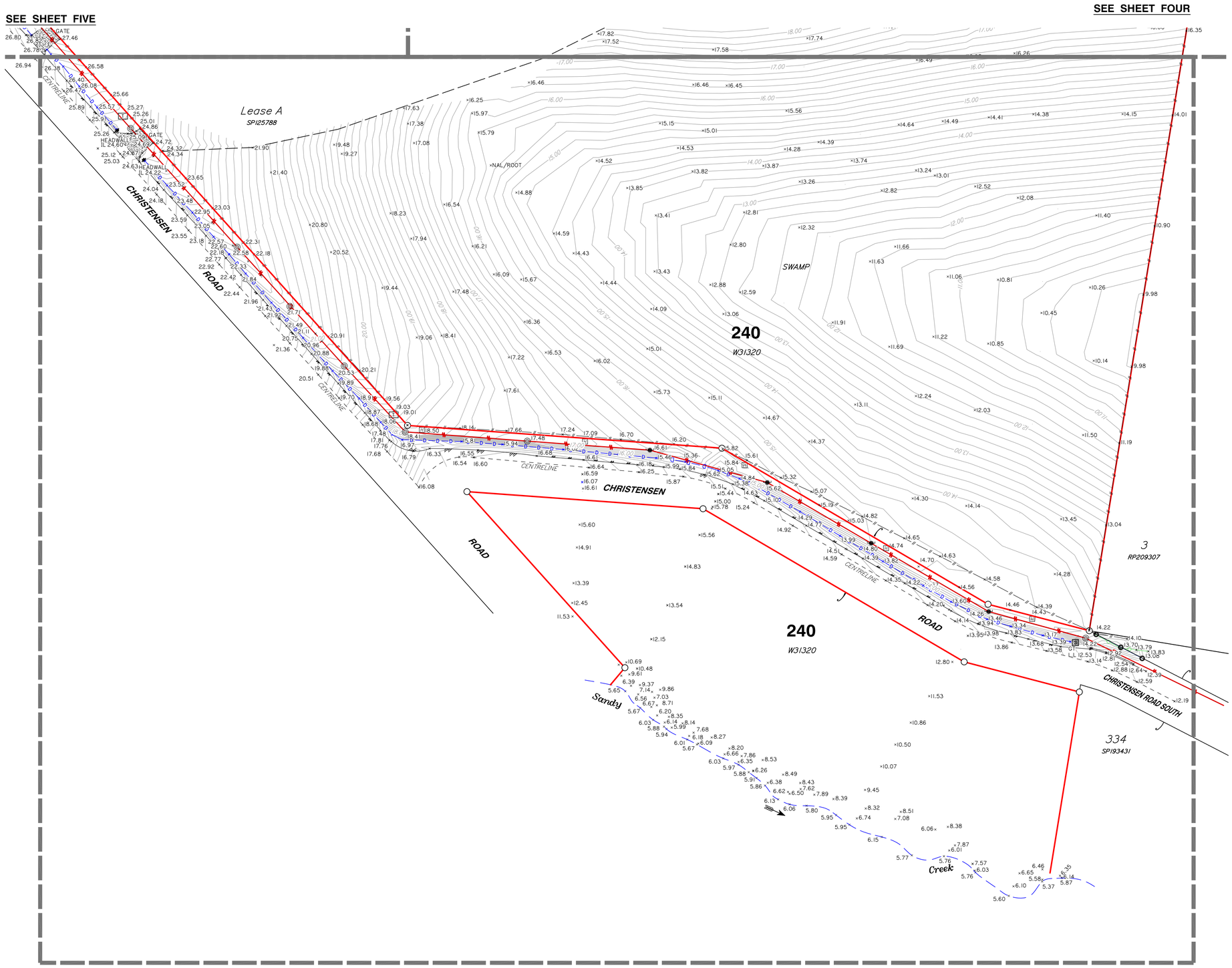
REFERENCE No. *5093-10*

PLAN No. ***5093 S CD 01***



Scale 1:1000 - Lengths are in Metres.

0 10 20 30 40 50 60 70 80

SHEET 6 OF 6

LEGEND

- PERMANENT MARK
- SEWER MANHOLE
- SEWER INSPECTION OUTLET
- ELECTRICITY PILLAR
- ELECTRICITY POLE
- ELECTRICITY POLE WITH LIGHT
- TELSTRA PIT
- MANHOLE
- STORMWATER MANHOLE
- GULLY TRAP
- WATER METER
- FIRE HYDRANT
- VALVE
- GATE
- BOLLARD
- CONCRETE
- EDGE OF BITUMEN
- FENCE
- OVERHEAD ELECTRICITY
- OPEN DRAIN
- RETAINING WALL
- EDGE OF GARDEN
- CONTOUR LEVEL

Notes

This plan has been prepared for the exclusive use and purposes of the client as stated on this plan and should not be used by any other person or corporation and for any other purpose.

Property boundaries have not been defined by this survey and have been compiled from IS216853.

Only those underground features and services as shown on this plan have been located by this survey. Prior to any construction, demolition or excavation on the site, the relevant authority should be contacted for the location of any further underground services and detailed location of all services.

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Client

HESTER

Project

CONTOUR AND DETAIL PLAN

Over Lot 1 on RP6882 and Lot 240 on WD31320

Parish of ***ALBERT***
County of ***Ward***
Local Govt ***GOLD COAST CITY COUNCIL***

Level Datum	A.H.D.	Date Surveyed	Jan 2011
Meridian	IS216853	Surveyor	A. Macdonald
Contour Interval	0.2	Drawn	S. Holt
F.B.	No	Date Drafted	02-02-2011
Origin	PSM 133471	Checked	
	RL 22.169		
Scale (on A1 original)		Designed	
1:1000		Drawn	
		Date Designed	

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t: (07) 32216732
f: (07) 32217308

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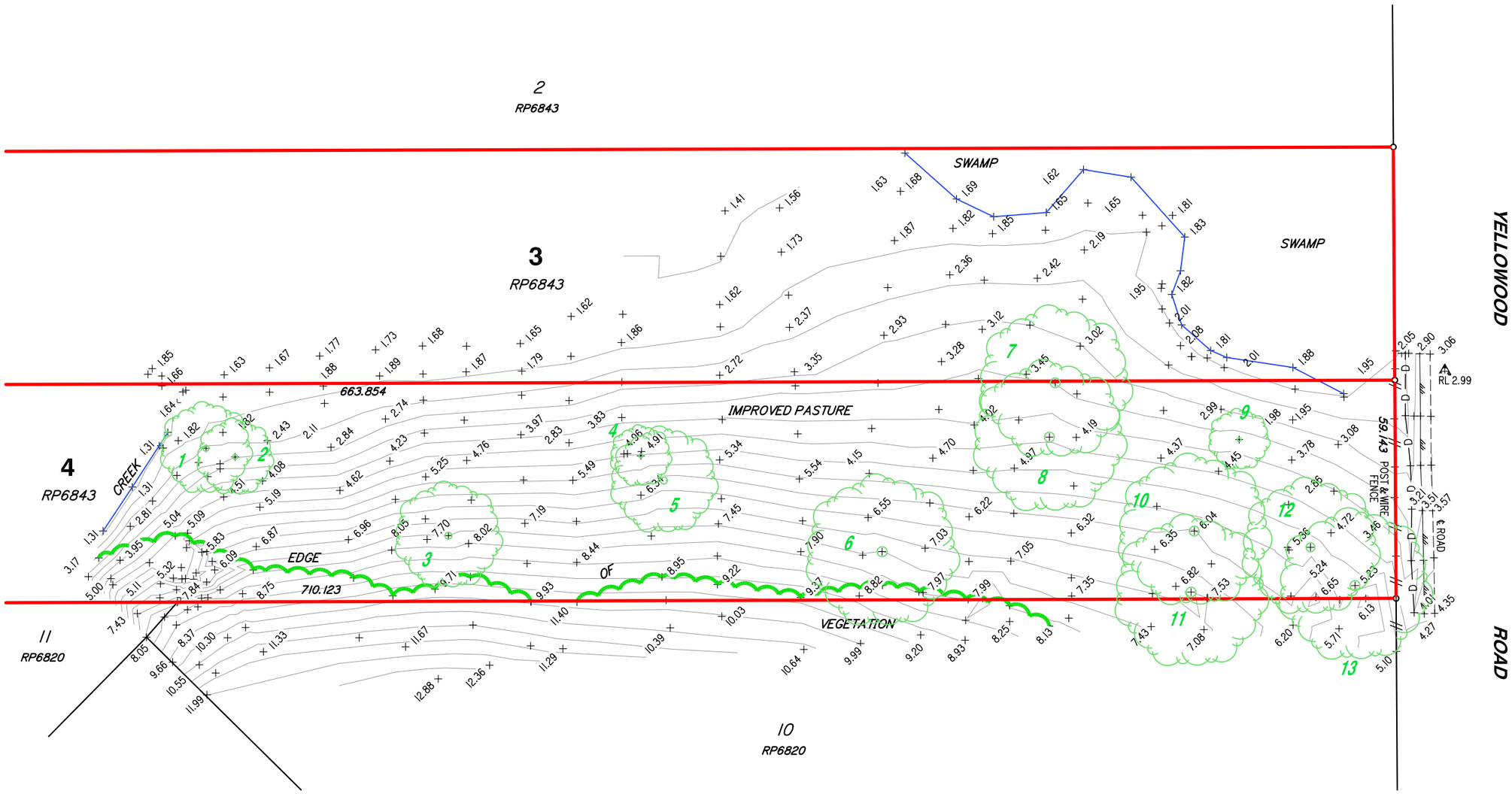
Access Business Park
76 Business Street Yatala Q. 4207
t: (07) 38073333
f: (07) 32875461

e: mail@gassman.com.au
w: www.gassman.com.au

REFERENCE No. *5093-10*

PLAN No. ***5093 S CD 01***



LEGEND

- BENCH MARK
- OPEN DRAIN
- EDGE OF BITUMEN
- FENCE

Scale 1:1250 - Lengths are in Metres.

0 10 20 30 40 50 60 70 80 90 100

TREE TABLE

TREE No.	Ø	SPREAD	HEIGHT
1	0.4Ø	12m	14m
2	0.4Ø	10m	14m
3	1.0Ø	14m	20m
4	0.3Ø	8m	10m
5	0.6Ø	14m	12m
6	0.8Ø	20m	10m
7	1.0Ø	20m	20m
8	1.0Ø	20m	20m
9	0.4Ø	8m	8m
10	1.5Ø	20m	26m
11	1.5Ø	20m	26m
12	0.6Ø	16m	20m
13	1.2Ø	20m	26m

Notes

This plan has been prepared for the exclusive use and purposes of the client as stated on this plan and should not be used by any other person or corporation and for any other purpose.

Property boundaries have not been defined by this survey.

Underground features and services have not been located by this survey. Those underground services shown have been compiled from the records of the relevant authority where available. Prior to any construction, demolition or excavation on the site, the relevant authority should be contacted for the location of any further underground services and detailed location of all services.

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Client
HESTER

Project
CONTOUR AND DETAIL PLAN

BORROW SITE
on Part of Lots 3 & 4 on RP6843

Parish of ***ALBERT***
County of ***Ward***
Local Govt ***GOLD COAST CITY COUNCIL***

Level Datum	A.H.D.	Date Surveyed	21-07-2011
Meridian	RP6843	Surveyor	S. White
Contour Interval	0.5	Drawn	S. Holt
F.B.	No	Date Drafted	22-07-2011
Origin	PSM130468 7.744	Checked	
Scale (on A3 original)	**1:1250**	Designed	
		Drawn	
		Date Designed	

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f: (07) 32217308
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Access Business Park
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e: mail@gassman.com.au
w: www.gassman.com.au

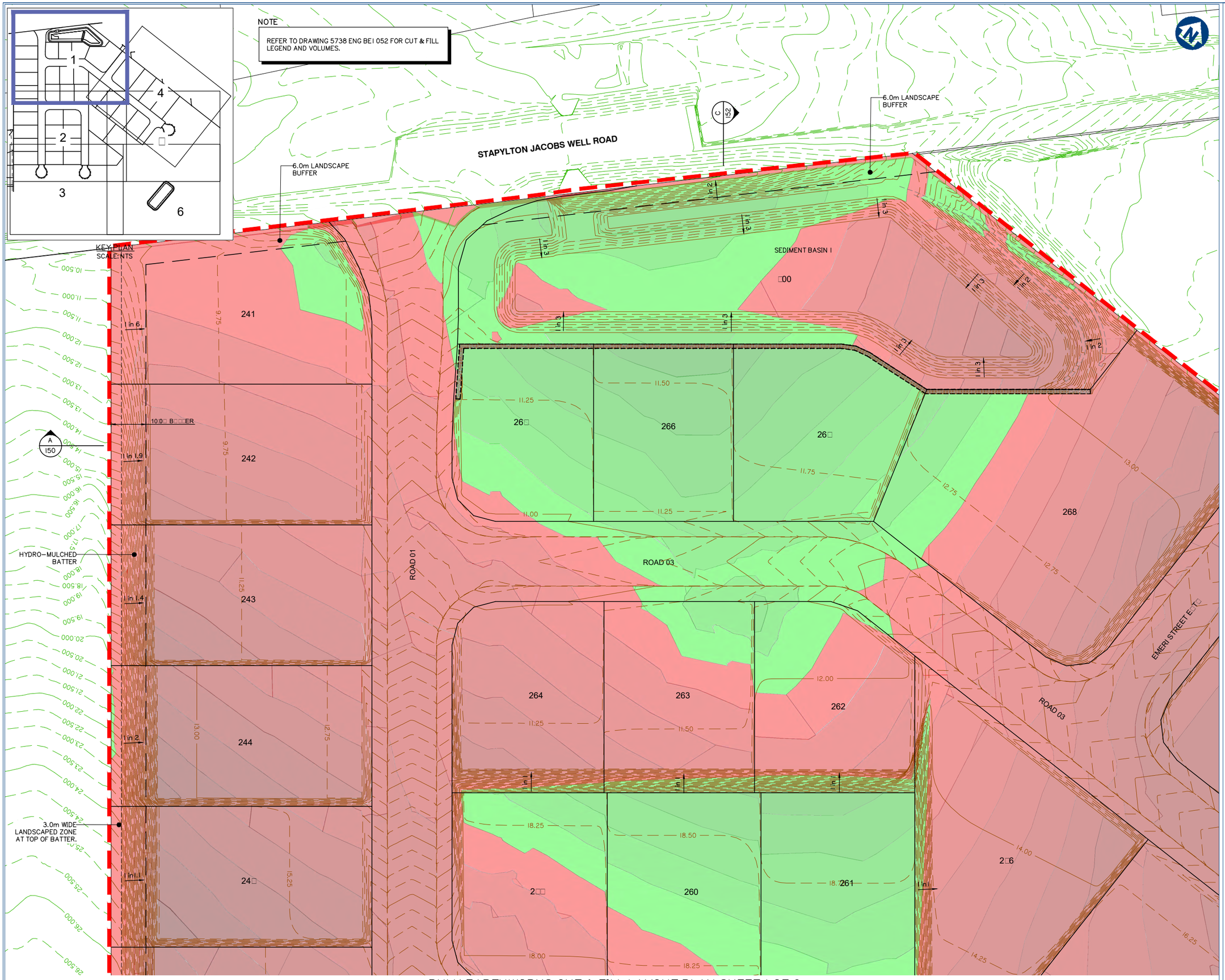
REFERENCE No. *5093-11*

PLAN No. **5093 S CD 03**

Appendix C – Bulk Earthworks Strategy

NOTE

REFER TO DRAWING 5738 ENG BE1 052 FOR CUT & FILL LEGEND AND VOLUMES.



BULK EARTHWORKS CUT & FILL LAYOUT PLAN SHEET 1 OF 6

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Client:

KS8 Pty. Ltd.

Site Address:

60 STAPLYTON JACOBS WELL ROAD, STAPYLTON

RPD:

Lot / Plan:	1 on RP6882 240 on W31320 4 on RP6843
Parish:	Albert
County:	Ward
Local Authority:	City of Gold Coast Council
Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	-
PSM:	
RL:	

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DRAWING TITLE

BULK EARTHWORKS
CUT & FILL LAYOUT PLAN
SHEET 1 OF 6

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

SCALE IN METRES

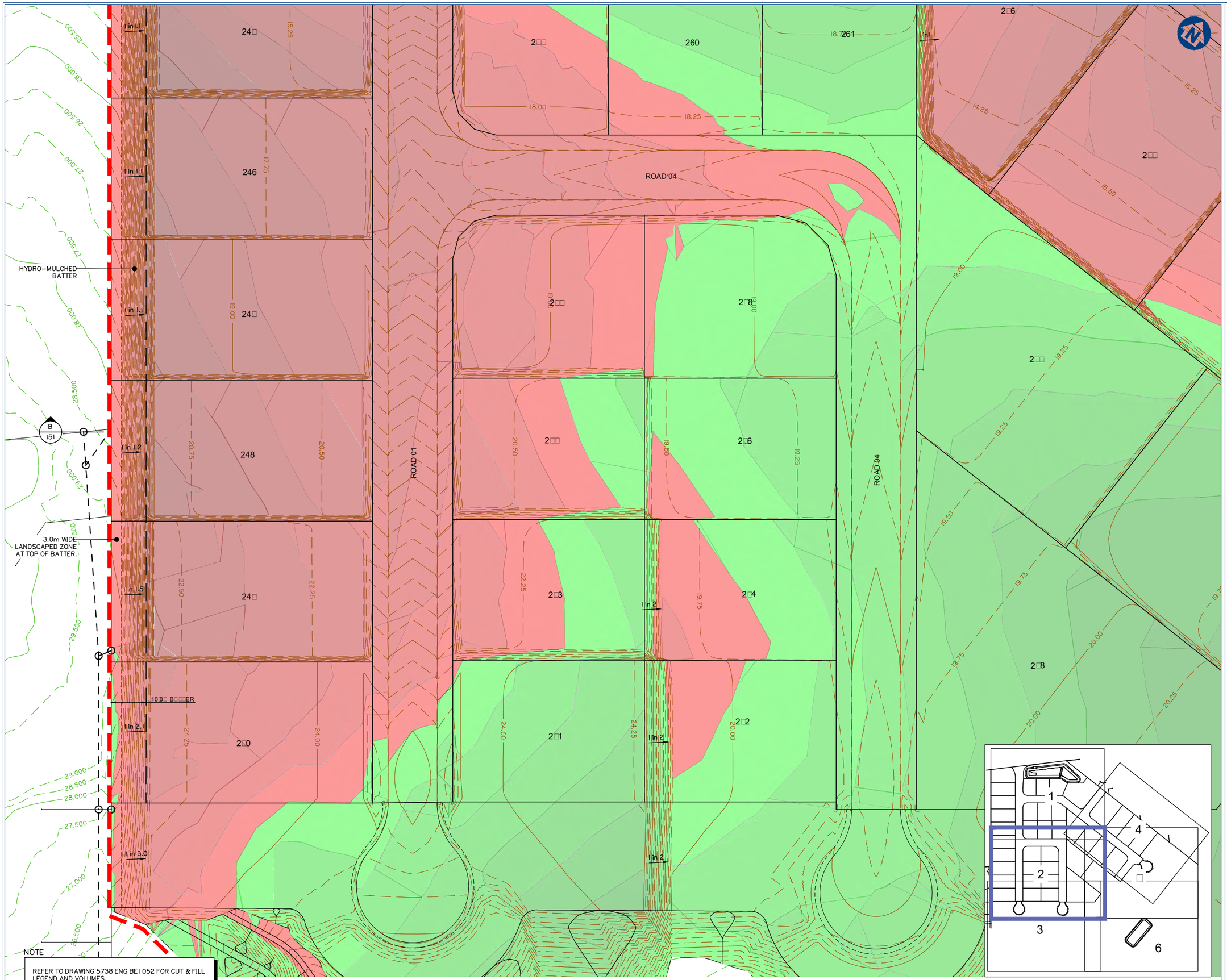
0 10 20 30 40 50

1:500 (FULL SIZE A1)
1:1000 (HALF SIZE A3)

Scale at A1:	1:500
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 050

Rev. No: B



NOTE

REFER TO DRAWING 5738 ENG BE1 052 FOR CUT & FILL LEGEND AND VOLUMES.

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Site Address:

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RPD:

Lot / Plan:	1 on RP6882 240 on W31320 4 on RP6843
Parish:	Albert
County:	Ward
Local Authority:	City of Gold Coast Council
Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	-
PSM:	
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BULK EARTHWORKS
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SHEET 2 OF 6

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

SCALE IN METRES

0 10 20 30 40 50

1:500 (FULL SIZE A1)
1:1000 (HALF SIZE A3)

Scale at A1:	1:500
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 051

Rev. No: B

HYDRO-MULCHED BATTER

3.0m WIDE LANDSCAPED ZONE AT TOP OF BATTER.

ROAD 01

ROAD 04

SARA DA MAPPING. FISH HABITAT AREAS. QUEENSLAND WATERWAYS FOR WATERWAY BARRIER WORKS – LOW

BULK EARTHWORKS DEPTHS (m)			
−13	to	−12	m
−12	to	−11	m
−11	to	−10	m
−10	to	−9	m
−9	to	−8	m
−8	to	−7	m
−7	to	−6	m
−6	to	−5	m
−5	to	−4	m
−4	to	−3	m
−3	to	−2	m
−2	to	−1	m
−1	to	0	m
0	to	1	m
1	to	2	m
2	to	3	m
3	to	4	m
4	to	5	m
5	to	6	m
6	to	7	m
7	to	8	m

BULK EARTHWORKS SUMMARY	
CUT	− 336,708 m³
FILL	+346,618 m³
+BULKING 15% (OF CUT BELOW 5.0m)	+3,930m³
ADJUSTED CUT VOLUME	−340,638m³
EXCESS OF FILL OVER CUT	5,980 m³

NOTES:

- BULK EARTHWORKS VOLUMES CALCULATED TO PAVEMENT SUBGRADE LEVEL.
- BULKING FACTOR OF 15% APPLIED TO EXCAVATED VOLUMES BELOW 5.0m.

KEY PLAN
SCALE: NTS

BULK EARTHWORKS CUT & FILL LAYOUT PLAN SHEET 3 OF 6

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Client:

KS8 Pty. Ltd.

Site Address:

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RPD:

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Parish:	Albert
County:	Ward
Local Authority:	City of Gold Coast Council
Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	-
PSM:	
RL:	

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Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

SCALE IN METRES

0 10 20 30 40 50

1:500 (FULL SIZE A1)
1:1000 (HALF SIZE A3)

Scale at A1:	1:500
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 052

Rev. No: B

NOTE

REFER TO DRAWING 5738 ENG BE1 052 FOR CUT & FILL LEGEND AND VOLUMES.

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County:	Ward
Local Authority:	City of Gold Coast Council
Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	-
PSM:	
RL:	

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SHEET 4 OF 6

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

SCALE IN METRES

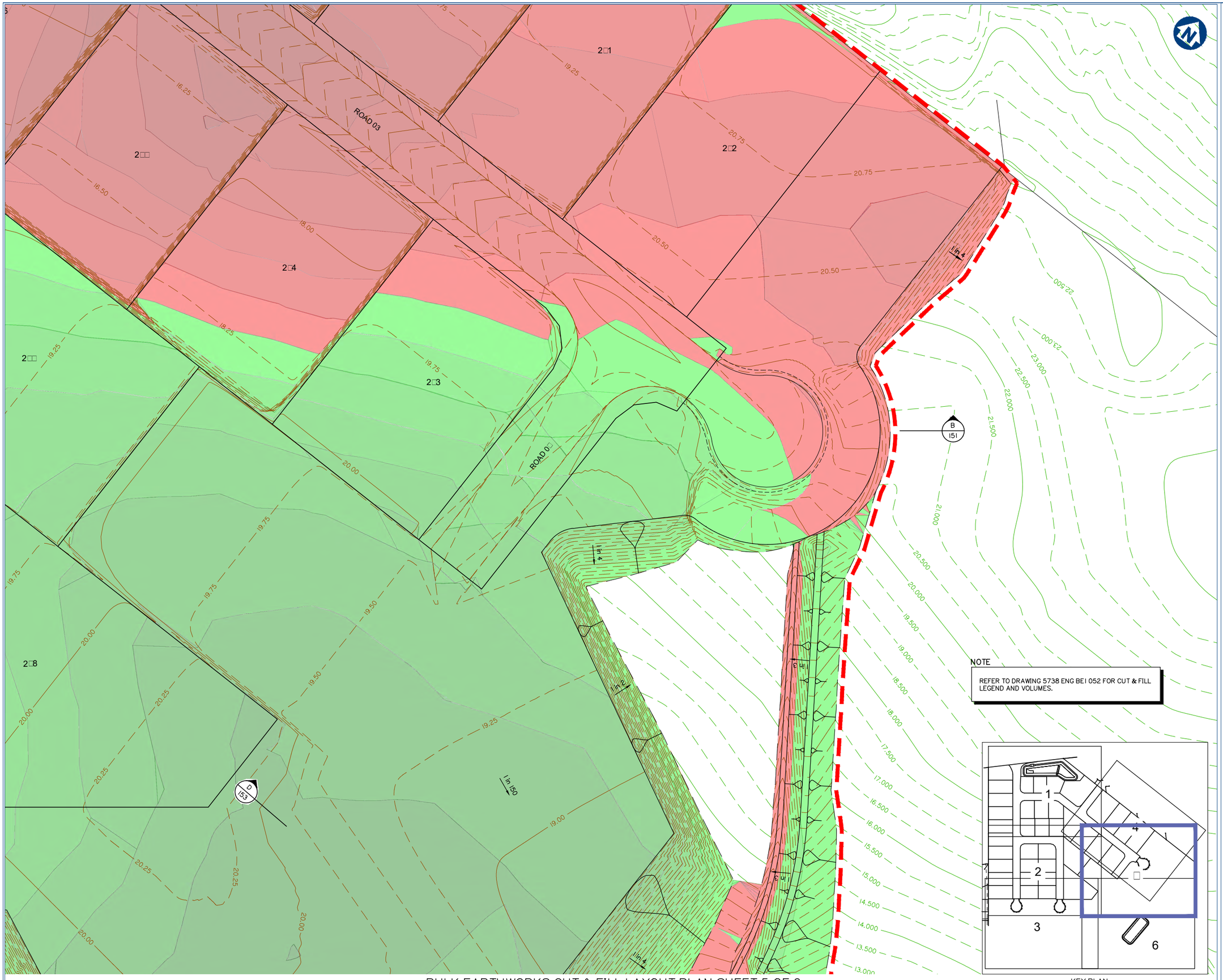
0 10 20 30 40 50

1:500 (FULL SIZE A1)
1:1000 (HALF SIZE A3)

Scale at A1:	1:500
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 053

Rev. No: B



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Site Address:

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RPD:

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Parish:	Albert
County:	Ward
Local Authority:	City of Gold Coast Council
Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	-
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CUT & FILL LAYOUT PLAN
SHEET 5 OF 6

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

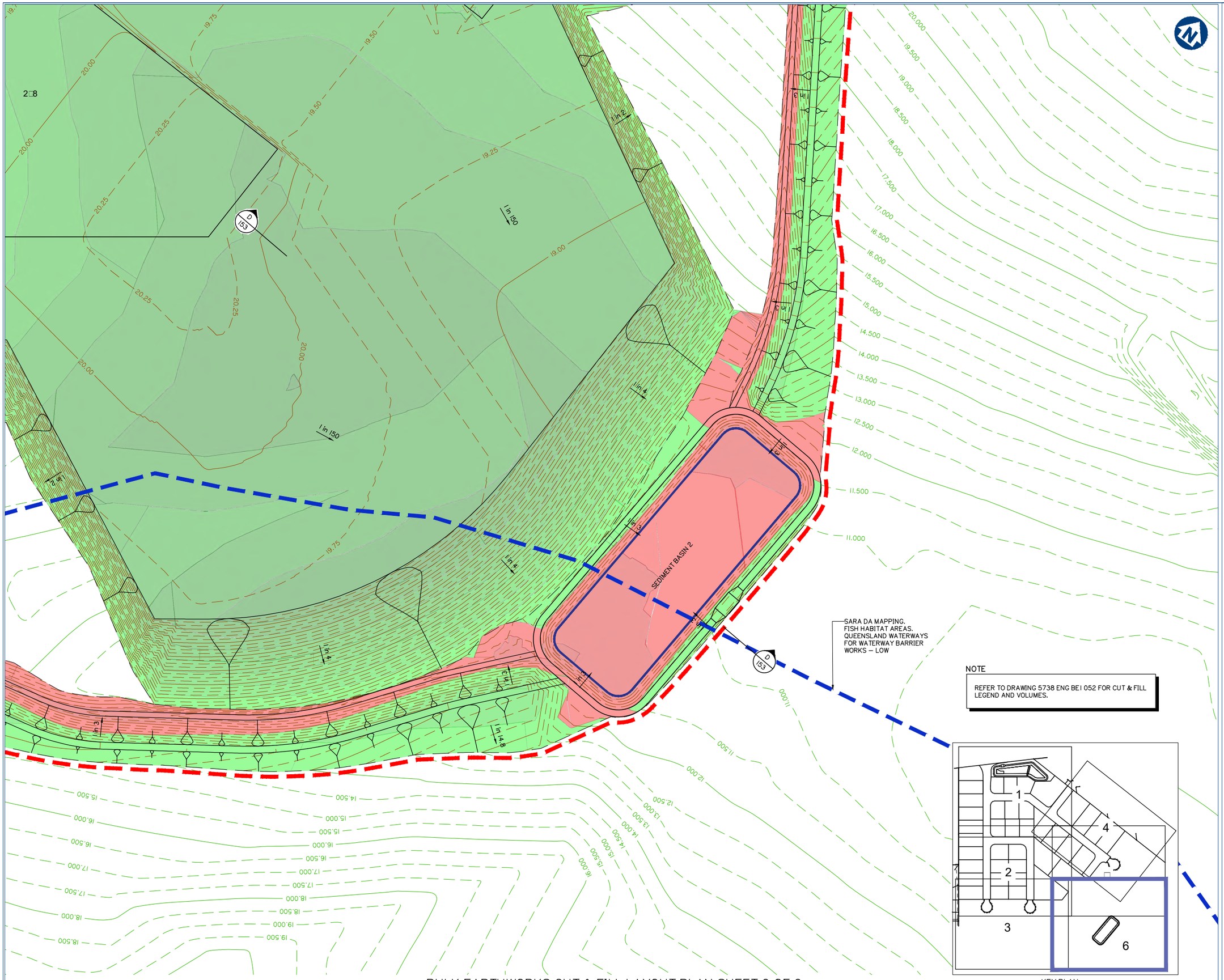
SCALE IN METRES

0 10 20 30 40 50

1:500 (FULL SIZE A1)
1:1000 (HALF SIZE A3)

Scale at A1:	1:500
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 054
Rev. No: B



BULK EARTHWORKS CUT & FILL LAYOUT PLAN SHEET 6 OF 6

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Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	-
PSM:	
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SHEET 6 OF 6

Issue	Date	Description	DRN	CHK
B	11-05-18	INFORMATION REQUEST RESPONSE	GCP	MG
A	09-02-18	ORIGINAL ISSUE	GCP	MG

SCALE IN METRES

0 10 20 30 40 50

1:500 (FULL SIZE A1)
1:1000 (HALF SIZE A3)

Scale at A1:	1:500
Designed:	IG
Drafted:	GCP
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG BE1 055
Rev. No: B

Appendix D – External Intersection Layout Plan

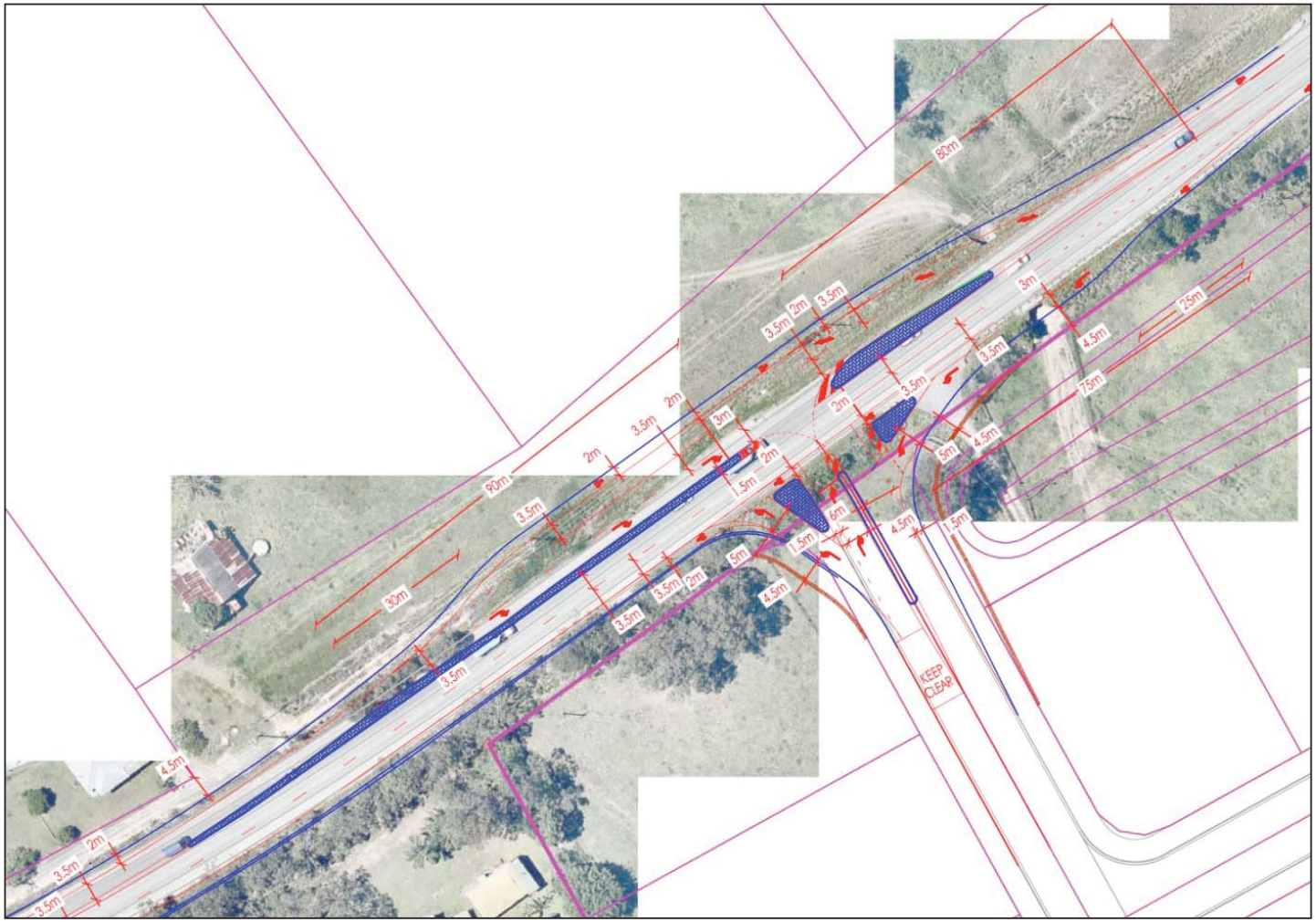
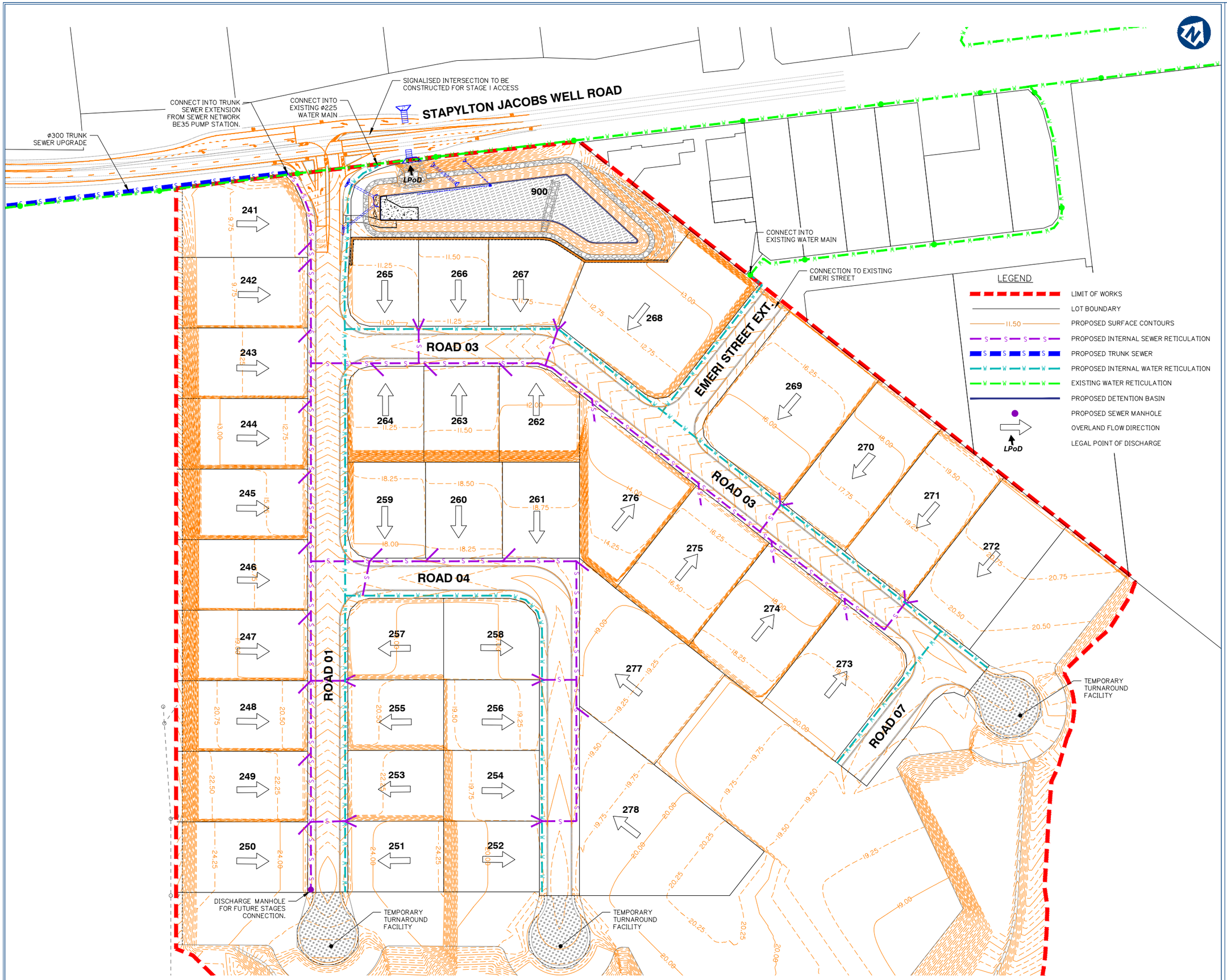


FIGURE 5.1 – CONCEPT DESIGN OF THE PROPOSED SITE ACCESS / STAPYLTON JACOBS WELL ROAD INTERSECTION

Appendix E – Civil Servicing Strategy Plan



STAGE 1 – ENGINEERING SERVICING SRATEGY PLAN

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Client:

KS8 PTY. LTD.

Site Address:

STAPYLTON-JACOBS WELL ROAD, STAPYLTON

RPD:

Lot:	1 and 240
Plan:	RP6882 and W31320
Parish:	Albert
County:	Ward
Local Authority:	CITY OF GOLD COAST
Level Datum:	AHD
Meridian:	IS216853
Contour Interval:	0.25
PSM:	-
RL:	-

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DRAWING TITLE

STAGE 1 - ENGINEERING SERVICING STRATEGY PLAN

Issue	Date	Description	DRN	CHK
B	11-05-2018	INFORMATION REQUEST RESPONSE	AN	MG
A	09-02-2018	ORIGINAL ISSUE	AN	MG

SCALE IN METRES

0 20 40 60 80 100

1:1000 (FULL SIZE A1)
1:2000 (HALF SIZE A3)

Scale at A1:	1:1000
Designed:	AN
Drafted:	AN
Approved:	MG
RPEQ:	16939
Signed:	
Date:	11-05-18

Drawing No: 5738 ENG SP 001

Rev. No: B

Appendix F – Dial Before You Dig Search Results

Indicative Plans

Issue Date:	30/01/2018	DIAL BEFORE YOU DIG www.1100.com.au
Location:	Stapylton Jacobs Well Road,stapylton,QLD-4207	

1	4	7
2	5	8
3	6	9

LEGEND

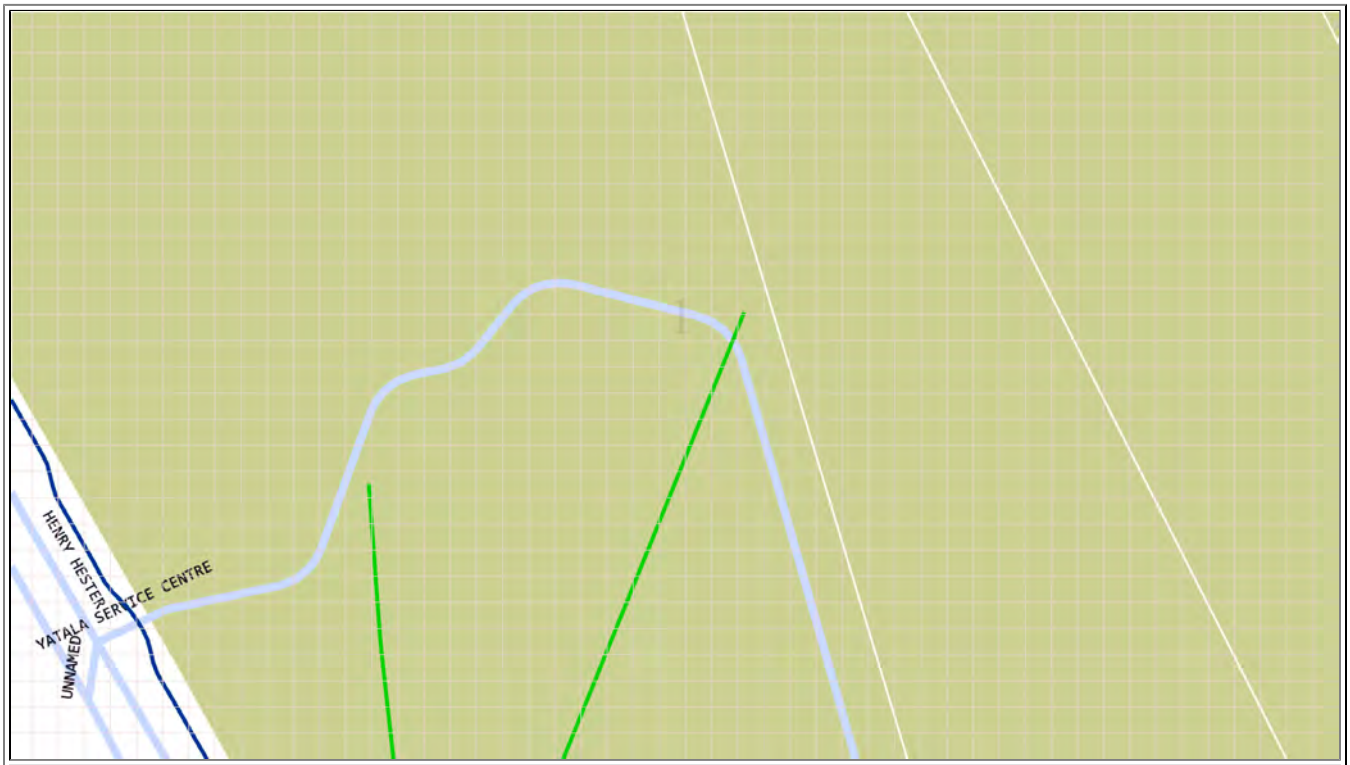
Type: Telco
Technology:Copper/Fibre
Assets

IN-SERVICE: Cable/ Duct/ Trench

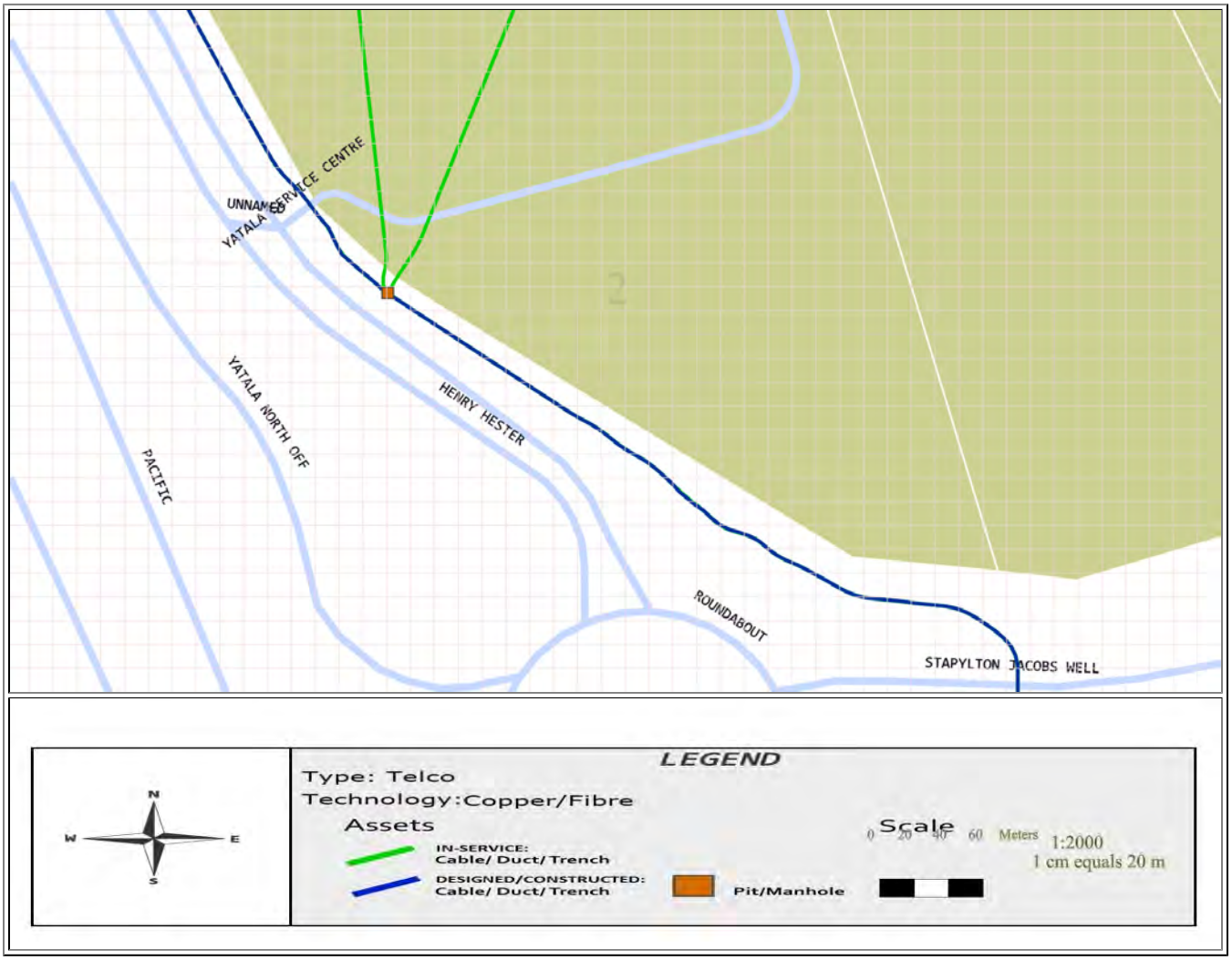
DESIGNED/CONSTRUCTED: Cable/ Duct/ Trench

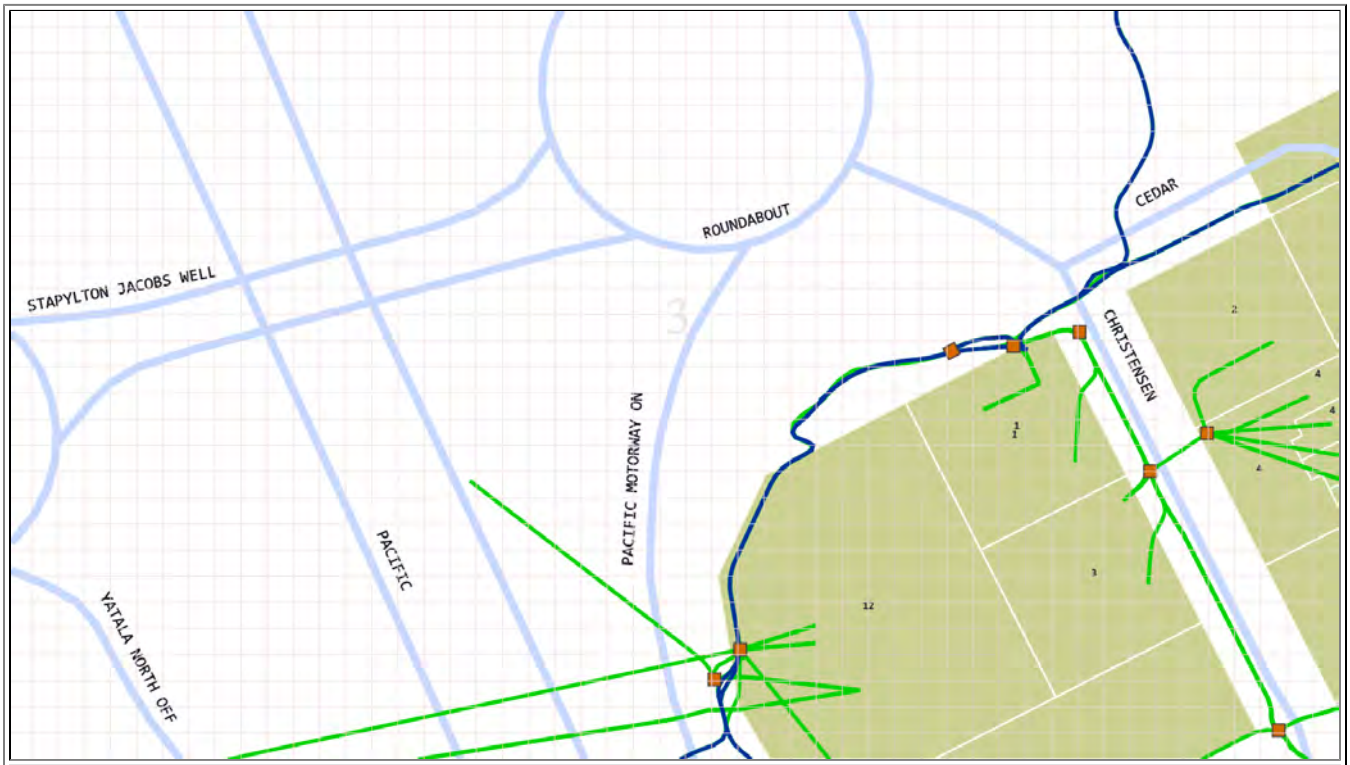
Pit/Manhole

Scale 0 20 40 60 Meters 1:2000
1 cm equals 20 m

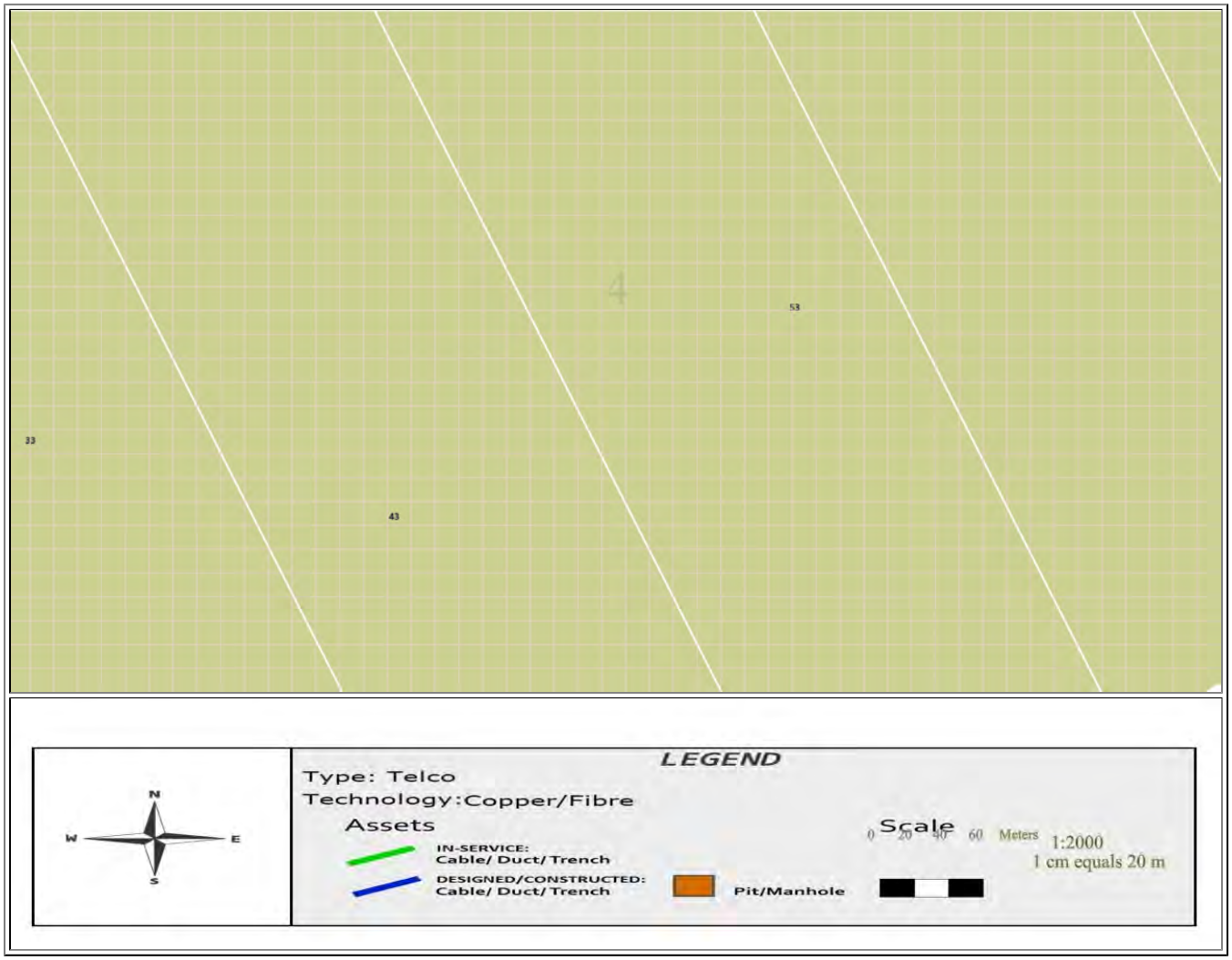

HENRY HESTER SERVICE CENTRE
YATALA
UNNAMED

N
W
E
S
LEGEND
Type: Telco
Technology:Copper/Fibre
Assets
IN-SERVICE:
Cable/ Duct/ Trench
DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench
Pit/Manhole
Scale
0 20 40 60 Meters
1:2000
1 cm equals 20 m


UNNAMED
SERVICE CENTRE
YATALA
YATALA NORTH OFF
HENRY HESTER
PACIFIC
ROUNDABOUT
STAPYLTON JACOBS WELL
N
W
E
S
LEGEND
Type: Telco
Technology:Copper/Fibre
Assets
IN-SERVICE:
Cable/ Duct/ Trench
DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench
Pit/Manhole
Scale
0 20 40 60 Meters
1:2000
1 cm equals 20 m


STAPYLTON JACOBS WELL
ROUNDABOUT
CEDAR
CHRISTENSEN
PACIFIC MOTORWAY ON
PACIFIC
YATALA NORTH OFF

N
W
E
S
LEGEND
Type: Telco
Technology:Copper/Fibre
Assets
IN-SERVICE:
Cable/ Duct/ Trench
DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench
Pit/Manhole
Scale
0 20 40 60 Meters
1:2000
1 cm equals 20 m


4
53
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43
N
W
E
S
LEGEND
Type: Telco
Technology:Copper/Fibre
Assets
IN-SERVICE:
Cable/ Duct/ Trench
DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench
Pit/Manhole
Scale
0 20 40 60 Meters
1:2000
1 cm equals 20 m

STAPYLTON JACOBS WELL
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13
15
17
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25

N
W
E
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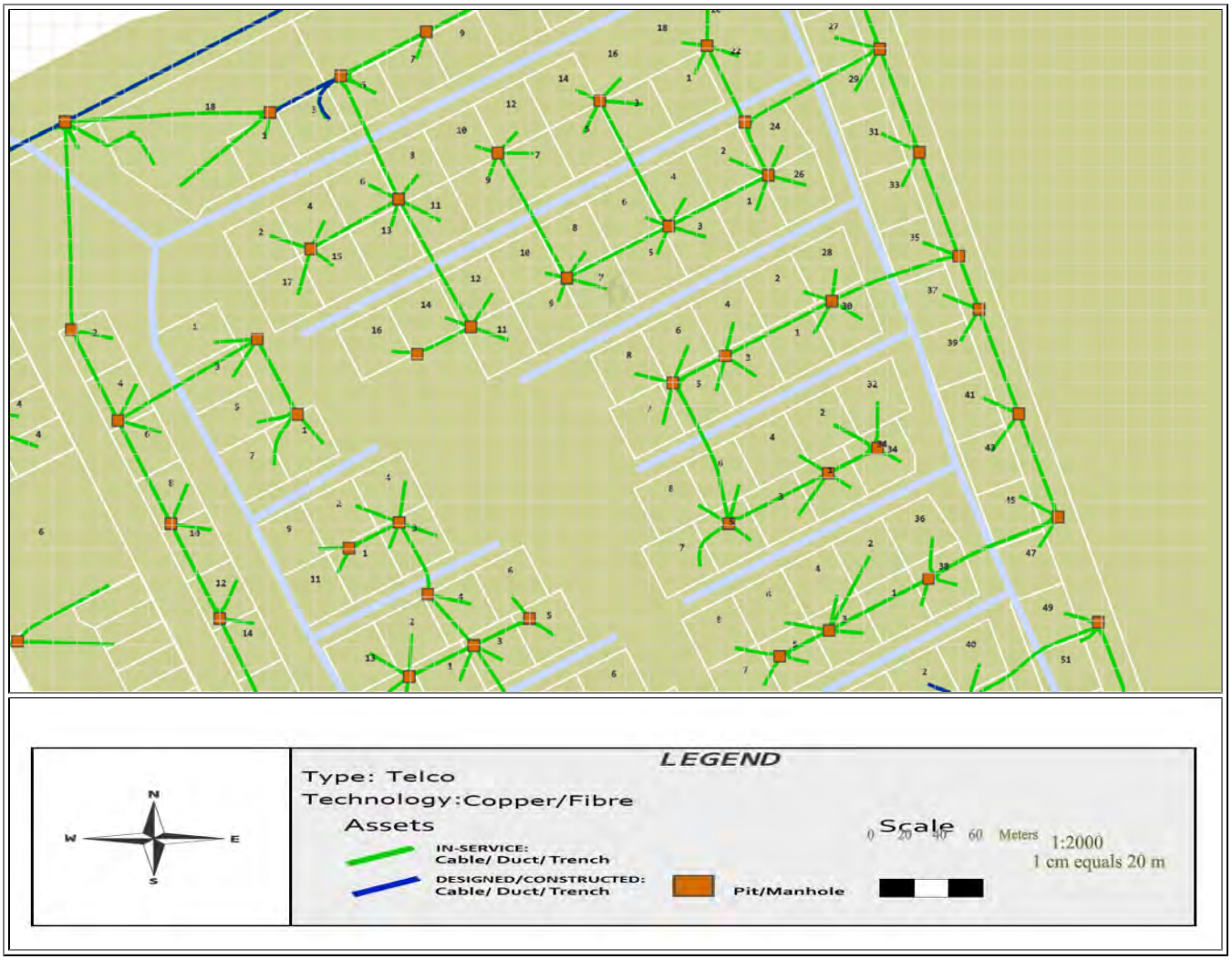
LEGEND
Type: Telco
Technology:Copper/Fibre
Assets
IN-SERVICE:
Cable/ Duct/ Trench
DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench
Pit/Manhole
Scale
0 20 40 60 Meters
1:2000
1 cm equals 20 m



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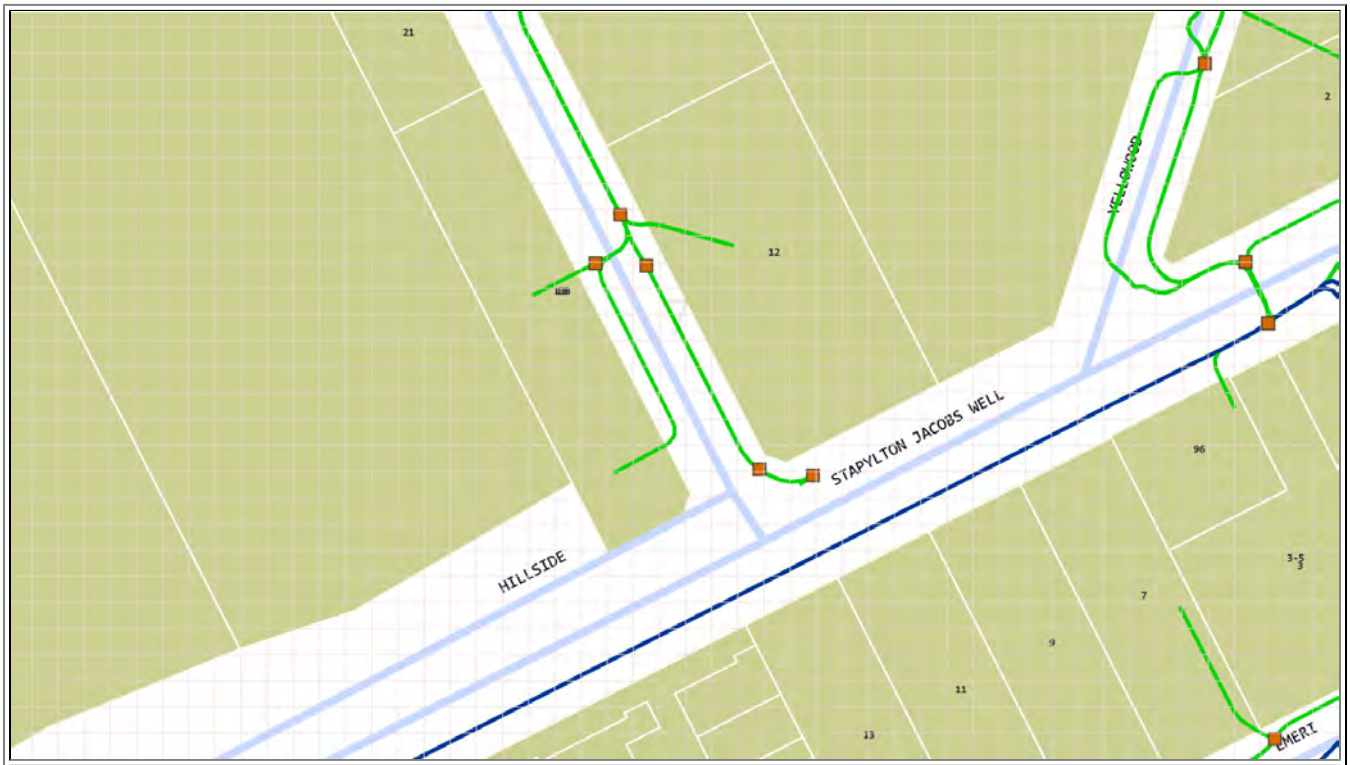

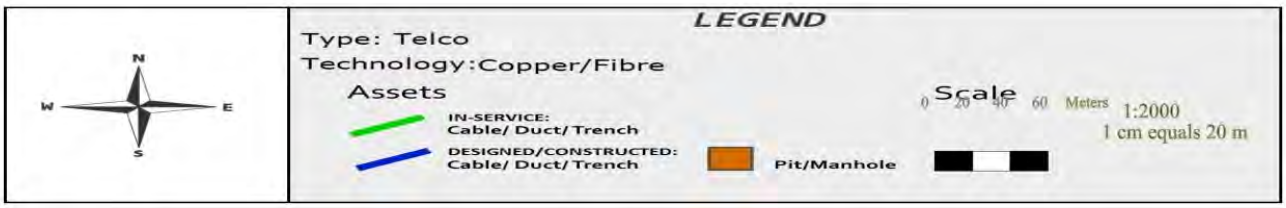

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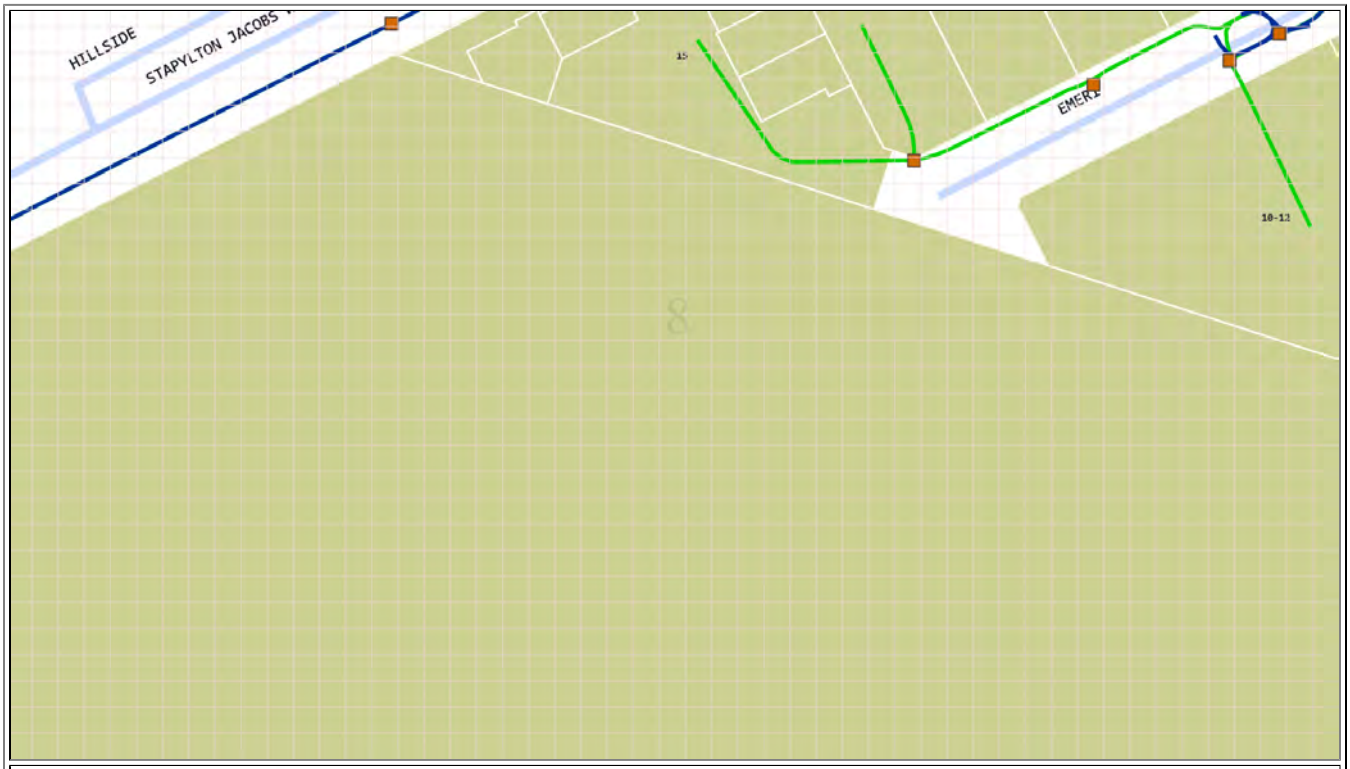

LEGEND

Type: Telco

Technology:Copper/Fibre

Assets

IN-SERVICE: Cable/ Duct/ Trench

DESIGNED/CONSTRUCTED: Cable/ Duct/ Trench

Pit/Manhole

Scale 0 20 40 60 Meters 1:2000

1 cm equals 20 m

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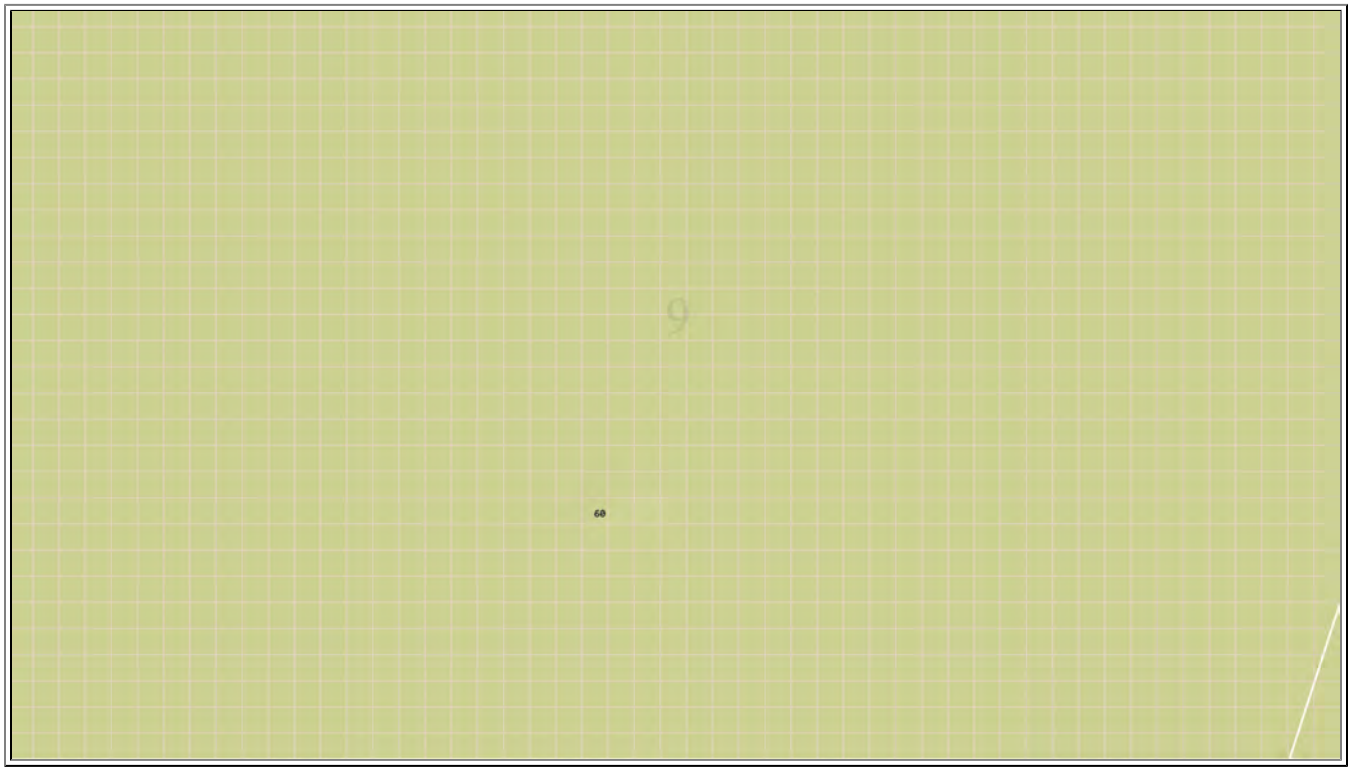

Emergency Contacts

You must immediately report any damage to **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.

Indicative Plans

Issue Date:	30/01/2018	DIAL BEFORE YOU DIG www.1100.com.au
Location:	Stapylton Jacobs Well Road,stapylton,QLD-4207	

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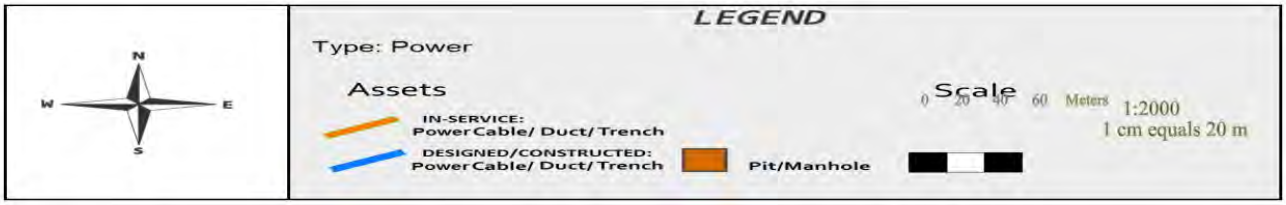
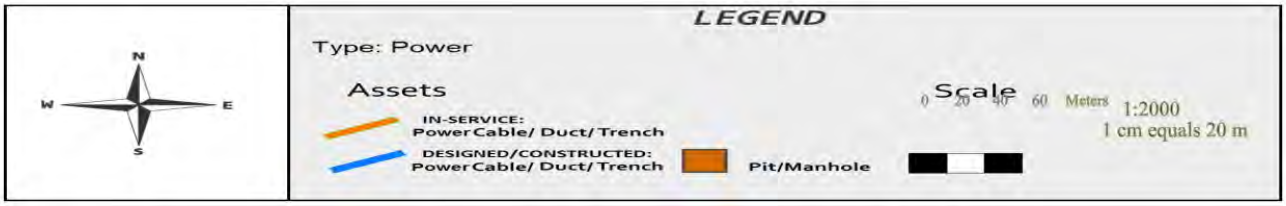
2	5	8
3	6	9





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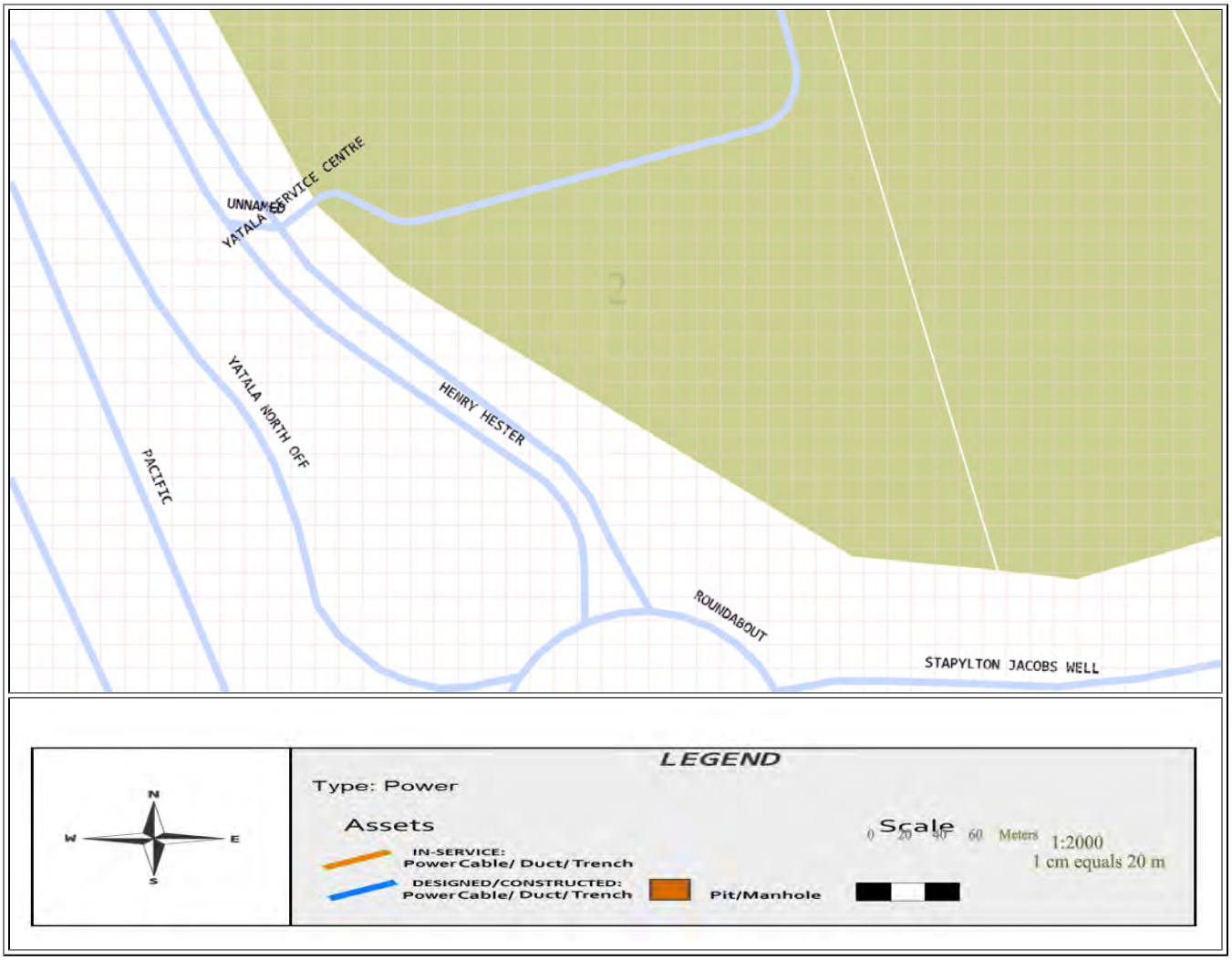
UNNAMED SERVICE CENTRE
YATALA
YATALA NORTH OFF
HENRY HESTER
PACIFIC
ROUNDABOUT
STAPYLTON JACOBS WELL
LEGEND
Type: Power
Assets
IN-SERVICE:
PowerCable/ Duct/ Trench
DESIGNED/CONSTRUCTED:
PowerCable/ Duct/ Trench
Pit/Manhole
Scale
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1:2000
1 cm equals 20 m
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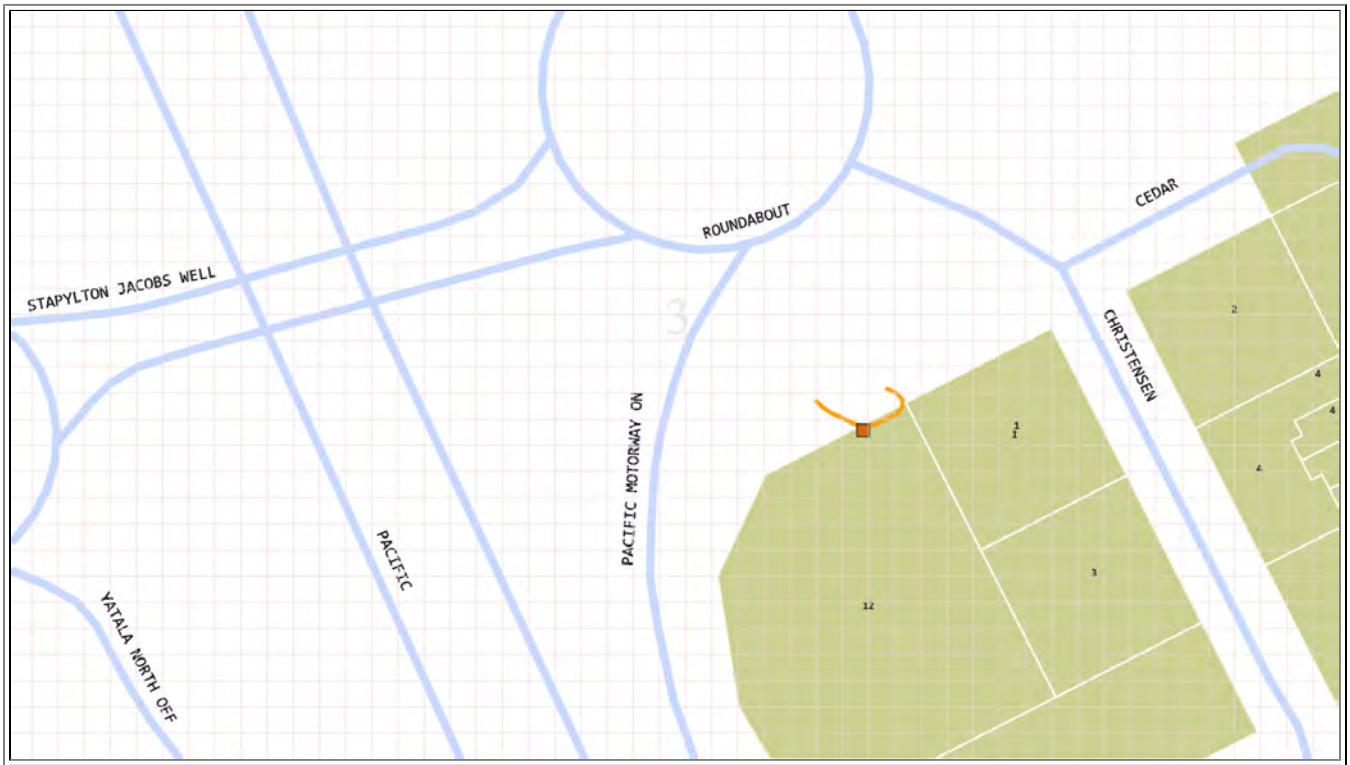
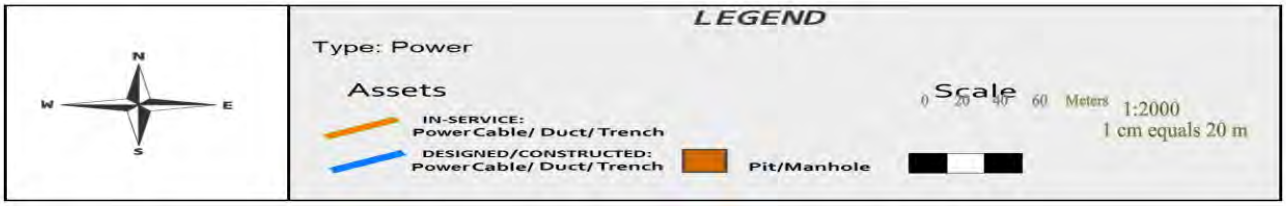
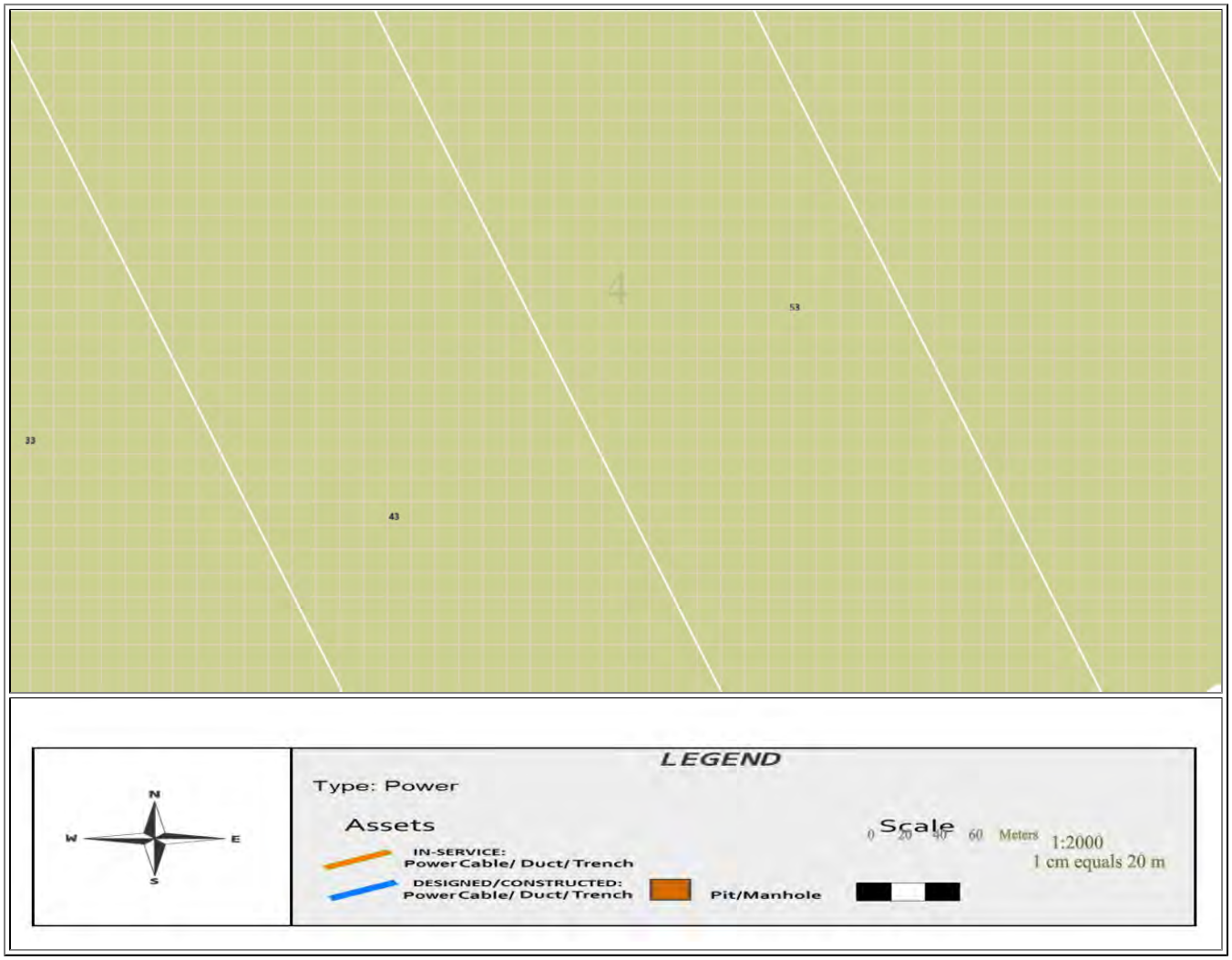




© 2015 nbn co limited | ABN 86 136 533 741



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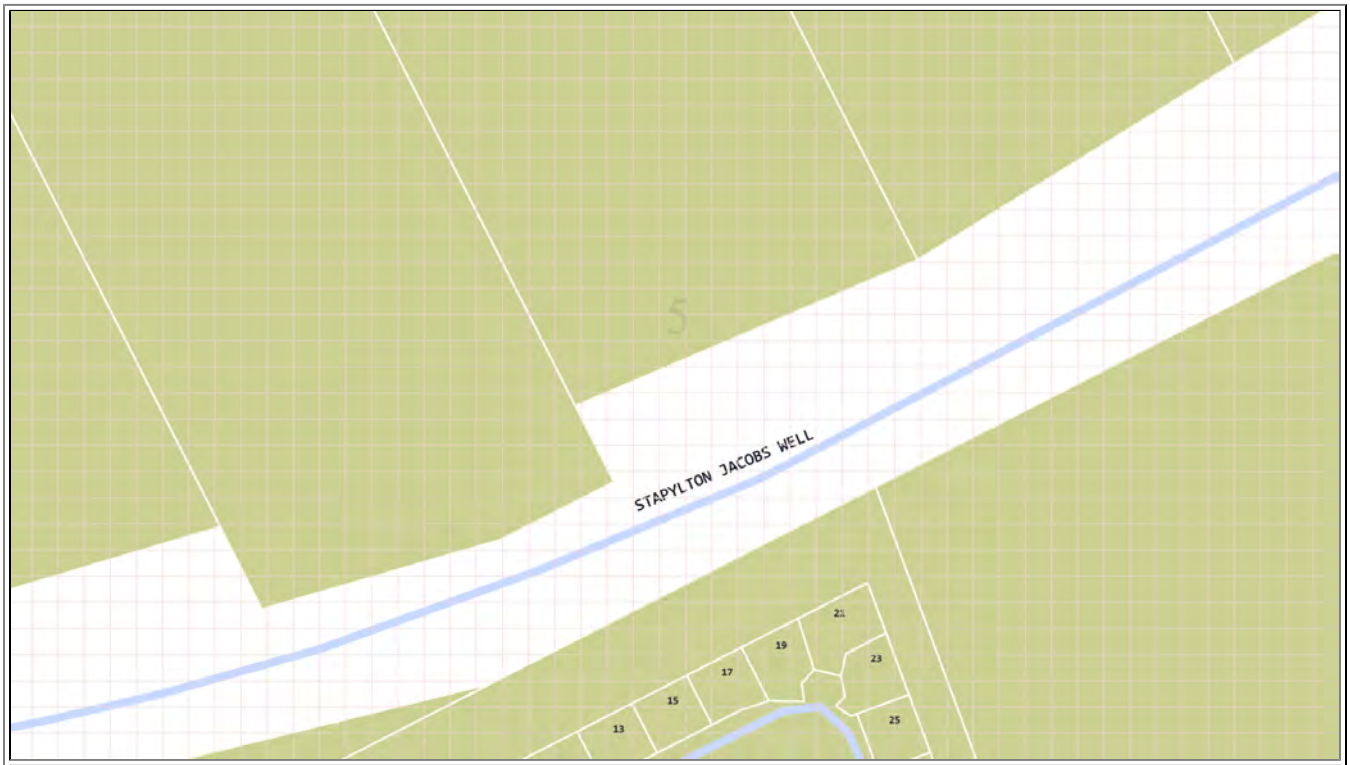
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STAPYLTON JACOBS WELL
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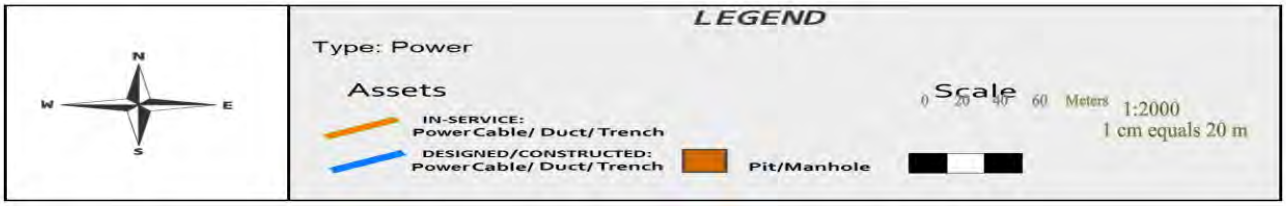
N
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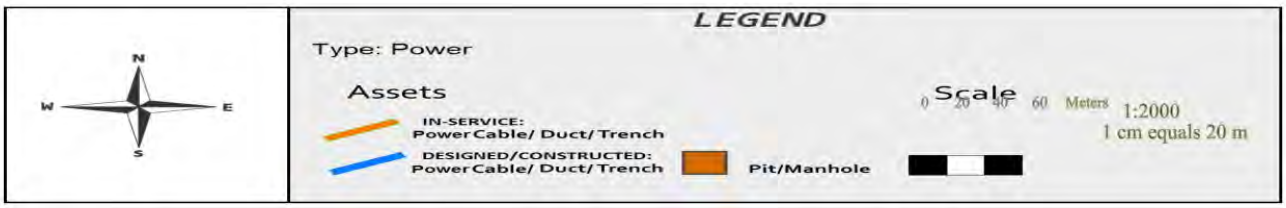
LEGEND
Type: Power
Assets
IN-SERVICE:
Power Cable/ Duct/ Trench
DESIGNED/CONSTRUCTED:
Power Cable/ Duct/ Trench
Pit/Manhole
Scale
0 20 40 60 Meters
1:2000
1 cm equals 20 m



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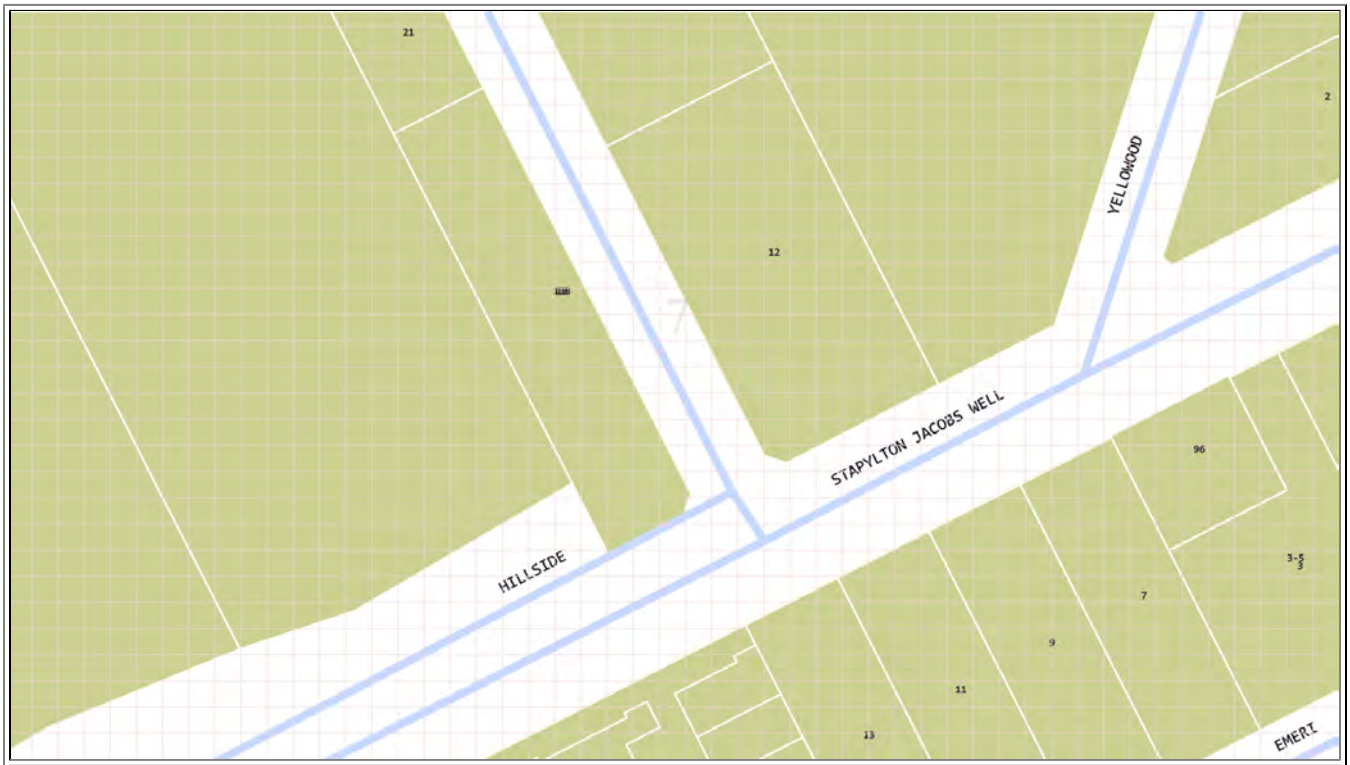

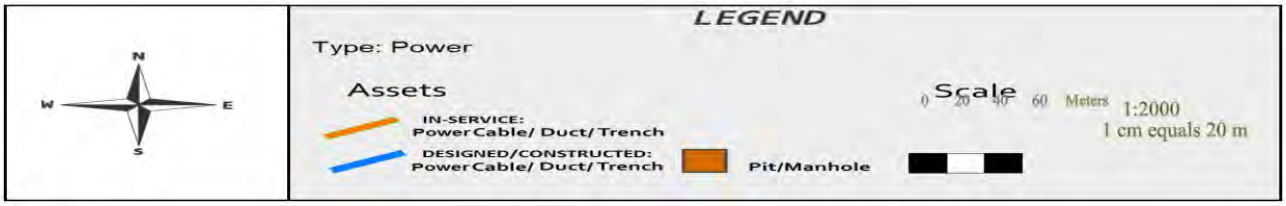

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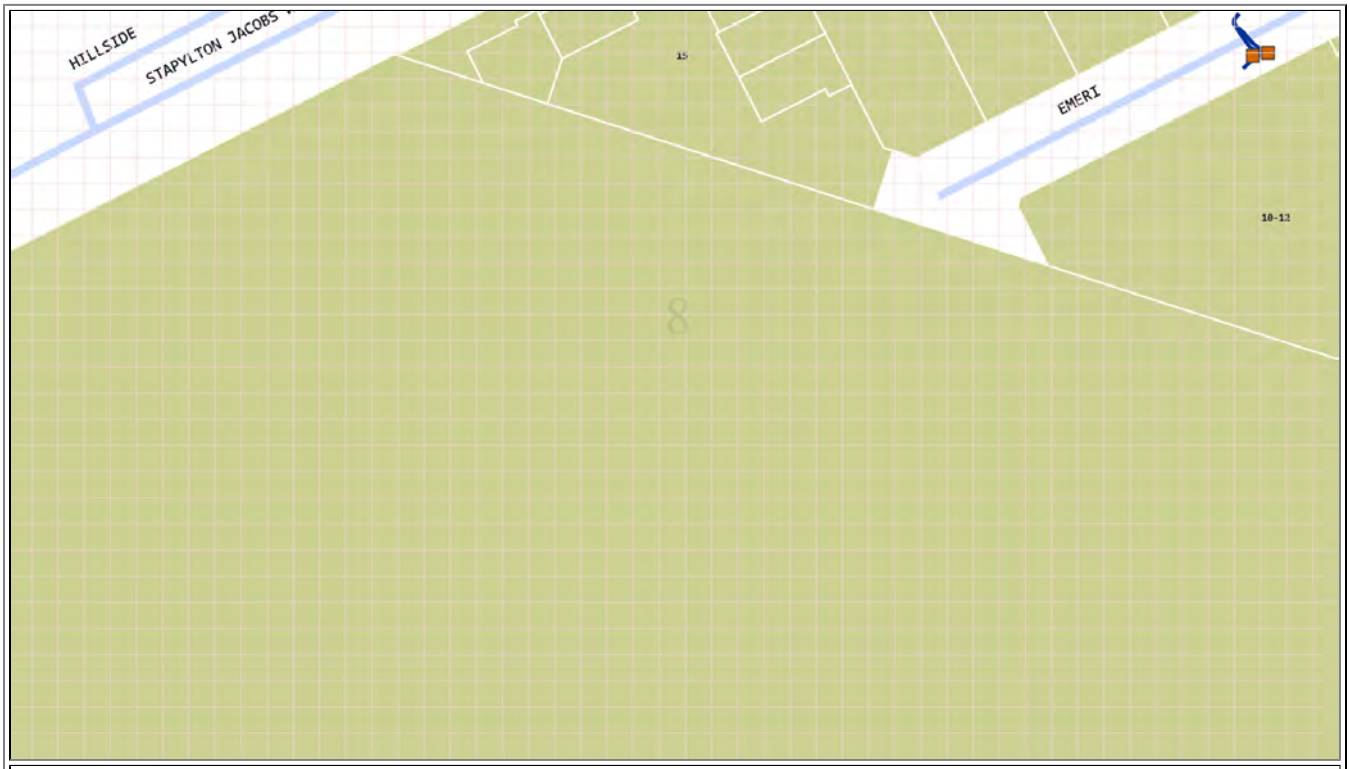
HILLSIDE
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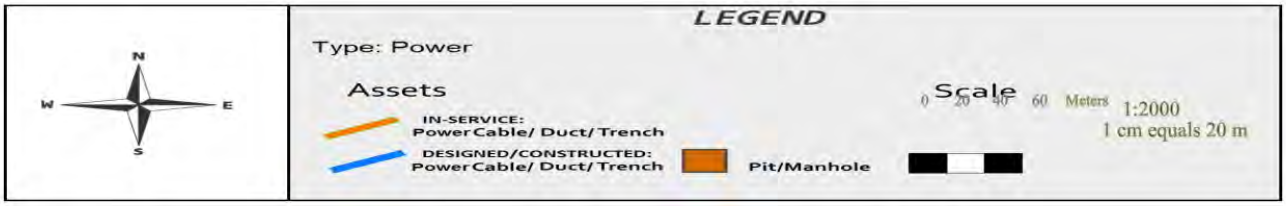
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LEGEND
Type: Power
Assets
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Power Cable/ Duct/ Trench
DESIGNED/CONSTRUCTED:
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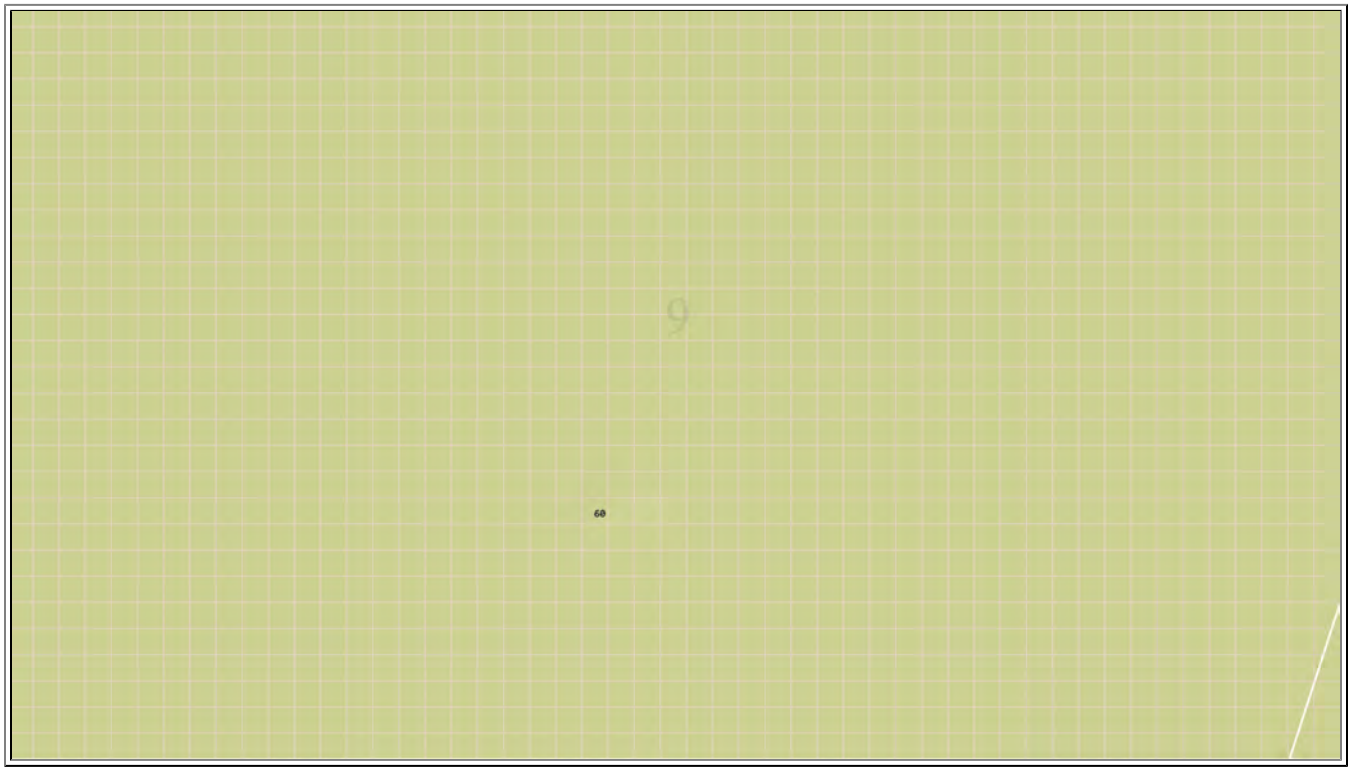

Emergency Contacts

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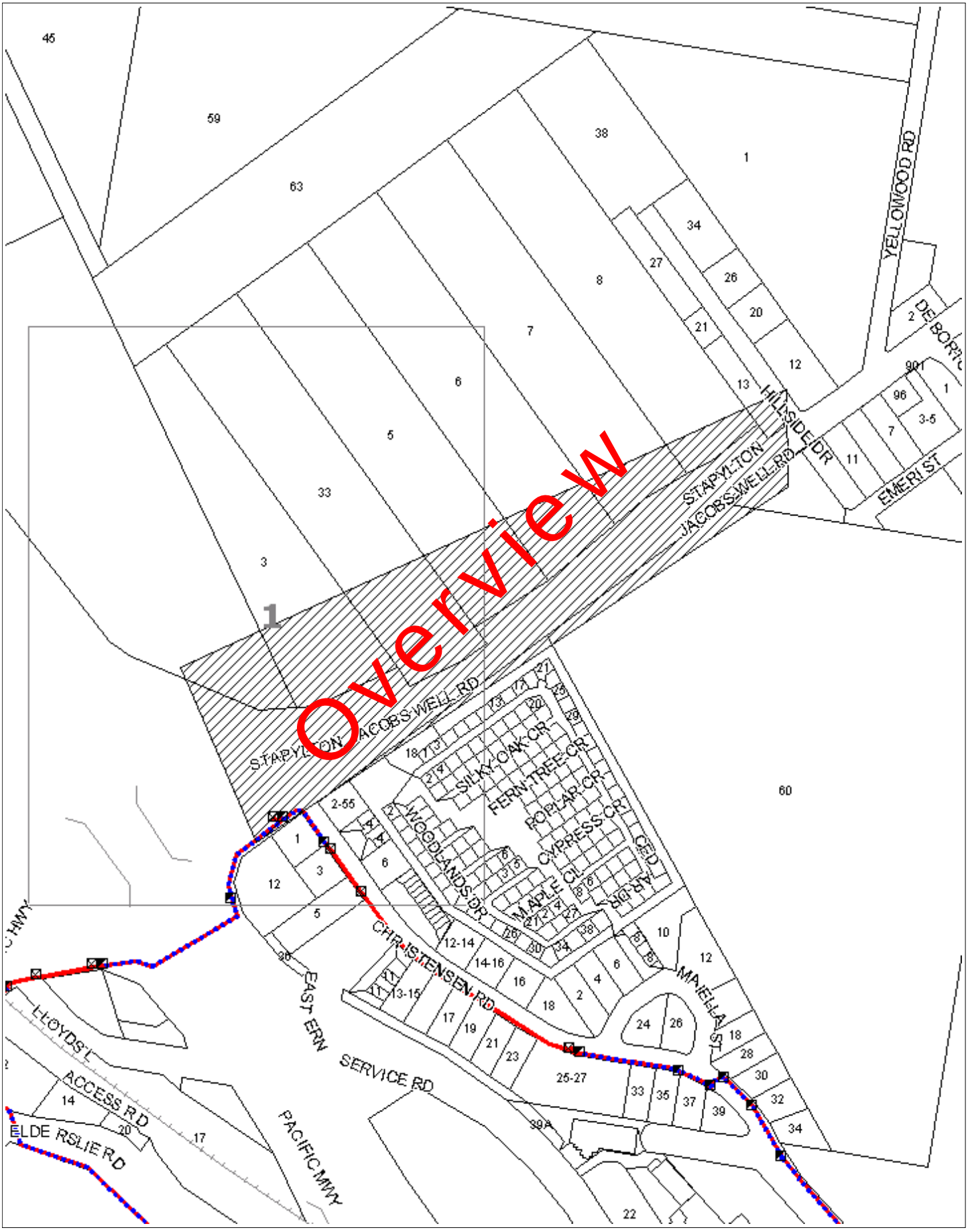

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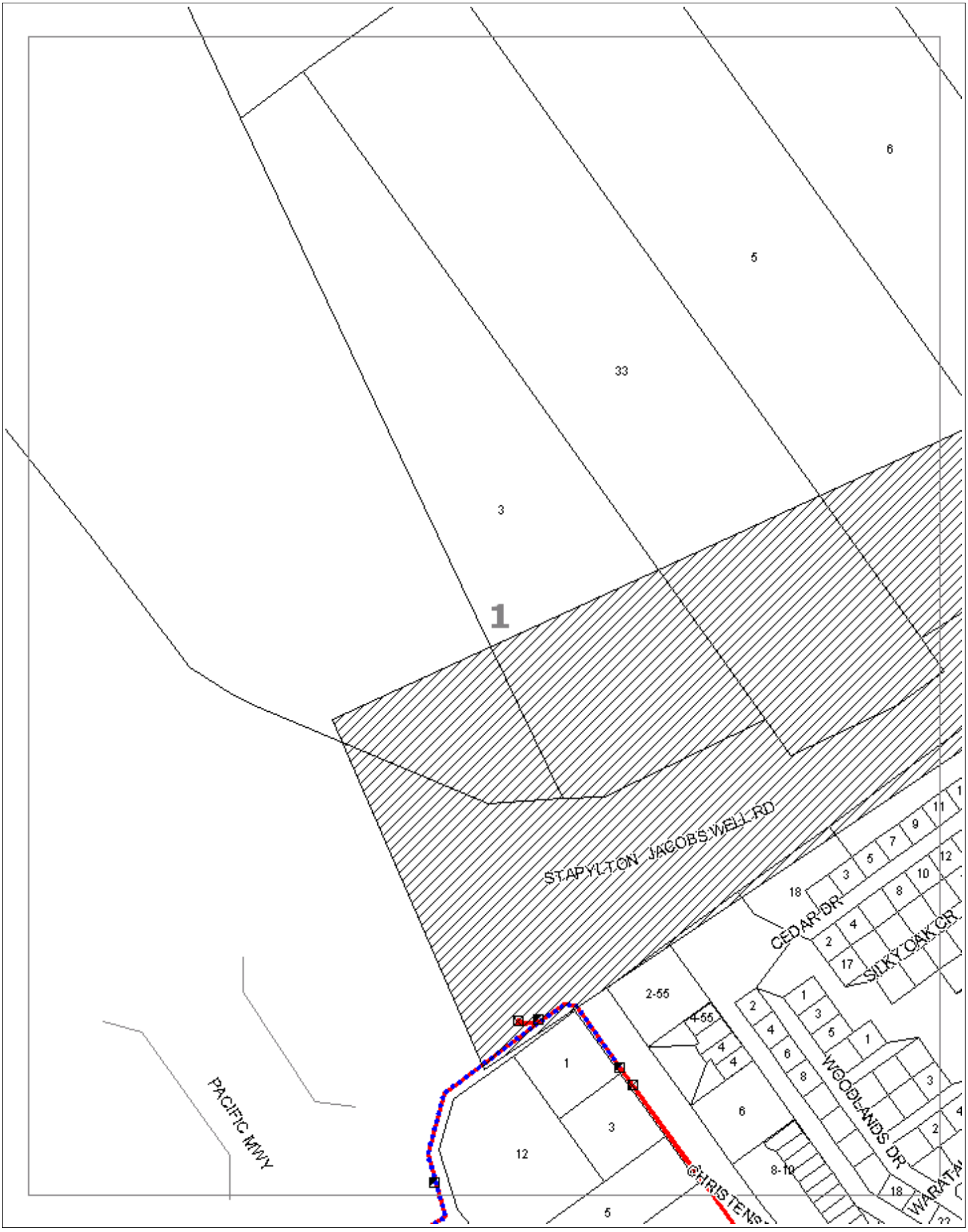
Optus Plans and information supplied are valid for 30 days from the date of issue. If this timeline has elapsed please raise a new enquiry.

Sequence Number: 68110312

Date Generated: 30/01/2018

For all Optus DBYD plan enquiries –
Email: Fibre.Locations@optus.net.au
For urgent onsite assistance contact 1800 505 777
Optus Limited ACN 052 833 208



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Sequence Number: 68110312 Date Generated: 30/01/2018

For all Optus DBYD plan enquiries –
Email: Fibre.Locations@optus.net.au
For urgent onsite assistance contact 1800 505 777
Optus Limited ACN 052 833 208

APA Group
PO Box 6014 Halifax Street
South Australia 5000

30/01/2018

Company: Gassman Development Perspectives
Mr Mitchell Gassman
PO Box 392
Beenleigh
QLD 4207

mitchell@gassman.com.au

Dear Mr Mitchell Gassman

Sequence Number: 68110313
Worksite Address: Stapylton Jacobs Well Road
stapylton
QLD 4207

RE: REQUEST FOR APA GROUP (APA) UNDERGROUND DIAL BEFORE YOU DIG

Dear Sir/Madam

In response to the above enquiry we wish to confirm that APA **operates underground plant** (Mains and / or Services) at or in the vicinity of the above address.

Please check that the following map represents the area you requested - if the area is not correct please contact our Dial Before You Dig Officer - (08) 8115 4500. If works are proposed adjacent to any underground plant operated by APA please ensure compliance with the attached "DUTY OF CARE"

Please find enclosed the following information in support of the above: -

1. A location map of the **suburb** the service is in and an A4 location map showing the **status** of APA underground plant (Mains and / or Services) adjacent to the subject site

2. DUTY OF CARE statement which forms **an integral part** of any information supplied by APA

For GAS EMERGENCIES 24 HOURS - 1800 GAS LEAK (1800 427 532)

Please note that as work on APA underground plant is ongoing any information supplied on their status can only be considered current for **30 days from the date of this response**. Expired locations, i.e., over 30 days from the date of this response, require a new Dial Before You Dig request to validate location information.

Should you have any questions with **regards to the attached information** please contact our Dial Before You Dig officer - (08) 8115 4500.

For any excavation works, including vacuum excavations, an "Authority to Work" Permit may be required and a Site Watch may need to be scheduled.

A minimum of 5 business days' notice is required to process permit applications. Permit applications can be made by: -

Post: Permit Applications QLD, PO Box 885 Hamilton Central QLD 4007 or

Email: permitsqld@apa.com.au or Phone: (07) 3215 6700 though an application will most likely be required

Charges may apply for Site Watch requests. Your sequence number may be requested when making your booking, please have this available when you request either a mains location or site watch.

For other enquiries please contact your gas retailer

To find out who your retailer is call 1800 657 567

Warning: if there are high or transmission pressure gas mains present in the vicinity of your area of interest, an APA employee must be in attendance during any excavation within 3 metres of high or transmission pressure mains, and an "Authority to Work" permit must be issued prior to work commencing.

Please contact us for a permit to work request if you believe your work is within this zone, by completing the "Authority to Work" request form attached and sending to APA. 5 days' notice is required prior to the commencement of any excavation to assess and allocate resources. Contact phone numbers are shown at the end of the notice of location.

Please Note: For some DBYD enquiries, you might receive 2 responses from the APA Group. Please read both responses carefully as they will relate to different assets. It is your responsibility to action all requirements set out in APA Group responses.

Please take some time to review the entire response document and check the information supplied and please let us have any feedback by sending an email to *DBYDNetworksAPA@apa.com.au* or contacting us direct on (08) 8115 4500.

Yours faithfully

Dial Before You Dig Officer
APA Group

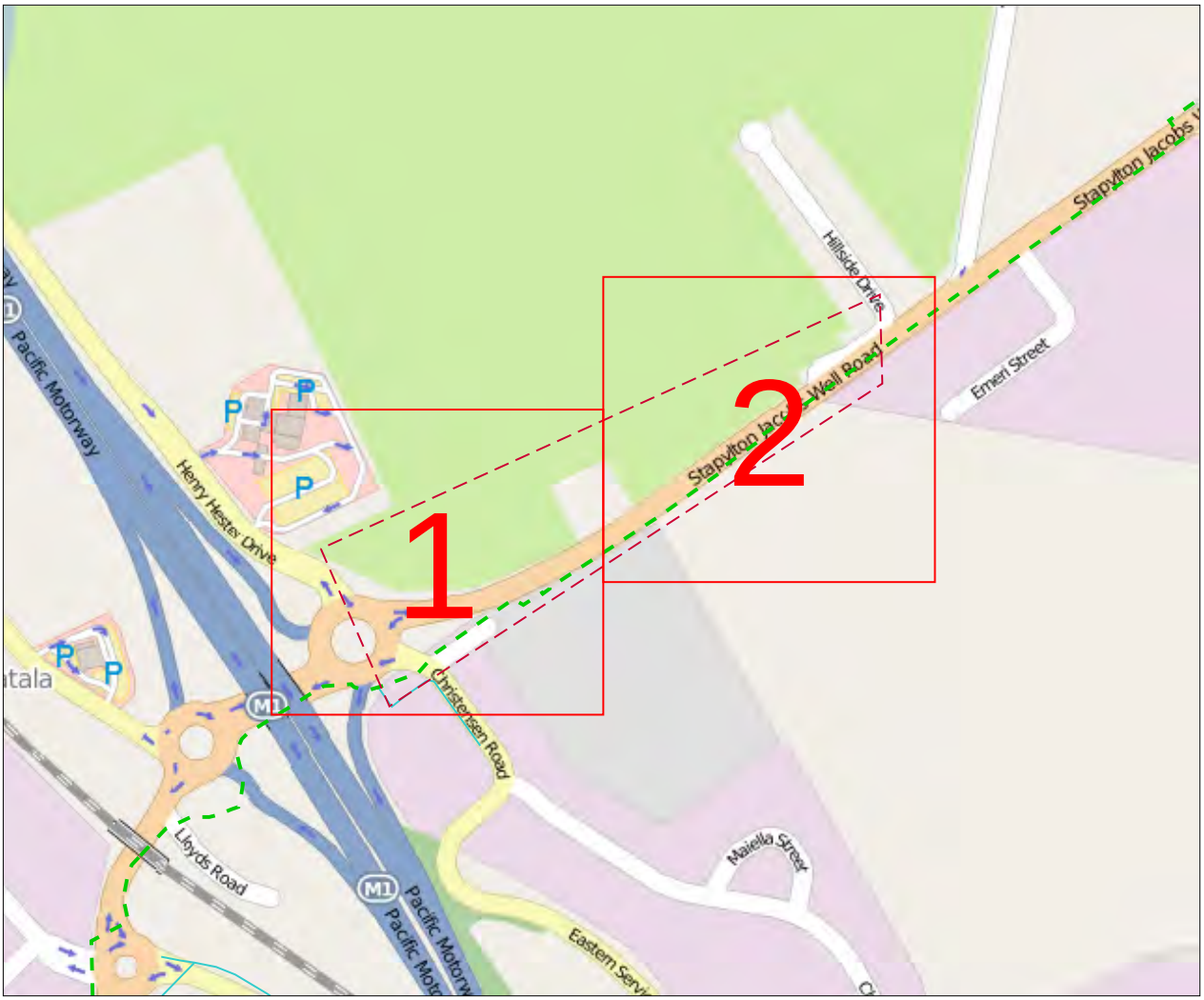
Email DBYDNetworksAPA@apa.com.au
Ph. (08) 8115 4500

DIAL BEFORE YOU DIG
www.1100.com.au
The Essential First Step

operated by apa

30/01/2018 **SCALE: DO NOT SCALE** **REF NO:** 68110313

As work on APA underground plant is ongoing any drawing with an issue date of more than 30 days previous can no longer be considered valid. All persons planning civil works on any site are advised to contact APA to confirm location. All underground gas pipelines are the property of APA & are not to be accessed by unauthorised persons. All care is taken with preparation of the drawings & no responsibility is accepted for errors or omissions



Enquiry: 68110313

Papersize: A4 **Scale:** 1: 6000

0 0.07km

NORTH

Legend

Distribution Main	Gas Assets and Fittings	Pipe Materials	
Class 900 Transmission	Gate Station	CI	Cast Iron
Class 600 Transmission	Regulator Station	CU	Copper
Class 300 Transmission	Block/ Emergency Valve	GAL	Wrought Galvanised Iron
High Pressure Steel	Isolation Valve	PGAL	Poly Coated Wrought Galvanised Iron
High Pressure PE Trunk	Test Point	ST	Steel
High Pressure/ Class 500	Syphon	NY/ NY11	Nylon
Medium Pressure PE/ Nylon (1)	Anode	PE	Polyethylene
Medium Pressure (Allgas)	Pipeline Marker	MDPE	Medium Density Polyethylene
Low Pressure	Trace Wire Point	HDPE	High Density Polyethylene
LPG	Reducer	DN	Nominal Diameter
TLP	Pipe Connector/ Tee	OD	Outside Diameter
Proposed/ Under Construction	Pipe Connector		
Idle Gas Pipe	End Cap		
Abandoned Gas Pipe			
Sleeve			

(1) Medium Pressure in AGN/ Nylon in Allgas

Examples: 40PE in DN80 CI — 40mm Polyethylene in an 80mm (Nominal Diameter) Cast Iron Sleeve

63PE INS — 63mm Polyethylene inserted in another pipe

Line/ Polygon Request

Data Source

Pipeline Data Copyright APA Group, Property Parcels Copyright QLD Government, UBD Imagery – Copyright Sensis, DBYD Dig Location provided by DBYD.

operated by apa

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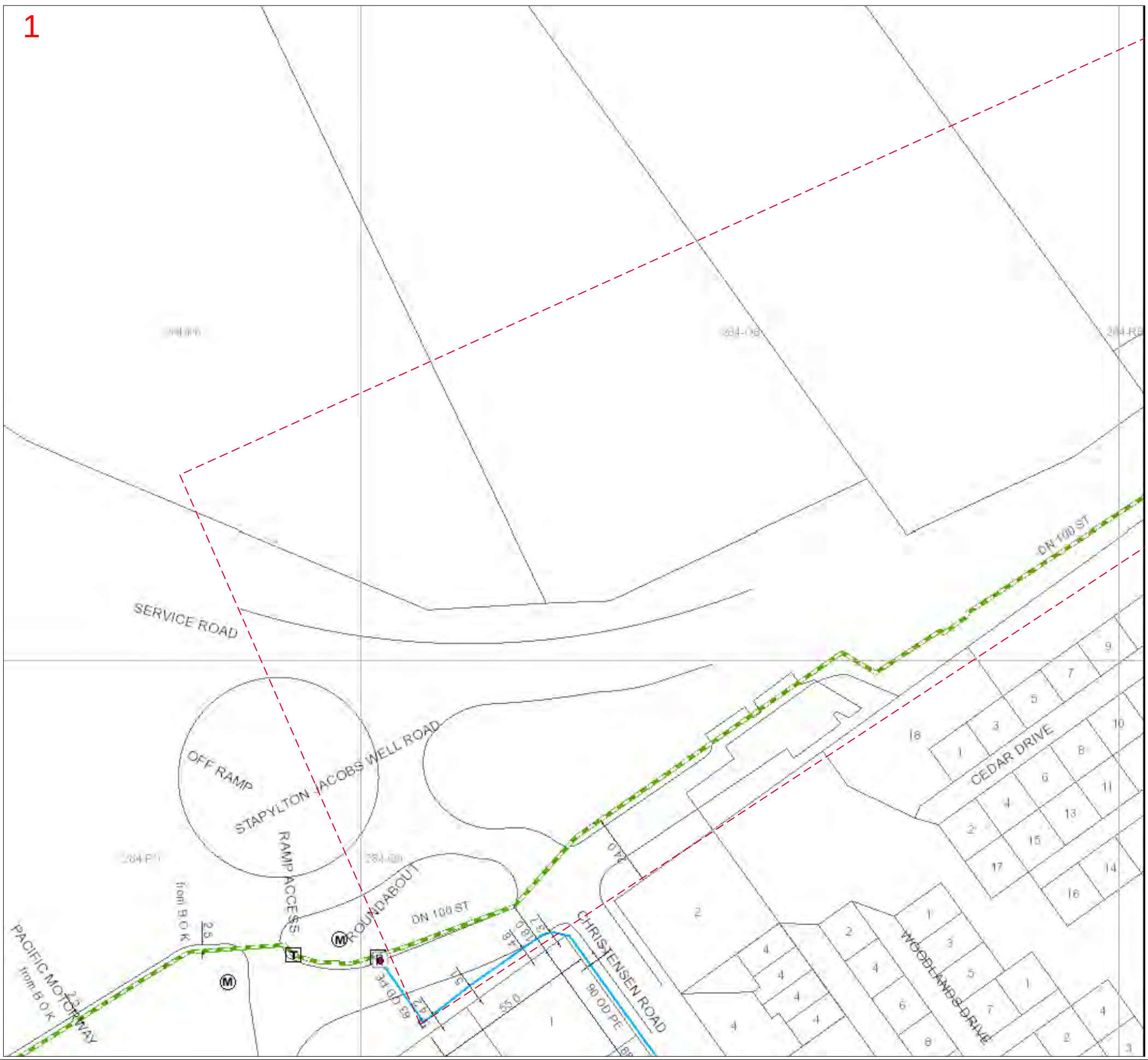

68110313 Map Sheet: 1

Papersize: A3 **Scale:** 1: 1000

0 0.01km

NORTH

Map Key:

1 2

This maps is created in colour and shall be printed in colour

Legend

Distribution Main

- Class 900 Transmission
- Class 600 Transmission
- Class 300 Transmission
- High Pressure Steel
- High Pressure PE Trunk
- High Pressure/ Class 500 (1)
- Medium Pressure PE/ Nylon
- Medium Pressure (Allgas)
- Low Pressure
- LPG
- TLP
- Proposed/ Under Construction
- Idle Gas Pipe
- Abandoned Gas Pipe
- Sleeve

(1) Medium Pressure in AGN/ Nylon in Allgas

Gas Assets and Fittings

- Gate Station
- Regulator Station
- Block/ Emergency Valve
- Isolation Valve
- Test Point
- Syphon
- Anode
- Pipeline Marker
- Trace Wire Point
- Reducer
- Pipe Connector/ Tee
- Pipe Connector
- End Cap

Pipe Materials

CI	Cast Iron
CU	Copper
GAL	Wrought Galvanised Iron
PGAL	Poly Coated Wrought Galvanised Iron
ST	Steel
NY/ NY11	Nylon
PE	Polyethylene
MDPE	Medium Density Polyethylene
HDPE	High Density Polyethylene
DN	Nominal Diameter
OD	Outside Diameter

Examples:

40PE in DN80 CI	40mm Polyethylene in an 80mm (Nominal Diameter) Cast Iron Sleeve
63PE INS	63mm Polyethylene inserted in another pipe

Line/ Polygon Request

operated by apa

Data Source

Pipeline Data Copyright APA Group, Property Parcels Copyright QLD Government, UBD Imagery – Copyright Sensis, DBYD Dig Location provided by DBYD.

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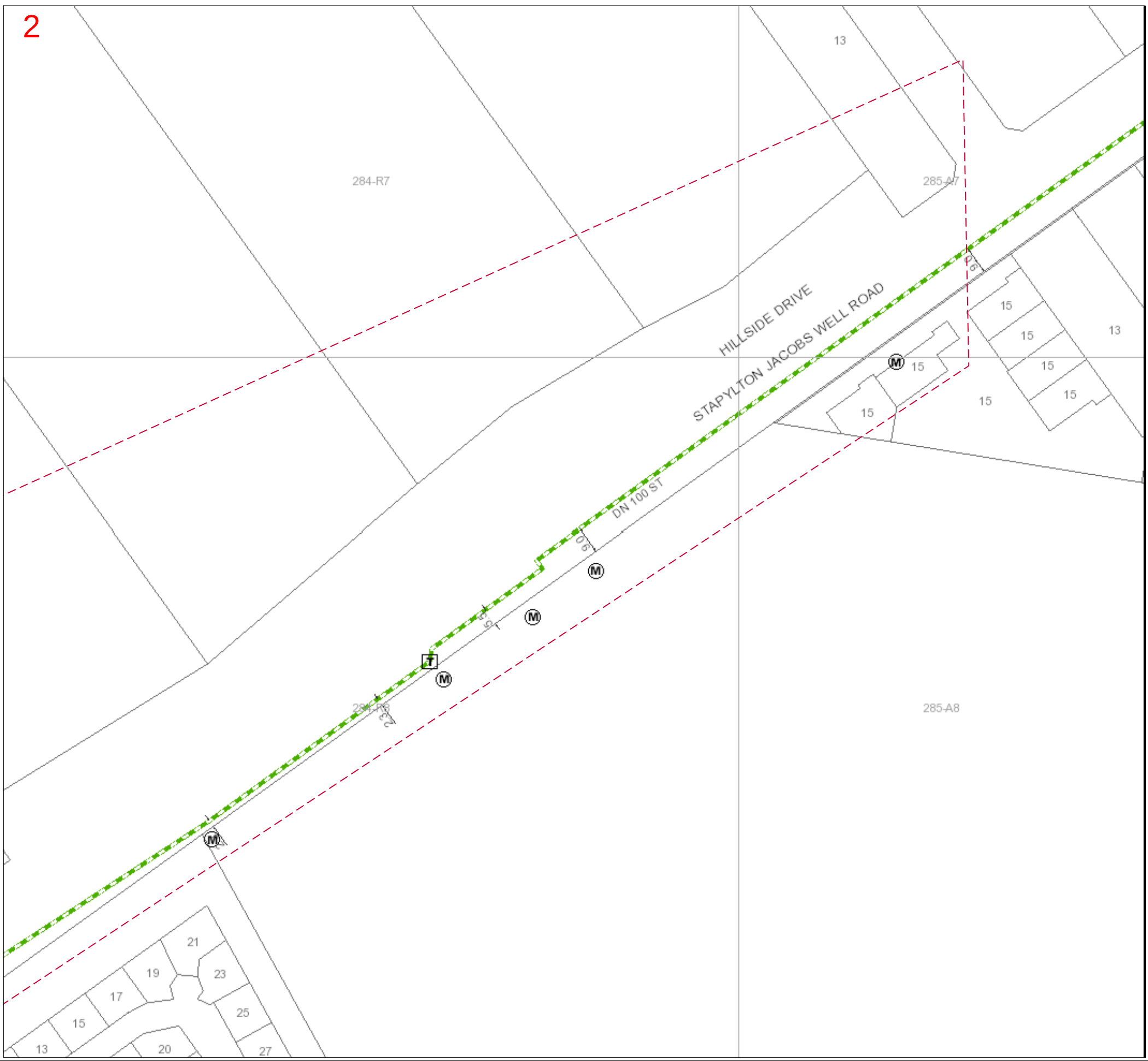

68110313 Map Sheet: 2

Papersize: A3 **Scale:** 1: 1000

0 0.01km

NORTH

Map Key:

1 2

This maps is created in colour and shall be printed in colour

Legend

Distribution Main

- Class 900 Transmission
- Class 600 Transmission
- Class 300 Transmission
- High Pressure Steel
- High Pressure PE Trunk
- High Pressure/ Class 500 (1)
- Medium Pressure PE/ Nylon
- Medium Pressure (Allgas)
- Low Pressure
- LPG
- TLP
- Proposed/ Under Construction
- Idle Gas Pipe
- Abandoned Gas Pipe
- Sleeve

(1) Medium Pressure in AGN/ Nylon in Allgas

Gas Assets and Fittings

- Gate Station
- Regulator Station
- Block/ Emergency Valve
- Isolation Valve
- Test Point
- Syphon
- Anode
- Pipeline Marker
- Trace Wire Point
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- Pipe Connector
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Pipe Materials

CI	Cast Iron
CU	Copper
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Examples:

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Line/ Polygon Request

operated by apa

Data Source

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Working Around Gas Assets: Duty of Care and Responsibilities

It is illegal to interfere or tamper with gas infrastructure.
Offenders who interfere or tamper with gas infrastructure may be prosecuted under relevant legislation and there are very serious penalties for such offences

"Gas infrastructure" or "infrastructure" in this document refers to any infrastructure or property owned or operated by APA Group including, but not limited to natural gas mains, services and regulator/meter stations or regulator pits.

1. Planning Your Work

a. The constructor must:

i. Request plans of APA Group infrastructure for a particular location at a reasonable time before construction begins (at least 5 business days);
ii. Design for minimal impact and ensure protection of APA Group infrastructure, this includes networks managed by APA on behalf of Australian Gas Networks and Allgas; and
iii. Contact APA Group if their infrastructure is in any way affected by planned construction activities.

2. Before You Start Work

a. Please Note: **You will be responsible to pay for the repair of any damage by you to gas assets.**

b. You must obtain **Dial Before You Dig** (DBYD) documentation before any on-site construction or excavation commences. This document is to be read in conjunction with the Dial Before You Dig plans and other relevant documentation.
APA Group will provide free site plans if an APA Group infrastructure location request is made to APA on **(08) 8115 4500**

c. If DBYD documents indicate you will be working within 3m of a high pressure or transmission gas pipeline, you must complete and submit the **Authority to Work Request** provided with your DBYD documentation **five (5) business days** prior to commencing the work. Requests **under** five (5) business days will incur extra charges.

d. APA Group shall assess your Authority to Work Request and will inform you if a Site Watch is required. A Site Watch involves the presence of an APA representative at site to advise on locating and working around the asset. Where on-site location advice is provided, the constructor is responsible for all hand digging (potholing) to visually locate and expose APA Group infrastructure. Vacuum excavations may only be used if permission is granted by APA and if it is used on high pressure mains Site Watch will be required. **Site Watch services are charged at an hourly rate.**

e. The principal contractor for the site must provide APA Group with a written construction methodology for all works impacting or encroaching on APA infrastructure. All construction methodology documents will be reviewed by APA Group prior to the commencement of site works. Construction methodology documents must be submitted as part of an Authority to Work Request (send to permitsqld@apa.com.au).

f. Site Plans

i. Plans and/or details provided by APA Group through DBYD or otherwise are current for one (1) month from the date of dispatch and should be disposed of by shredding or any other secure disposal method after use.
ii. APA Group retains copyright in all plans and details provided in connection with any request.
iii. APA Group plans or other details are provided for the use of the applicant, its servants, employees, contractors and agents, and must not be used for any unauthorised purpose.
iv. APA Group plans are pipe indication diagrams only and indicate the presence of plant in the general vicinity of the geographical area shown. Exact ground cover and alignments cannot be given with any certainty as such levels can change over time.
v. APA Group, its servants, employees, or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and/or details so supplied to the applicant/constructor, its servants, employees, contractors and/or agents, and the applicant/constructor agrees to indemnify APA Group against any claim or demand for any such loss or damage.
vi. The constructor is responsible for all infrastructure damage occasioned to APA Group infrastructure.
vii. APA Group reserves all rights to recover compensation for loss or damage caused by interference or damage, including consequential loss and damages to its property and gas infrastructure.
viii. All care is taken in the preparation of location drawings and plans, but NO responsibility is accepted by APA Group for errors or omissions.

3. Working in the Vicinity of a Gas Pipeline

a. **Excavation** near Gas Mains and Services

PLEASE NOTE: Unless otherwise approved, mechanical excavation is not permitted above, or within 600mm of either side of APA Group infrastructure.

i. **Location of Gas Mains and Services:** Examining the DBYD documentation and other plans is not sufficient as reference points may change from the time of installation and recording on documentation. You MUST use appropriately qualified plant locators to accurately locate and prove the position of all assets and then validate these positions prior to commencing work. For all work to be done within 3.0 metres of APA Group infrastructure, the constructor is required to hand dig (pothole) and expose the plant, hence proving its exact location before work can commence. Vacuum excavation can cause failure of some types of gas mains and therefore APA Group must be contacted prior to any vacuum excavation.

Please note that new APA Group gas mains generally have a plastic warning tape or lightweight plastic board buried above the pipe but this is not the case for older mains or when pipe is laid by means of boring or located in conduit.

ii. **IMPORTANT NOTE:** Not all gas services (i.e. pipe from gas main to a gas meter in an individual property) are captured on APA Plans. Gas services shown on plans are indicative only and do not pinpoint the exact location of APA's asset. A gas service may also cross a road to reach a property. To confirm the presence of a gas service, please contact the APA DBYD number below for further information.

iii. **Installation of Utilities Parallel to Gas Mains and Services**: If construction work is being undertaken parallel to APA Group gas mains, then hand digging (potholing) at least every 4 m is required to establish the location of all gas mains. Nominal locations must be confirmed before work can commence. A minimum clearance of 600mm must be maintained from gas mains unless otherwise approved by APA. If an excavation exceeds the depth of the gas mains and it is likely that the covers or bedding material around the pipes will move, approval must be sought from APA Group's Capital Works team.

iv. **Installation of Utilities Across Gas Mains and Services:** A minimum clearance of 300mm above and below and APA Group gas mains must be maintained unless otherwise approved by APA. If the width or depth of the excavation is such that the gas mains will be exposed or unsupported, then APA Group must be contacted to determine whether the gas mains should be taken out of service, or whether they need to be protected or supported. Protective cover strips when removed must be replaced under APA Group supervision.

v. **Exposed Gas mains and Services:** Exposure of APA infrastructure shall be limited to potholing for location purposes. Any other exposure of pipe is not permitted unless expressly approved by APA Group. Exposed gas pipes must be protected by the constructor against the effects of heat by shielding or covering with a suitable material. Heating of exposed plastic pipes is dangerous. If depth of cover is compromised in any way due to works, please contact APA immediately.

vi. **Heavy machinery Operation over Gas Mains and Services:** Where heavy "Crawler" or "Vibration" type machinery is operated over the top of gas mains, a minimum cover of 750mm to the gas mains must be maintained using load bearing protection whilst the machinery is in operation.

vii. **Directional Drilling Near Gas Mains and Services:** When drilling parallel to gas mains, trial holes must be carefully hand dug at least every 4m to prove the actual location of the conduits/pipes before using drilling machinery. Where it is required to drill across the line of gas mains, the actual location of the gas mains must first be proven by the constructor by hand digging. A trench must be excavated one metre from the side of the gas mains where the auger will approach to ensure a minimum clearance of 600mm for gas mains can be maintained unless otherwise approved by APA.

viii. **Explosives:** Clearances must be obtained from APA Group's Networks Engineering Manager for use of explosives in the vicinity of gas mains. Please contact the APA Group.

b. **Damage Reporting**: All damage to conduits and pipes and any other gas infrastructure and property must be reported to APA Group no matter how insignificant the damage appears to be. Even very minor damage to protective coverings can lead to eventual failure through corrosion. All work in the vicinity of damaged infrastructure should cease and the area should be vacated until a clearance to continue work has been obtained from an APA Group officer. Please contact the Emergency number below to report damage.

c. **Solutions and Assistance**: If it is determined that APA Group infrastructure is likely to be impacted or encroached upon by planned construction, APA Group must be contacted to arrange for possible engineering solutions. If APA Group relocation or protection works are part of the agreed solution, then payment to APA Group for the cost of this work will be the responsibility of the principal contractor. APA Group will provide an estimated quotation for work on receipt of the order number before work will proceed.

d. **Reinstatement**: APA assets affected by third party works as highlighted above are to be reinstated as per APA requirements, potentially including but not limited to; warning tape/marker board, soft bedding/backfill materials, trench dimensions, depth of cover, trace wire for PE mains, compaction requirements, concrete protection, and surface re-instatement.

4. Contacting APA

GAS EMERGENCIES 24 HRS	GAS PLANT RELOCATIONS	APA GROUP GAS ASSET LOCATIONS	DIAL BEFORE YOU DIG
1800 GAS LEAK (1800 427 532)	APA CAPITAL WORKS PH: 07 3215 6709 FAX: 07 3215 6699 capitalworksqldnetworks@apa.com.au	TEAM (PERMITS OFFICE) PH: 07 3215 6700 FAX: 07 3215 6699 permitsqld@apa.com.au	SUPPORT PH: (08) 8115 4500

HIGH PRESSURE GAS DISTRIBUTION MAINS "AUTHORITY TO WORK" REQUEST

N.B. THIS IS NOT A PERMIT TO WORK

SITE ADDRESS: ……

SUBURB: ……UBD MAP REF:……

DBYD Sequence Number:…… Date of DBYD Enquiry….....

(Note: Only valid enquiries will be accepted and the currency of DBYD requests will affect your permit period. APA Group's DBYD requests are valid for 30 days only. Enquiries may need to be renewed and a new application may be required)

COMMENTS:……

……

BROAD DESCRIPTION OF WORK (please provide any approvals from APA Group related to these works)

……

……

……

WORK TO BE CARRIED OUT:

Class 1.	Location	
	Works crossing a high pressure gas mains	☐
Class 2.	Location	
	Works within 3 metres of a high pressure gas mains	☐
Class 3.	Location	
	Works involving large excavations that would cause ground movement, vibrations or blasting beyond 3m of a high pressure gas mains	☐
Class 4.	Location	
	Works within 1m of gas service or connection to industrial gas meter	☐

DETAILS OF WORK INVOLVED (Tick Applicable)

Excavation	☐	Change to surface level	☐
Service crossing (Gas CONNECTION)	☐	Boring	☐
Proving (Dial Before You Dig)	☐	Blasting	☐
Earthworks	☐	Road Construction/Change?	☐
Vacuum Excavation	☐	Other (give details)	☐

……

Relevant drawings, Block Plans etc, attached Yes ☐ No ☐

PROPOSED DATES AND TIMES	**From:**	**To:**
Excavation	…… / ……. / 20… ..... am/pm	…… / ……/ 20… ..... am/pm
Backfill	…… / ……. / 20… ..... am/pm	…… / ……/ 20… ..... am/pm

Insurance Cover – Current Level None ☐ $5M ☐ $10M ☐ $20M ☐ Other☐ _

NOTES

1. This Authority to Work applies only to work in the vicinity of the Gas Mains. It does not authorise work near or on the Gas Mains itself.
2. A minimum of 5 business days must be allowed between receipt by APA Group of this Request and a response. However, more time for notification may be necessary.
3. For Class 1 and Class 2 classifications, this application must be accompanied by a detailed sequence of events, outlining all aspects of work involved and work is not permitted until an Authority to Work is issued.
4. For class 1 and 2 Dial Before You Dig, APA Group will arrange for an inspector to be on site as necessary during the work. An inspector must be present at all times for works involving excavation within 1m of the Gas Mains. APA Group will advise the requirement for an inspector for other works within 3m of the Gas Mains.
5. The applicant is responsible for any damage resulting from the work and all consequential damages and losses arising from such damage and therefore must insure against every liability of the contractor in respect of or arising out of any loss of life, loss of or damage to property of person (both real and personal), arising out of or in any way connected to this permit.

Such insurance must be arranged for an indemnity of not less than $20 Million unless otherwise agreed.

Permit Requested By:(print name)…….Signature: ……Date …./…./….

Company:…… Postal Address:……..

Phone No:…….. Fax number…….. Email……

Requestors PO Number…….. Site Contact Details: Name……

Site Contact Number……

Principal Contractors Details(if required)……

Principal Contractors Contact details:……

Please be advised;
Under the Work Health and Safety Act 2011, each work place has an obligation to comply to Workplace Health and Safety Regulations and Codes of Practice.

APA Group brings to your attention Work Health and Safety Regulations 2011, Chapter 4: Hazardous Work. Failure to comply to the above regulation may result in APA Group reporting the non-compliance to Workplace Health and Safety.

Office use only
Received: Date …/…./…. Site Watch required? **Yes/No** (please circle)

Pipeline Officer:
(print name)……..Signature: ……Date: …/…/….

Further information can be requested via:
Post: **Permit Applications QLD**
PO Box 885 Hamilton Central QLD 4007
Phone: (07) 3215 6700 though an application will most likely be required
Email: permitsqld@apa.com.au

Optus Contract Management Team
Unit 9, 677 Springvale Road
Mulgrave, Victoria, 3178

Date:	30/01/2018
To:	Mr Mitchell Gassman
Company:	
Address:	PO Box 392 Beenleigh, QLD 4207

ENQUIRY DETAILS

Location:	Stapylton Jacobs Well Road, stapylton, QLD 4207
Sequence No.:	68110312
DBYD Reference:	13610918

In relation to your enquiry of the above location, Optus advises as follows:

Optus records indicate that there ARE underground Optus FIBRE OPTIC TELECOMMUNICATIONS ASSETS in the vicinity of the above location as per the attached drawing(s).

This reply is valid for a period of 30 days from the date above.

IMPORTANT INFORMATION
Asset location drawings provided by Optus are reference diagrams and are provided as a guide only. The completeness of the information in these drawings cannot be guaranteed. Exact ground cover and alignments cannot be provided with any certainty as these may have altered over time. Depths of telecommunications assets vary considerably as do alignments. It is essential to identify the location of any Optus assets in the vicinity prior to engaging in any works.

All Optus assets in the vicinity of any planned works will need to be electronically located to ascertain their general location. Depending on the scope of planned works in the vicinity, the assets may also need to be physically located.

You MUST engage the services of one of the Optus Asset Accredited Locators to carry out asset location (refer to list of Accredited Locators at the end of this DYBD response).

Unless otherwise agreed with Optus, where an on-site asset location is required, the requestor is responsible for all costs associated with the locating service including (where required) physically exposing the Optus asset.

DUTY OF CARE
When working in the vicinity of telecommunications assets you have a legal "Duty of Care" and non-interference that must be observed.

It is your responsibility as the requesting party (as a landowner or any other party involved in the planned works) to design for minimal impact to any existing Optus asset. Optus can assist at the design stage through consultation.

It is also your, as the requesting party (or your representative's), responsibility to:

a) Obtain location drawings (through the Dial Before You Dig process) of any existing Optus assets at a reasonable time before any planned works begin;

b) Have an Optus Accredited Asset Locator identify the general location of the Optus asset and physically locate the asset where planned works may encroach on its alignment; and

c) Contact Optus for further advice where requested to do so by this letter.

DAMAGE TO ANY OPTUS NETWORK MUST BE REPORTED TO 1800 500 253 IMMEDIATELY
You, your head contractor and any relevant subcontractor are all responsible for any Optus asset damage as a result of planned activities in the vicinity of Optus assets.

This applies where works commence prior to obtaining Optus drawings, where there is failure to follow instructions or during any construction activities.

Optus reserves the right to recover compensation for loss or damage to its assets including consequential loss. Also, you, your head contractor and any relevant subcontractor may also be liable for prosecution under the Criminal Code Act 1995 (Cth).

ASSET RELOCATIONS
You are not permitted by law to relocate, alter or interfere with any Optus asset under any circumstance. Any unauthorised interference with an Optus asset may lead to prosecution under the Criminal Code Act 1995 (Cth).

Enquiries relating to the relocation of Optus assets must be referred to the relevant Optus Damages and Relocations Team (refer to "FURTHER ASSISTANCE").

APPROACH DISTANCES
On receipt of Optus asset location drawings and prior to commencing any planned works near an Optus asset, engage an Optus Accredited Locator to undertake a general location of the Optus asset.

Physical location of the Optus asset by an Optus Accredited Locator will also be required where planned works are within the following approach distances of the general location of the Optus asset:

a) In built up metropolitan areas where road and footpaths are well defined by kerbs or other features a minimum clear distance of 1 meter must be maintained from the general location of the Optus asset.

b) In non-established or unformed metropolitan areas, a minimum clear distance of 3 meters must be maintained from the general location of the Optus asset.

c) In country or rural areas where wider variations may exist between the general and actual location of an Optus asset may exist, then a minimum clear distance of 5 meters must be maintained from the general location of the Optus asset.

If planned works are parallel to the Optus asset, then the Optus asset must be physically located by an Optus Accredited Locator at a minimum of 5 meter intervals along the length of the parallel works prior to work commencing.

Under no circumstances is crossing of any Optus asset permitted without physical location of the asset being carried out by an Optus Accredited Locator. Depending on the asset involved an Optus representative may be required onsite.

The minimum clearances to the physical location of Optus assets for the following specific types of works must be maintained at all times.

Note: Where the clearances in the following table cannot be maintained or where the type of work differs from those listed then advice must be sought from the relevant Optus Damages and Relocations Team (refer to "FURTHER ASSISTANCE").

Type of Works	**Clearance to Physical Location of Optus Asset**
Jackhammers / Pneumatic Breakers	Not within 1 meter.
Light duty Vibrating Plate or Wacker Packer type compactors (not heavy road construction vibrating rollers etc.)	500mm compact clearance cover before a light duty compactor can be used over any Optus conduit. No compaction permitted over Optus direct buried cable without prior approval from Optus.
Boring Equipment (in-line, horizontal and vertical)	Not within 5 meters parallel of the Optus asset location without an Accredited Optus Asset Locator physically exposing the Optus asset and with an Optus representative onsite. Not to cross the Optus asset without an Accredited Optus Asset Locator physically exposing the Optus asset and with an Optus representative onsite.

Type of Works	Clearance to Physical Location of Optus Asset
Heavy vehicle Traffic (over 3 tonnes)	Not to be driven across Optus conduits with less than 600mm of cover. Not to be driven across Optus direct buried cable with less than 1.2 meters of cover. Once off crossings permitted, multiple crossing (e.g. road construction or logging) will require Optus approval. Accredited Optus Asset Locator to physically expose the Optus asset to verify actual depth.
Mechanical Excavators, Farm Ploughing, Vertical Hole installation for water bore or fencing etc.	Not within 1 meter. Accredited Optus Asset Locator to physically expose the Optus asset to verify actual location.

ASSET CLEARANCES AFTER COMPLETION OF WORKS

All Optus pits and manholes must be a minimum of 1 meter from the back of any kerb, 3.5 meters of the road surface without a kerb or not within 15 meters of street intersection.

In urban areas Optus conduit must have the following minimum depth of cover:

- Footway 600mm;
- Roadway 1 meter at drain invert and at road centre crown.

In rural areas Optus conduit must have a minimum depth of cover of 1 meter and direct buried cable 1.2 meters.

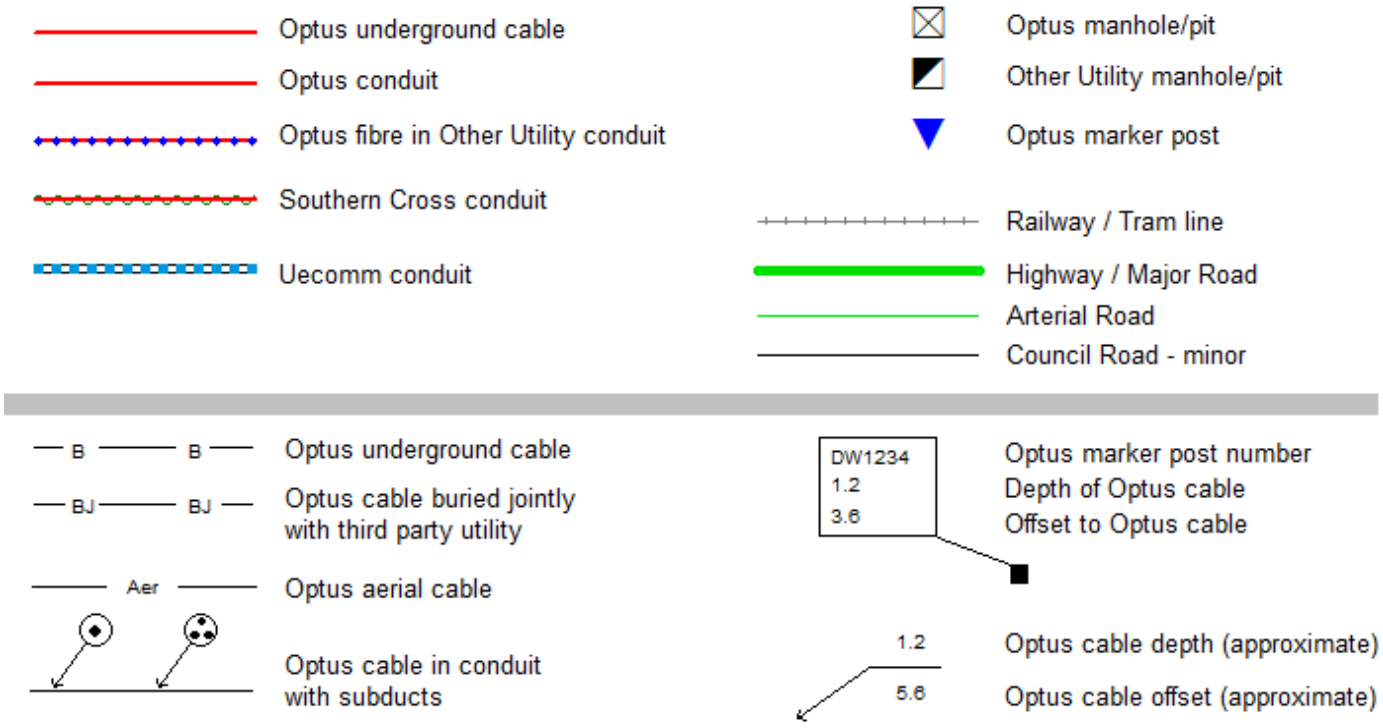
In cases where it is considered that the above clearances cannot be maintained at the completion of works, advice must be sought from the relevant Optus Damages and Relocations Team (refer "Further Assistance").

FURTHER ASSISTANCE

Further assistance on asset clearances, protection works or relocation requirements can be obtained by contacting the relevant Optus Damages and Relocations Team on the following email address:
NFODamages&RelocationsDropbox@optus.com.au

Further assistance relating to asset location drawings etc. can be obtained by contacting the Optus Network Operations Asset Analysis Team on 1800 505 777.

OPTUS ENGINEERING DRAWING SYMBOLS



OPTUS

Optus Accredited Asset Locators

Name	Company Name	Phone	Email	State	Region/Service Area
Alan Cordner	Alcom Fibre Services Pty Ltd	0400 300 337	alcomfibre@bigpond.com	NSW / ACT	Sydney
Brad McCorkindale	Bradmac Locating Services	0434 157 409	brad.mac@bigpond.com	NSW / ACT	All
Troy Redden	On Point Utility Locating	1300 6676 468	troy@onpointlocating.com.au	NSW	Sydney Only
Shane Buckley	Cable & Pipe Locations	0408 730 430	sabuckley@bigpond.com	NSW / QLD	Armidale, Casino, Coffs Harbour, Dorrigo, Glenn Innes, Grafton, Inverell, Kempsey, Lismore, Nambucca, Port Macquarie, Tamworth, Taree, Tenterfield, Yamba
Philip Pegler	Down Under Detection Services (DUDS)	0418 267 964	apegler@duds.net.au	NSW	All
Noreen Egan	SureSearch	1300 884 520 0418 920 245	Noreen@suresearch.com.au	NSW / ACT / QLD	NSW, Sydney, Northern NSW, Canberra, QLD, South East QLD.
Leonard McGowan	Pipesure Australia	1300 411 811	len@pipesure.com.au	NSW	Sydney
Bruce Whittaker	Optical Fibre Technologies	0402 354 322	opticaltek1@aol.com	NSW	Sydney/Wollongong
Darryl Smith	Darryl Smith Electrical	02 6642 3731	office@dsmithelectrical.com.au	NSW	Grafton
George Koenig	Downunder Locations NSW Pty	0438 243 856	Downunderlocations@gmail.com	NSW	Tweed Heads, Gold Coast, Brisbane
Michael Grant	M&K Grant Bega Bobcats Pty Ltd	0427 260 423	zzbobcat@bigpond.net.au	NSW	Bega, Far South Coast
Antony Critcher	Geotrace Pty Ltd	0417 147 945	antony@geotrace.com.au	NSW	All Areas, Sydney, Wollongong, Newcastle, ACT
Anthony Lane	Hydro Digga	0447 774 000	locator@hydrodigga.com	NSW	All of NSW, ACT & South East Qld
Grant Pearson	Australian Utilities Management Pty Ltd	0427 833 222	aine@ausutilities.net.au	NSW	Sydney Metro

Nathan Ellis	Utility Locating Services	0404 087 555	nathan@utilitylocatingservices.com.au	NSW	Sydney
Rodney Pullen	Provac	0450 268 012	rod@provac.net.au	NSW / QLD	South East QLD, Northern NSW
Rodney Pullen	One Find Cables	0451 268 012	rod@provac.net.au	NSW / QLD	South East QLD, Northern NSW
Drew Misko	Australian Subsurface Pty Ltd	0427 879 600	admin@australiansubsurface.com	NSW / ACT	All of NSW/ACT
Scott O'Malley	Coastal Cable Locators Pty Ltd	0427 975 777	skomalley@bigpond.com	NSW	South Coast- Snowy Mountains- Southern Highlands
Liam Bolger	Brandon Construction Services	0438 044 008	liam.bolger@hotmail.com	NSW	Bathurst, Orange, Dubbo
Brett Pickup	All About Pipes	02 8763 4200	Brett.Pickup@allaboutpipes.com.au	NSW / VIC	All
Karen Joyce	Durkin Construction Pty Ltd	02 9712 0308	karen@durkinconstruction.com.au	NSW	Sydney
Timothy Laidler	Locate & Map	0431 191 669	tim@locateandmap.com.au	NSW	Sydney, Central Coast
Ken Brown	Riteway Traffic Control Pty Ltd	0419 212 969	kbrowne@ritewaytc.com.au	NSW	Central Coast, Hunter
Walter R Johansen	Steger & Associates	02 6296 4089	enquiries@steger.com.au	ACT / NSW	Canberra
Jean-Max Monty	Civilscan	0416 068 060	civilscan@bigpond.com	NSW	Sydney – Central Coast – Newcastle – Wollongong – Hunter Valley – Blue Mountains
Alan Hunter	Hunter Ground Search	02 4953 1244 0418 684 819	huntergroundsearch@bigpond.com	NSW	Newcastle, Central Coast, Hunter Valley, Mid North Coast, Liverpool Plains, Central West NSW
Gilbert J Cook	Datateks Communivations Speciaists	0408 693 660	datateks@datateks.com.au	NSW	Southern NSW
Damien Black	Mid North Coast Hydro Digging	0418 409 465	dblack1@bigpond.com	NSW	Newcastle- foster-Taree-Wauchope -Port Macquarie - Kempsey -Coffs harbour
Sean Henry	Utility Mapping Pty Ltd	0428 229 919	sean@utilitymapping.com.au	NSW	Sydney
Daniel Fox	Epoca Environmental Pty Ltd	02 4739 2465 0433 100 642	daniel@epocaenvironmental.com.au	NSW	All NSW, ACT

Rod Shaw	Cable Find	0478 887 073	rod@cablefind.com.au	NSW	Northern Rivers
Danny Carter	Online Pipe & Cable Locating	1300 665 384	danny@onlinepipe.com.au	NSW	Sydney, Newcastle, Canberra, Blue Mountains
Sam Romano	Locating Services	0403 065 510	sam.romano@locatingservices.com.au	NSW	NSW All
Scott Allison	Crux Surveying Australia	02 9540 9940	sydneyoffice@cruxsurveying.com.au	NSW	Sydney Metro & Surrounding Areas
Ian Brown	Peter Ellsmore & Associates	0439423708	ian.brown@ellsmore.com.au	NSW	Wollongong, Illawarra, South Coast, Southern Highlands, Macarthur & Sydney
Donna Wullaert	Commence Communications Pty Ltd	02 6226 3869 0428 595 620	admin@commencecomms.com.au	NSW	Canberra, Yass, Bungendore, Goulburn and Surrounding regional Areas
Stephen Fraser	Advanced Ground Locations	02 4930 3195 0412 497 488	steve_agl@hotmail.com	NSW	Newcastle, Hunter Valley, Central Coast, Taree & Surrounding Areas
Bobby Friesz	Vac Group	0447 837 267	Bobby.Friesz@vacgroup.com.au	NSW	Sydney
Chris Hall	D C Locators Pty Ltd	0419 679 741	dcloc@powerup.com.au	QLD	Brisbane, Ipswich
Jeff Trackson	J.R & L.M Trackson Pty Ltd	0417 600 978	jtrackson@tracavoid.com.au	QLD	All
Benji Lee	LADS	0478 915 237	benji@ladsqld.com.au	QLD	South East QLD
Andrew Watson	Lambert Locations Pty Ltd	07 5562 8400	andrew@lambertlocations.com.au	QLD	South East QLD & Northern NSW
Ross Clarke	FNQ Cable Locators Pty Ltd	0428 775 655	onlineco@bigpond.net.au	QLD	Far North QLD, Cape York & Peninsula
Col Greville	Bsure Locators	0488 520 688	admin@bsurelocators.com.au	QLD	Wide Bay Burnett and Central Qld
Mikael White	All Asset Locations	0478 846 025	allassetlocations@gmail.com	QLD	Sunshine Coast
Andrew Cowan	Vac Group	0447 008 806	andrew.cowan@vacgroup.com.au	QLD	South East and Central QLD
Jimmy Wilkins	GeoRadar Australia	0425 677 227	jimmy@georadar.net.au	QLD	Emerald, Bundaberg
Beaumont Blake	PipeHawk CCTV	0435 558 533	accounts@pipehawkcctv.com.au	QLD	South East QLD & Northern NSW
Craig Waite	C Locate	0437 808 444	clocate@bigpond.com	QLD	South East QLD
QLD Operations	Utility Location Services	0499 775 095 07 3807 3552	qldops@utilitylocationservices.com.au	QLD	SouthEast QLD, Northern NSW
Gary Poppi	Ace Cable Locations	0431 517 837	garypoppi@bigpond.com	QLD	Wide Bay Burnett

Daniel Vigliarolo	Vac Group	0449 953 047	daniel.vigliarolo@vacgroup.com.au	VIC	Melbourne
Josh Taylor	Advanced Locations Victoria	0427 846 716	josh@advancedlocationsvic.com.au	VIC	All
Ben Minutoli	Geelong Cable Locations	1800 449 543	ben@geelongcablelocations.com.au	VIC	Melbourne, Geelong, Country Victoria
Mick McGoldrick	Cavan Constructions	0404 241 679	mick@cavanconstructions.com.au	VIC	Western Victoria
Matthew Keppich	Construction Sciences	03 9553 7236	matthew.keppich@constructionsciences.net	VIC	Victoria
Stuart Miles	ELS Environmental Location Systems	03 8795 7461	accounts@radiodetection.com.au	VIC	Victoria
Galen Shanahan	Vac Group	0447 837 000	Galen.Shanahan@vacgroup.com.au	SA	All
Marilyn Dentice	Cable Locates & Consulting	08 9524 6600	accounts@cablelocates.com.au	WA	Metro & Country
Lisa Scofield	Abaxa	08 9256 0100	accounts@abaxa.com.au	WA	All
Derek McShane	Subterranean Service Locations	0420 862 426	Derek@sslwa.com.au	WA	Midwest/Gascoyne
Ben Upton	TerraVac Vacuum Excavation	0427 531 119	locations@terravac.com.au	WA	All
Dale Shearsmith	Subtera Subsurface Locating	1300 046 636	dale@subtera.com.au	WA	All
Paul Arnold	LivePower	08 6401 6234	bookings@livepower.com.au	WA	Perth & South West
Liam Davies	Bunbury Telecom Service Pty Ltd	08 9726 0088	liam@btswa.com.au	WA	South West WA
Tammy Thorp	B.C.E Spatial	08 9364 6408	admin@bcespatial.com.au	WA	Perth Metro & Regional
Chris Lee	Pulse Locating	0437 289 861	enquiries@pulselocating.com.au	WA	Perth
Tim Daws	Award Contracting	0411 878 895	info@awardcontracting.com.au	WA	City & Regional
Dave Turner	Anywair Pipe & Cable	0418 890 071	dave@anywair.com.au	NT	All NT, WA, QLD
Steve Gault	Northern Comms	0407 904 319	steve@northerncomms.net.au	NT	All
Wayne Parslow	Danisam	0417 089 865	danisam@westnet.com.au	NT	Darwin NT and Surrounds
Elizabeth Young	Archers Underground Services Locations (AUS Locations)	03 6245 1298	admin@auslocations.com.au auslocations@bigpond.com	TAS	All

ENERGEX DBYD RESPONSE
"ASSETS FOUND - EXISTING"

Our search has revealed there is existing ENERGEX Underground Assets within the nominated search area. They are shown on the attached plan(s).

To: Mr Mitchell Gassman		***DBYD Sequence No:*** 68110310	
Company: Gassman Development Perspectives		***Date of Response:*** 30-Jan-2018	
Address: PO Box 392 Beenleigh QLD 4207		***Period of Plan Validity:*** 28 Days	
Email Address: mitchell@gassman.com.au	***Phone:*** 07 3807 3333	***Mobile:*** 0437 073 333	***Fax:*** Not Supplied
Location of Search: Stapylton Jacobs Well Road stapylton QLD 4207			
UBD Map Ref: 284P8,284P9,284Q8,284Q9,284R7,284R8,285A7,285A8			
External Comments (if any):			

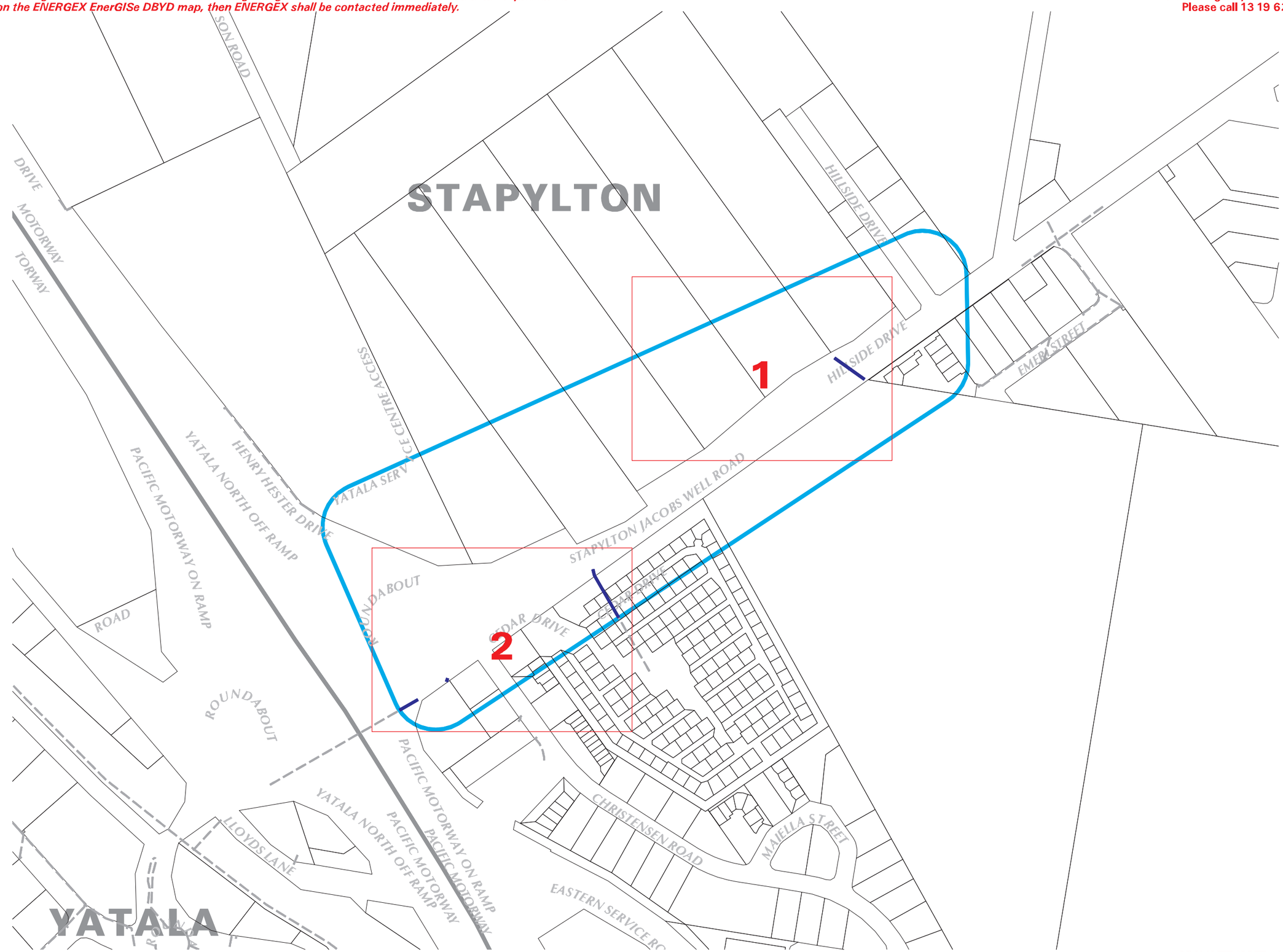
It is important that you note:

1. Please read and understand all the information and disclaimers provided – including the Terms and Conditions on the attached pages.
2. We have only searched that area which has been nominated. If this nominated area is not what you require, please resubmit another enquiry with DBYD
3. Plans provided by ENERGEX are only an indication of the presence of Underground assets within the nominated locations provided are approximate and the plans are not suitable for scaling purposes as exact ground cover and alignments cannot be provided.
4. Plans provided by ENERGEX do not show the presence of any Overhead Network.
5. That in addition to underground cables marked on attached plan there maybe underground Earth Conductors or Consumers Mains in the vicinity of the nominated work area(s) that are not marked on the plans.
6. This advice does not identify the presence of private underground cables (inc. consumers' mains) that may run from ENERGEX mains onto private property. Assets located on private property are the responsibility of the owner for identification and location.
7. Underground Cable Locators can be found in the Yellow Pages under Electronic Detectors, or Underground Service Locators on an Internet search.
8. The ENERGEX Dial Before You Dig information provides the vicinity of underground cable and will not be adequate for conveyancing purposes. A Solicitor's Search can be arranged through ENERGEX.
9. In the event that excavation does not commence within 28 days of receipt of a plan, a new plan should be obtained.
10. For Cable Support advice around the 33Kv and 110Kv Underground Networks please note that you should allow for a minimum of twenty (20) working days advance notice in your construction program to permit ENERGEX time to allocate the necessary resources to carry out the investigations. Please contact the ENERGEX DBYD team on the details listed below.
11. Immediately report life threatening emergencies to ENERGEX on **13 19 62**

PAPER SIZE A3

All underground cables shall be treated as being energised. Where a cable is located that is not represented on the ENERGEX EnerGISe DBYD map, then ENERGEX shall be contacted immediately.

For Emergency Situations Please call 13 19 62



This output provides details of the ENERGEX electrical network. As variations may exist no responsibility is incurred by ENERGEX for the accuracy or completeness of the information provided. Exact positions of cables and electrical connectivity should be confirmed on site.

UNCONTROLLED COPY

energex

EnerGISe
DBYD

Date: 30 Jan 18 Time: 16.41.40
Requested By: DBYD

NOT TO SCALE

0 150m

Enquiry No: 68110310
KEY MAP

Enquiry Area

LOCALITY DIAGRAM

PAPER SIZE A3

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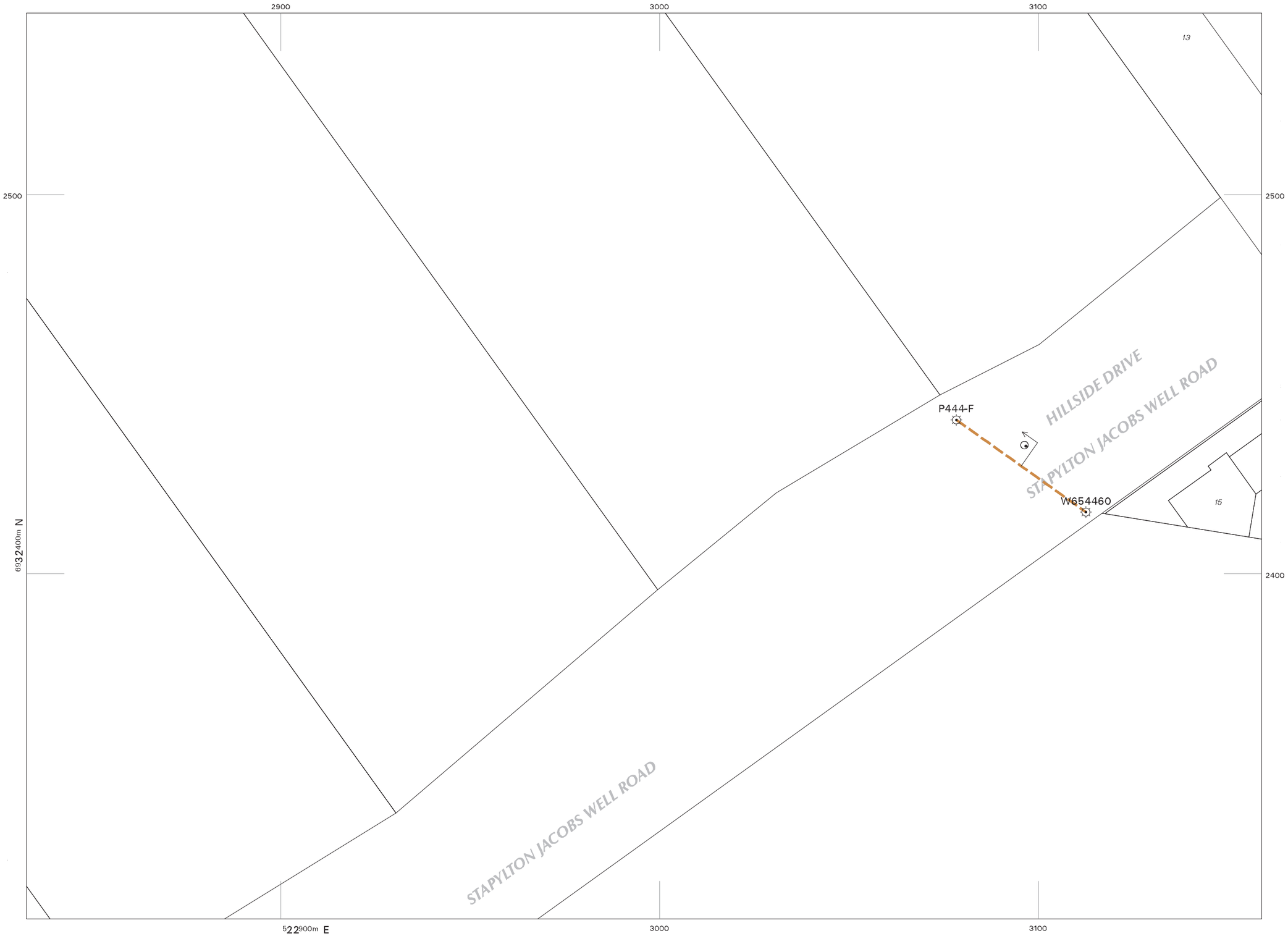

energex

EnerGISe

DBYD

Date: 30 Jan 18 Time: 16.41.51
Requested By: DBYD

SCALE 1:1000

20 0 20m

Enquiry No: 68110310

STRIP No: 1

- *Ground Transformer*
- *Cubicle Transformer*
- *Ring Main Unit*
- *Metering Unit*
- *Link Pillar*
- *Service Pillar*
- *Junction Pillar*
- *Pit*
- *Cable Joint*
- *Cable Termination*
- *Cable Marker*
- *Street Light Pole*
- *Earth*
- *Works Order Polygon*
- *Cable Voltage Less Than 33kV*
- *Cable Voltage 33kV or Higher*
- *Direct-Lay Cable*
- *Conduit*
- *Multi-Section Duct*
- *Trench*
- *Cable Tray*
- *Tunnel*

N W E S

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2

LOCALITY DIAGRAM

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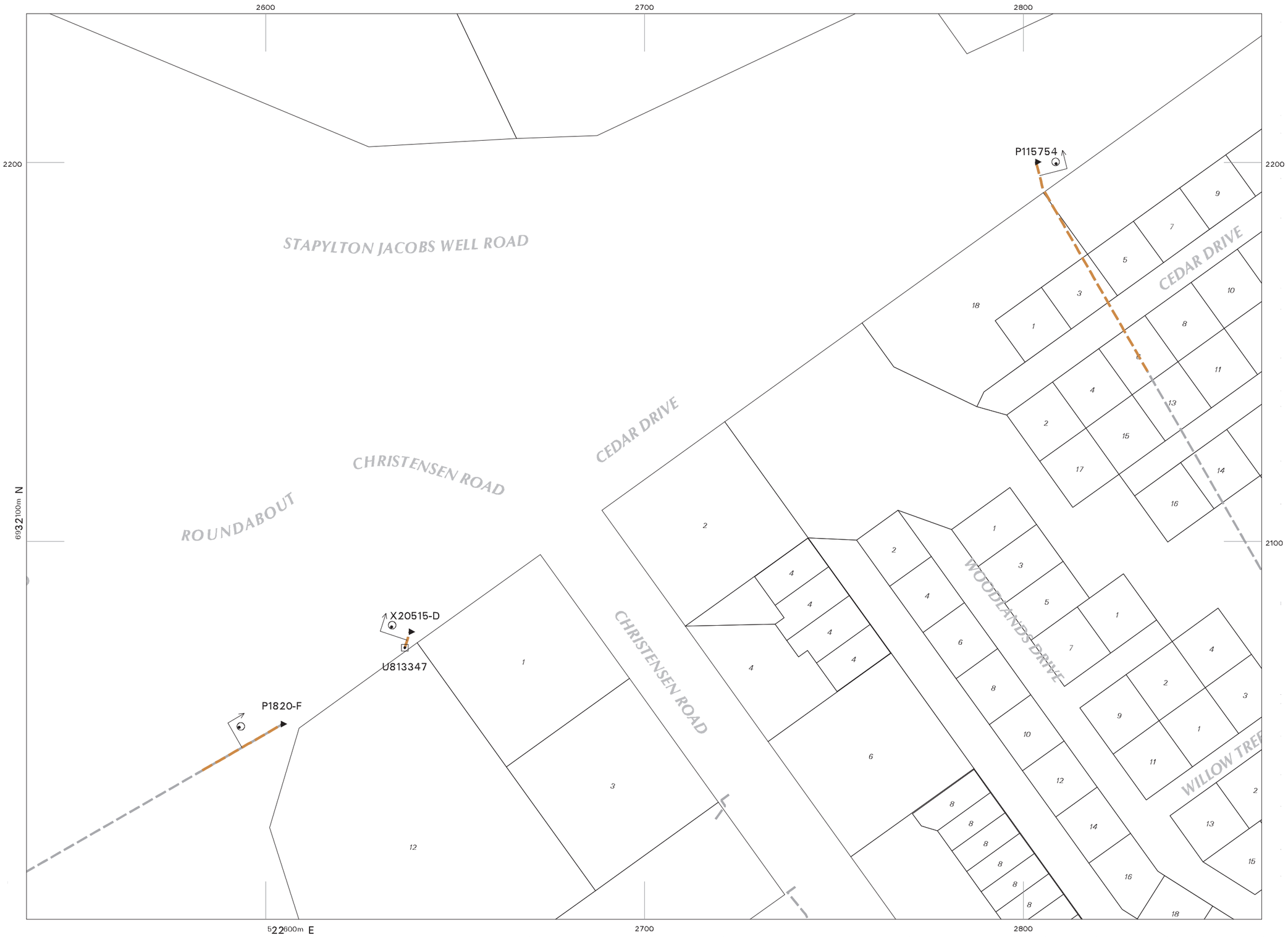
For Emergency Situations Please call 13 19 62



This output provides details of the ENERGEX electrical network. As variations may exist no responsibility is incurred by ENERGEX for the accuracy or completeness of the information provided. Exact positions of cables and electrical connectivity should be confirmed on site.

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energex

EnerGISe

DBYD

Date: 30 Jan 18 Time: 16.42.06
Requested By: DBYD

SCALE 1:1000

20 0 20m

Enquiry No: 68110310

STRIP No: 2

- Ground Transformer
- Cubicle Transformer
- Ring Main Unit
- Metering Unit
- Link Pillar
- Service Pillar
- Junction Pillar
- Pit
- Cable Joint
- Cable Termination
- Cable Marker
- Street Light Pole
- Earth
- Works Order Polygon
- Cable Voltage Less Than 33kV
- Cable Voltage 33kV or Higher
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LOCALITY DIAGRAM

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Plate 1: Mature vegetation with grassy understory

Plate 2: Standing stags providing habitat

Information provided in the FMP includes:

1.0 Introduction
2.0 Background
3.0 Habitat value
4.0 Fauna register
5.0 Wildlife management
6.0 Special considerations
7.0 Onsite operational actions
8.0 Responsible authority

Legend

Stage 1

Site boundary

0 250 500 1,000
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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Fauna Management Plan

60 Stapylton Jacobs Well Road
82 Christensen Road
31 Yellowwood Road

Gassman Development Perspectives

May 2018

Revision No.	Job No.
0	PR3546
Revision Date	**Reviewed By**
10/05/18	Natalie Toon

Fauna Management Plan

1.0 Introduction

This Fauna Management Plan (FMP) has been produced for Gassman Development Perspectives on behalf of KS8 Pty. Ltd. to support an industrial subdivision over land at Lot 4 on RP6843, Lot 1 on RP6882 and Lot 240 on W31320, Stapylton (herein referred to as the subject site). The subdivision is proposed to be divided into two stages with Stage 1 encompassing Lots 1 on RP6882 and Lot 240 on W31320. The subject site is located within City of Gold Coast (CoGC) and is 77.16 hectares in area, with Stage 1 encompassing 27.5 hectares of the site. This FMP is produced for the Stage 1 works and should be read in conjunction with the Vegetation Management Plan (VMP) (Gassman Development Perspectives 2018).

The intention of this FMP is to provide a methodology to protect and mitigate potential harm to fauna from the proposed industrial developmental requirements within the subject site. The FMP has been developed to incorporate information identified from desktop and field assessment. This information includes an assessment of onsite habitat values, records of fauna presently using or likely to use the subject site, identifying potential impacts to fauna and developing strategies to mitigate fauna injury/impacts.

Abbreviations

DES - Department of Environment and Science
EPBC - Environment Protection and Biodiversity Conservation Act 1999
FMP - Fauna management plan
CoGC - City of Gold Coast
MSES - Matters of State Environmental significance
RE - Regional Ecosystem
SEQ - South East Queensland
VMP - Vegetation management plan

2.0 Background

2.1 The proposed industrial subdivision requires vegetation clearing on Lots 1 on RP6882 and 240 on W31320 to facilitate Stage 1 works. Compensatory earthworks are also required on Lot 4 on RP6843 for providing flood storage and flood water dispersal on the floodplain within the Stapylton area. The subject site is currently a mixture of improved pasture in the lower and flatter parts of the site, and low and tall open remnant forests in the north eastern and south eastern corners of the site.

2.2 After reviewing the ecological planning background of the subject site, the following information has been identified:

2.2.1 Regional Ecosystem (RE) mapping suggests the subject site supports areas of remnant vegetation which has been identified as 12.11.25 (of concern) and 12.11.5/12.11.24 (no concern). Stage 1 earthworks will encompass portions of 12.11.5/12.11.24 with areas identified as 12.11.25 (adjacent to Christensen Road South) outside of Stage 1 of the subject site development

2.2.2 Matters of State Environmental Significance (MSES) wildlife habitat (threatened and least concern wildlife) occurs within the subject site

2.2.3 Koala habitat values mapping under the Planning Act 2016 designates the site as being 'Outside' a Koala Assessable Development Area, with habitat mapped on the site as 'High Value Bushland', 'Medium Value Rehabilitation' and 'Low Value Rehabilitation' habitat values

2.2.4 CoGC Matters of Local Environmental Significance (MLES) – wetlands and watercourses have been identified in Lot 240W31320;

2.2.5 CoGC MLES – high, medium and general priority vegetation recorded across Lot 240W31320 and Lot1RP6882; and

2.2.6 CoGC MLES – local significant species identified within Lot 240W31320.

3.0 Habitat Values

3.1 Due to the timeframe between the initial ecological assessment undertaken by Gassman Development Perspectives (2011), an additional onsite field inspection was undertaken on the 2 May 2018 to provide a current review of the subject site in relation to the habitat characteristics identified in the ecological assessment. Through the field inspection the following habitat features were observed in the open forest section of the stage 1 works footprint:

3.1.1 28 single hollows observed in trees with an ID tag
3.1.2 30 trees with termite mounds with tree ID tag
3.1.3 15 dead trees (stags with hollows) with tree ID tag
3.1.4 6 trees with multiple hollows/significant single hollows with tree ID tag
3.1.5 2 trees with old bird nests
3.1.6 1 single tree with many scratch marks a large hollow and the fur of a brushtail possum (Trichosurus vulpecula).

3.2 There are additional densely forested areas within the stage 1 works footprint which were not described in detail within the VMP that would provide further habitat for fauna. Habitat features identified in these areas include 6 stag trees with hollows/termite mounds and 22 hollow bearing trees. Also identified through stage 1 works foot print were 26 piles of old dead trees providing additional fauna habitat.

3.3 The review of the ecological assessment and the site inspection established the following habitat types:

3.3.1 mature vegetation with intact crown cover providing habitat for fly through birds (Plate 1)
3.3.2 large older trees and standing stags providing sites for arboreal termite mounds, nesting hollows, crevices, and perching sites, for mammals and birds (Plate 2)
3.3.3 a stand of paper bark or tea tree (Melaleuca quinquenervia) with very loose bark which is ideal habitat for micro bats
3.3.4 fallen timber (including 26 piles of dead fallen logs), branches and leaf litter offering habitat for small ground-dwelling mammals, reptiles, and amphibians
3.3.5 improved pasture/grassland, providing habitat for grassland birds, small ground-dwelling mammals and grazing macropods
3.3.6 aquatic and riparian habitat, including locally significant wetlands/watercourses within Lot 240 on W31320
3.3.7 anthropogenic structures providing habitat for small mammals, reptiles and amphibians.

4.0 Fauna Register

4.1 Records of fauna sightings on the subject site from the initial ecological assessment (GDP 2011) and opportunistic sightings during the site inspection (2 May 2018) are listed in Table 1. An ecological desktop assessment of the subject site was undertaken in 2011, and due to the lapse of time, additional desktop searches were completed in 2018 to provide an updated review. Searches for the subject site (5 km radius) were completed on both Queensland and Commonwealth databases. A Protected Matters Search (Environment Protection and Biodiversity Conservation Act 1999) was completed and revealed 23 threatened (endangered, vulnerable, near threatened) fauna species and 17 threatened migratory species. A Queensland Department of Environment and Science (DES) Wildnet search identified 31 species occurring within the locality of the subject site. The results of these searches and the fauna's likelihood of occurrence at the subject site are provided in Table 1. Only migratory species identified as likely or possibly occurring have been included in Table 3.

5.0 Wildlife Management

5.1 All native fauna are protected under the Nature Conservation Act 1992 . Following the listed operational actions detailed within this FMP will assist with the compliance requirements under the Nature Conservation Act 1992 . The FMP compliments the appropriate provisions within the VMP for undertaking vegetation removal and ensuring fauna are neither directly or indirectly impacted during operational works. Onsite operational actions within the FMP have been assessed and developed from species identified through site assessment and expected fauna presence through desktop assessment.

6.0 Special Considerations

6.1 Presence of endangered or vulnerable (priority) species identified prior to or during vegetation activities requires special considerations. The tree containing the priority species and any other trees having an overlapping canopy with the primary tree are to be clearly identifiable through flagging or marking. Where allowable, a corridor of vegetation linking the primary tree with an area of suitable habitat is to remain to allow the priority species to naturally relocate. Until the priority species has moved out of the area to be cleared, the corridor linkage is to remain undisturbed. The priority species, the relevant trees and vegetation corridor are to be clearly marked and all onsite contractors alerted to minimise disturbance.

6.2 Where possible, clearing works should be undertaken sequentially to allow fauna to naturally move offsite away from the clearing front. Clearing should be undertaken towards adjoining bushland and not towards the transport corridors (such as roads).

6.3 For fauna being removed from the subject site, there is a hierarchy for relocation from first preference (ideal) to lowest preference (last resort):

6.3.1 Relocation to suitable habitat within subject site
6.3.2 Relocation to suitable habitat adjacent/near subject site
6.3.3 Placement within a rehabilitation program with the individual to be released in the future
6.3.4 Individual to be placed into an educational, research or conservation facility
6.3.5 Euthanasia (seriously injured fauna).

6.4 Euthanasia must only be completed by a FSC with the relevant permits and experience in appropriate techniques. Should an animal be observed that is clearly injured, the FSC will attempt to capture the animal, assess its injuries and determine whether the animal should be euthanised, released untreated or taken to a vet for treatment or wildlife carer.

7.0 Onsite Operational Actions

7.1 Within the timeframe between the fauna assessment and clearing works it is possible that arboreal nests will be constructed within the site during bird breeding season and tree hollows and hollow arboreal termite mounds will be occupied by breeding fauna. Therefore, if fauna is confirmed to be present prior to clearing works in arboreal nests, termite mounds or tree hollows, it is recommended that a FSC is used to safely capture and relocate fauna to suitable habitat or appropriate care.

7.2 Many arboreal termite mounds and tree hollows within the project area are inaccessible and could not be visually inspected during the habitat assessment without the use of an elevated work platform (EWP). However, the site is not conducive to an EWP, it is recommended to use either climbing or pole cameras to inspect or excavator with vertical grab to remove hollows.

7.3 Pre-operational works

7.3.1 a pre-clear fauna survey of the entire clearing area and a pre-clear report must be completed by the project DES accredited FSC and issued to Council prior to commencement of works
7.3.2 a pre-clear inspection must occur within 48 hours prior to vegetation clearing. The inspection check must be conducted by a suitably qualified fauna expert (DES Accredited)
7.3.3 the FSC is to be provided with the GPS coordinates of the habitat features prior to clearing
7.3.4 trees to be felled must be checked for the presence of arboreal mammals, roost sites, dreys and nests.

7.4 Operational works

7.4.1 all vegetation clearing and tree felling must be conducted under the guidance of a suitably qualified FSC (DES accredited)
7.4.2 an FSC is to be present for each piece of clearing equipment (i.e. excavator or bulldozer), unless they are working near and the FSC is able to safely and effectively service more than one machine
7.4.3 communication (UHF radio) between the FSC and the clearing machine operator is to be maintained at all times
7.4.4 the FSC is to search ahead of clearing works for the presence of fauna in trees, beneath logs, bark or in hollows or shrubs. FSC to search ahead for burrowing bird nests
7.4.5 where practical, hollow bearing trees should be left in situ as long as possible (minimum 24 hours preferably) while smaller trees around them are cleared to encourage fauna to relocate on their own
7.4.6 if fauna breeding activity is confirmed within tree hollows, nests or arboreal termite mounds and fauna cannot be safely removed by any method, the tree should be left in-situ until the fauna has vacated
7.4.7 trees with hollows, arboreal termite mounds or nests where no obvious breeding activity is observed should be laid over as gently as possible (soft felled), in a direction that is likely to reduce damage to the habitat feature and minimise deceleration injuries and/or death to animals
7.4.8 in the event of an animal being located, an area of 5 m radius will be established around the tree / location, felling / construction activities must cease until the animal has relocated
7.4.9 machinery must also be excluded from the area until the animal has relocated (most likely overnight)
7.4.10 fauna to be relocated to a similar habitat type within the Stapylton area. Should an animal require relocating, this must be undertaken by the project DES accredited FSC
7.4.11 an FSC should be present during sheering or mulching of cleared vegetation if left longer than 24 hours
7.4.12 where possible, logs and hollow limbs should be placed in adjacent or nearby vegetation, so they can be used for habitat
7.4.13 clearing contractors are in the best position to observe fauna on the clearing front. If fauna is seen, clearing contractors should cease work and seek assistance from the FSC.
7.4.14 vet and wildlife carer details (Table 2) are to be kept on the construction site.

Treatment or removal of injured fauna

7.4.15 if fauna is injured and requires transportation to appropriate care, clearing work should cease until the FSC advises clearing work can continue
7.4.16 any native fauna orphaned or injured by the development process must be reported to Queensland Parks and Wildlife Service 1300 130 372 and / or RSPCA on 1300 852 188 / 07 5575 6146

8.0 Responsibilities

8.1 The implementation of the FMP requirements across the subject site is the responsibility of the site supervisor.
8.2 Appropriate permits to undertake fauna management are to be retained and followed by the DES accredited FSC.
8.3 All project contractors are to examine and understand this FMP. The FMP advises all individuals of their responsibilities toward the ethical management of fauna within the subject site.

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Fauna Management Plan

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Gassman Development Perspectives

May 2018

Revision No.	Job No.
0	PR3546
Revision Date	**Reviewed By**
10/05/18	Natalie Toon

Table 1: Fauna observations on the site

Scientific name	Common name	Presence in habitat trees	Survey 2011	Survey 2018
Acridotheres tristis	common Indian myna	-	X	
Alectura lathami	Australian brush-turkey	-	X	
Apis mellifera	European bee hive	in hollow tree id 303		X
Aquila audax	wedge-tailed eagle	-		X
Ardea intermedia	intermediate egret	-	X	
Bubulcus ibis	cattle egret	-		X
Chenonetta jubata	Australian wood duck	-	X	
Corvus orru	torresian crow	-		X
Cracticus nigrogularis	pied butcher bird	-	X	X
Cryptoblepharus virgatus	wall skink	-	X	
Dacelo novaeguineae	kookaburra	-	X	X
Egretta garzetta	little egret	-		X
Grallina cyanoleuca	magpie-lark	-		X
Hirundo neoxena	welcome swallow	-		X
Lampropholis guichenoti	common garden skink	-	X	X
Liasis olivaceus	olive python	-	X	
Macropus giganteus	eastern grey kangaroo	-	X	X
Manorina melanocephala	noisy minor	-	X	X
Milvus migrans	black kite	-		X
Ocyphaps lophotes	crested pigeon	-		X
Physignathus lesueurii lesueurii	water dragon	-	X	
Platycercus adscitus	pale-headed rosella	in hollow tree id 484	X	X
Rhipidura leucophrys	willy wagtail	-	X	
Sphecotheres	fig bird	-		X
Strepera graculina	pied currawong	-	X	
Trichoglossus chlorolepidotus	scaly- breasted lorikeet	-		X
Trichoglossus moluccanus	rainbow lorikeet	-		X
unsure of species	native bee hive	tree id 583		X
Vanellus miles	masked lapwing	-	X	X
Wallabia bicolor	swamp wallaby	-	X	

Table 2: Wildlife emergency details

Institution	Details
Beenleigh Veterinary Hospital	2A George St, Beenleigh, QLD, 4207. Ph: (07) 3287 2599
Wildcare Australia	Ph: 07 5527 2444
Windaroo Veterinary Surgery	1 Janine Dr, Bahrs Scrub QLD 4207. Ph: (07) 3807 3699

VM Act Regional Ecosystem Mapping indicates the site holds Category B remnant vegetation and Category C high value regrowth.

SEQ Koala SPRP designates the site as being 'Outside SPRP Koala Assessable Development Areas'.

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Reviewed By
Natalie Toon

Table 3: Likelihood of conservation siginificant species occurence - Fauna

Scientific name	Common name	EPBC Act Status	NC Act Status	Habitat Description/ Regional ecosystems present	Likelihood of Occurence
Anthochaera phrygia	regent honeyeater	CE	E	Box-Ironbark eucalypt woodland and dry sclerophyll forest associations in areas of low to moderate relief.	Unlikely. Suitable habitat absent
Apus pacificus	fork-tailed swift	Mi	SLC	Low to very high airspace over varied habitat, rainforest to semi-desert	Likely. Present in a wide range of habitats and may overfly the site
Ardea ibis	cattle egret	Mi	Null	Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. Observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures.	Possible. Vegetation within the site may provide suitable habitat for this species
Argynnis hyperbius inconstans	Australian fritillary	CE	Null	The species only occurs in areas where its larval food plant, the arrowhead violet (Viola betonicifolia) is found. Arrowhead violet usually grows in damp locations in more open areas.	Unlikely. Host plant not recorded onsite or with 5km of site
Botaurus poiciloptilus	Australasian bittern	E	LC	Terrestrial wetlands with tall, dense vegetation and occasionally estuarine habitats. Favours permanent shallow waters, edges of pools and waterways	Unlikely. No suitable wetland habitat. Tall dense vegetation absent around waterbodies
Calidris canutus	red knot	E	Null	Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours.	Unlikely. No suitable wetland habitat, intertidal areas absent
Chalinolobus dwyeri	large-eared pied bat	V	V	Dry forests and woodlands, moist eucalypt forests, caves and mines	Unlikely. Suitable habitat absent
Cuculus optatus	oriental cuckoo	Mi	SLC	Forest and woodland	Possible. Present in a wide range of habitats
Cyclopsitta diophthalma coxeni	Coxen's fig-parrot	E	Null	Coxen's Fig-Parrot occurs in rainforest habitats including subtropical rainforest, dry rainforest, littoral and developing littoral rainforest, and vine forest.	Unlikely. Suitable habitat absent
Dasyornis brachypterus	eastern bristlebird	E	Null	This species inhabits a broad range of vegetation communities with a preference for dense understorey vegetation.	Unlikely. Suitable habitat absent
Dasyurus maculatus maculatus	spot tailed quoll	E	Null	This species prefers mature wet forest habitat, ideally unlogged forest or forest that has been less disturbed by timber harvesting.	Unlikely. No suitable habitat onsite, high level of disturbance onsite
Delma torquata	collared delma	V	V	Open eucalypt forest with a sparse understorey of shrubs and tussock grasses, on rocky hillsides with flattish rocks or on deep-cracking soils	Unlikely. Suitable habitat absent
Erythrotriorchis radiatus	red goshawk	V	E	Tropical grassy woodlands mostly in undulating stony lands	Unlikely. Suitable habitat absent
Falco hypoleucos	grey falcon	Null	V	Inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses	Unlikely. Suitable habitat absent
Gelochelidon nilotica	gull-billed tern	Null	SLC	This species is a nomadic inland species showing preference for coastal lagoons or saltmarshes.	Unlikely. Suitable habitat absent
Geophaps scripta scripta	squatter pigeon	V	V	Open grassy woodlands on sandy soils with gravelly ridges	Unlikely. Suitable habitat absent, gravelly ridges not present
Hirundapus caudacutus	white-throated needletail	Mi	SLC	Breed outside Australia. Low to very high, open airspace over almost any habitat, including oceans, forests and deserts.	Likely. Likely to overfly the site.
Lathamus discolor	swift parrot	CE	E	Dry sclerophyll eucalypt forests and woodlands. Occasionally wet sclerophyll forests. Feeds mostly on nectar, mainly from eucalypts, but also eats psyllid insects and lerps, seeds and fruit	Possible. Seasonal occurrence. Suitable habitat present
Myiagra cyanoleuca	satin flycatcher	Mi	SLC	Forests and woodlands, mangroves, coastal heath scrubs but avoids rainforests.	Possible. Suitable habitat exists for this species to occur.
Numenius madagascariensis	eastern curlew, far eastern curlew	CE	Null	This migratory shorebird typically recorded in bays, estuaries, inlets, coastal lagoons, and harbours, with sandflats or intertidal mudflats.	Unlikely. No suitable wetland habitat
Ornithorhynchus anatinus	platypus	Null	SLC	Platypus are dependent on rivers, streams and bodies of freshwater. They favour coarser bottom substrates, particularly cobbles and gravel.	Unlikely. Suitable habitat absent, permanent waterbodies unsuitable for this species
Petauroides volans	greater glider	V	V	Tall eucalypt forests and woodlands. Dependent on large tracts of undisturbed, tall forest with suitably large nesting hollows.	Unlikely. Suitable habitat absent
Phascolarctos cinereus	koala	V	V	A range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species – food and shelter trees	Possible. Suitable habitat occurs for this species, RE mapping identifies suitable vegetation communities
Phyllodes imperialis smithersi	pink underwing moth	E	Null	This species is found in undisturbed subtropical rainforest . A vine, Carronia multisepalea, provides the food and habitat the moth requires in order to breed.	Unlikely. Host plant not recorded onsite or with 5km of site
Plegadis falcinellus	glossy ibis	Null	SLC	The Glossy Ibis requires shallow water and mudflats, so is found in well-vegetated wetlands, floodplains and mangroves	Unlikely. No suitable wetland habitat
Pluvialis fulva	Pacific golden plover	Null	SLC	This species usually inhabits coastal habitats mostly on beaches, mudflats and sandflats or in sheltered areas including harbours, estuaries and lagoons.	Unlikely. Suitable habitat absent
Potorous tridactylus tridactylus	long-nosed Potoroo	V	Null	This species inhabits coastal heath and dry and wet sclerophyll forests. An important habitat requirement is relatively thick ground cover.	Unlikely. Suitable habitat absent
Pseudomys novaehollandiae	New Holland mouse	V	Null	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes.	Unlikely. Suitable habitat absent
Pteropus poliocephalus	grey-headed flying-fox	V	Null	This species inhabits subtropical and temperate rainforests as well as tall sclerophyll forests and woodlands, heaths and swamps. Urban gardens and cultivated fruit crops are also utilised.	Possible. Food resources may occur within this site
Rostratula australis	Australian painted snipe	E	V	Shallow inland wetlands, brackish or freshwater that are permanently or temporarily inundated	Unlikely. Suitable wetland habitat absent
Saiphos reticulatus	three-toed snake-tooth skink	V	Null	This species is often found in forest litter, under rotting logs and soils with high component of decomposing vegetation.	Unlikely. Suitable habitat absent from site
Symposiachrus trivirgatus	spectacled monarch	Null	SLC	This species prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	Unlikely. Suitable habitat absent from site
Tachyglossus aculeatus	short-beaked echidna	Null	SLC	Found in various open woodland communities including rainforest, savannah, semi-arid and arid areas. Also found in agricultural areas.	Possible. Suitable habitat exists for this species to occur. Records of occurrences within 10km of site
Turnix melanogaster	black-breasted button quail	V	V	Occur in forested areas where deep leaf litter layer, exists in a wide variety of forest types.	Unlikely. No suitable habitat onsite, dense leaf litter layer absent
Xeromys myoides	water mouse, false water rat, yirrkoo	V	Null	Water mouse habitat includes mangrove communities and adjacent sedgelands, grasslands and freshwater wetlands.	Unlikely. No suitable wetland habitat