

CIVIL ENGINEERING REPORT

New Secondary School in Ripley Valley

Prepared for Group GSA

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Document Information

PROJECT NUMBER:	251257
PROJECT NAME:	Ripley Valley State High School
REPORT TITLE:	CIVIL ENGINEERING REPORT
CLIENT:	Group GSA
REVISION:	D

REVISION	STATUS	REVISION BY	VERIFIED BY	DATE	CERTIFIED
A	Issued for Approval	O. Gamage	A. Tatham	22 May 2026	S. Killoran
B	Issued for Approval	L. Blackwell	A. Tatham	1 July 2026	S. Killoran
C	Issued for Approval	L. Blackwell	A. Tatham	3 July 2026	S. Killoran
D	Issued for Approval	A. Frith	A. Tatham	15 July 2026	S. Killoran  R.P.E.O. No: 25874

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Executive Summary

This Civil Engineering Report (CER) has been prepared on behalf of the State of Queensland, represented by the Department of Education (Applicant), in support of a Priority Development Area (PDA) development application over part of land at 54 Wensley Road, and 581 – 617 Ripley Road, Ripley QLD 4306 and described as Lots 190 and 191 on SL18 (site). This PDA development application seeks approval from the MEDQ for a development permit for a material change of use for educational establishment, community facility, indoor sport and recreation, and outdoor sport and recreation.

The Applicant proposes a State secondary school for Years 7–12, delivered in stages:

- Stage 1 opening in 2029 with capacity for 917 enrolments.
- Stage 2 opening in 2031 with a cumulative enrolment capacity for 1,813.
- Further undefined stage to provide a cumulative enrolment capacity of 2,043.

This CER provides advice on engineering services strategy for the proposed school and the engineering planning issues associated with the development application. This report demonstrates that the proposed development can connect to local stormwater, potable water, sewerage reticulation, electricity, gas, telecommunications and transport infrastructure. The servicing strategy for the development is summarised below:

- **Site Access** – Two vehicular access points are proposed for the school development. Site access is proposed from the future road along the eastern boundary and a western access from Wensley Road. All internal hardstand and carpark will be designed in accordance with Department of Education's civil design guidelines.
- **Earthworks** – The development will require bulk earthworks cut/fill operations to achieve the desired surface levels to accommodate for the development and ensure it interfaces with the existing road reserves and boundary levels.
- **Stormwater Management** – The proposed school development will maintain a split catchment stormwater strategy similar to the existing site catchments. The northern portion of the site is proposed to discharge to the external roadside swale drain located on Ripley Road to the north-east of the site. The southern portion of the school site will outlet to the adjacent creek located to the east of the site. Stormwater quality and quantity for the development will be managed through two bioretention/detention basins located at each discharge location.
- **Water Supply** – The development's internal water network will have a single metered connection to the existing DN450 DI trunk main on Wensley Road, or alternatively to the DN355 PE water main on Ripley Road via a new reticulation main, subject to the Service Advice Notice from Urban Utilities. It is expected that the proposed development loads will not increase from the projected loads for the site.
- **Sewer Reticulation** – The development's internal network will connect to the existing DN400 PE gravity sewer main to the east, via a proposed gravity sewer main constructed beneath the future road corridor on the site's eastern boundary. It is expected that the proposed development loads will not increase from the projected loads for the site.
- **Electrical Supply** – The development will require an extension of the existing electrical cables (<33kV) from the Ripley Road reserve, with low-voltage supply provided to all on-site facilities in accordance with Ipswich City Council and Energex requirements.
- **Gas Supply** – An existing gas service has been identified within the Ripley Road reserve. It is anticipated that gas supply will be required for the school development, connection will be undertaken by a specialist consultant as part of future building works applications.
- **Telecommunications** – Connection to the existing telecommunications infrastructure surrounding the site will be made via underground cables, with all work to be undertaken by a specialist consultant.
- **Future Rail Corridor** – Engineering Works for the proposed school site will remain outside the future railway corridor. All earthworks and retaining structures should not undermine any railway infrastructure. The school development does not propose any worsening over the corridor in the 1% AEP plus climate change event

1. Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Group GSA to prepare a Civil Engineering Report (CER) on behalf of the State of Queensland, represented by the Department of Education (Applicant), in support of a Priority Development Area (PDA) development application over part of land at 54 Wensley Road, and 581 – 617 Ripley Road, Ripley QLD 4306 and described as Lots 190 and 191 on SL18 (site). This PDA development application seeks approval from the MEDQ for a development permit for a material change of use for educational establishment, community facility, indoor sport and recreation, and outdoor sport and recreation.

The purpose of this CER is to provide advice on the engineering servicing strategy for the proposed development regarding earthworks, roadworks, stormwater management (quality, quantity and flooding), sewerage, water supply, electricity, communications and gas.

Table 1 - Property Details

Site Address	54 Wensley Road, 581-617 Ripley Road, Ripley QLD 4306
Lot Title	Lot 190 and 191 SL18
Total Site Area	11.95 Ha
Proposed Land Use	Secondary School

1.1. Related Reports and Documents

This report is to be read in conjunction with the following supporting and reference documents:

- Civil Design Drawings by BG&E for External Road Updates to Ripley Road
- Civil Bulk Earthworks Drawing by Northrop Consulting Engineers.
- Traffic Impact Assessment prepared by PTT dated 11th June 2026.
- Flood Impact Assessment Report prepared by StormFlood Engineering dated 1st July 2026.

2. Site Context and Existing Characteristics

The subject site is located at 54 Wensley Road, QLD , 4306. The site currently comprises grassland with sparse trees and a dwelling house located on the south-west corner of Lot 191. The site is currently bound by:

- Ripley Road Corridor to the North
- Lot 1 on SP337684, comprising a dwelling house, to the East
- Future Queensland Rail Corridor to the South
- Wensley Road Corridor to the West (currently unsealed road)

Figure 1 below illustrates the site location and existing site characteristics. The entire site extent is considered to include both Lot 191 and the adjoining Lot 190 to the east, as reflected in Figure 1. However, this report will only address the proposed secondary school development primarily on Lot 191.

North of the site, land resumption is planned to accommodate the Ripley Road Corridor widening. The proposed road widening design has been completed by BG&E on behalf of Ipswich City Council. It is anticipated as part of the road corridor widening that the existing roadside swale along Ripley Road will be realigned and upsized.

There is a mapped future Queensland Rail Corridor located within the southern portion of the site. The Queensland Rail Corridor to the south is anticipated to not be delivered until 2032.



Figure 1 – Site Locality (QLD Globe, 2026)

3. Proposed Development

The proposed School development involves the construction of New state high school for Ripley which will consist of several multi-level classrooms, carparking and sports facilities. As part of the school development, it is proposed to construct a future road along the eastern boundary to be the predominant access to the school and designed to accommodate bus stops.

The proposed architectural masterplan layout was prepared by Group GSA as shown below in figure. Architectural drawings are included in Appendix D.

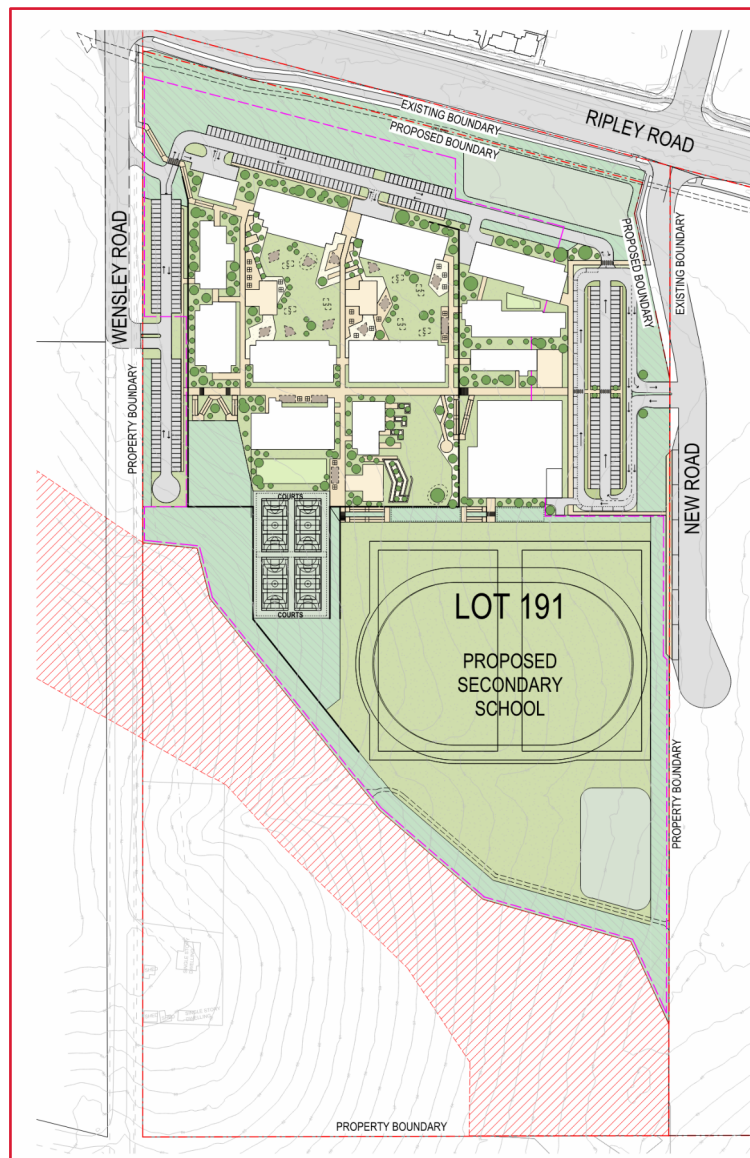


Figure 2 – Proposed Development (Group GSA, 2026)

4. Earthworks

4.1. Bulk Earthworks

The development will require bulk earthworks cut/fill operations to achieve the desired surface levels to accommodate for the development and ensure it interfaces with the existing boundary levels. Preliminary bulk earthworks modelling has been undertaken, indicating the following volumes:

- Cut: 128,222 m³
- Fill: 81,555 m³
- Balance: 46,667 m³ (CUT)

Refer to Northrop's Preliminary BEW Layout Plan (refer to Appendix A) for further details. These volumes are considered preliminary and are subject to change pending finalization of the adjoining corridor design levels.

4.2. Acid Sulfate Soil Assessment

The site does not fall within Acid Sulfate Soils Mapping and there are no proposed works anticipated below RL 5.0mAHD. ASS testing will be completed during initial geotechnical site investigations which will confirm extent of ASS present on site and the required treatments.

Council and the Department of Environment and Heritage Protection may require an Acid Sulfate Soils Investigation Report regarding the presence of acid sulfate soils on site and if required, a full Acid Sulfate Soil Management Plan will need to be prepared as mandated by the State Planning Policy.

5. Roads and Access

Two vehicular access points are proposed for the development in the ultimate site layout: a primary access from a future collector road to the east, and a secondary access from Wensley Road to the west. All internal carpark areas will be designed in accordance with Design Standards for Queensland Government Education Facilities.

The eastern collector road is anticipated to be constructed as part of the school works, forming the southern leg of a future signalised Ripley Road/Brooking Rise intersection, with the school driveway located approximately 130m south of this intersection.

Wensley Road access is proposed to be delivered in stages as follows:

- **Stage 1** – An interim driveway approximately 80m south of the Ripley Road intersection, timed to align with the Ipswich City Council Ripley Road Upgrade (due 2028/2029). This provides secondary access to staff parking and service vehicles separate from the drop-off/pick-up area.
- **Stages 2 & 3** – Following the Wensley Road upgrade, the driveway is anticipated to relocate further south to connect to the western carpark, potentially as left-in/left-out only.

For further details on the staging of works, refer to PTT's Traffic Report (Ref. 25-730 Rev D). Figure 3 below illustrates the ultimate scenario for site access.

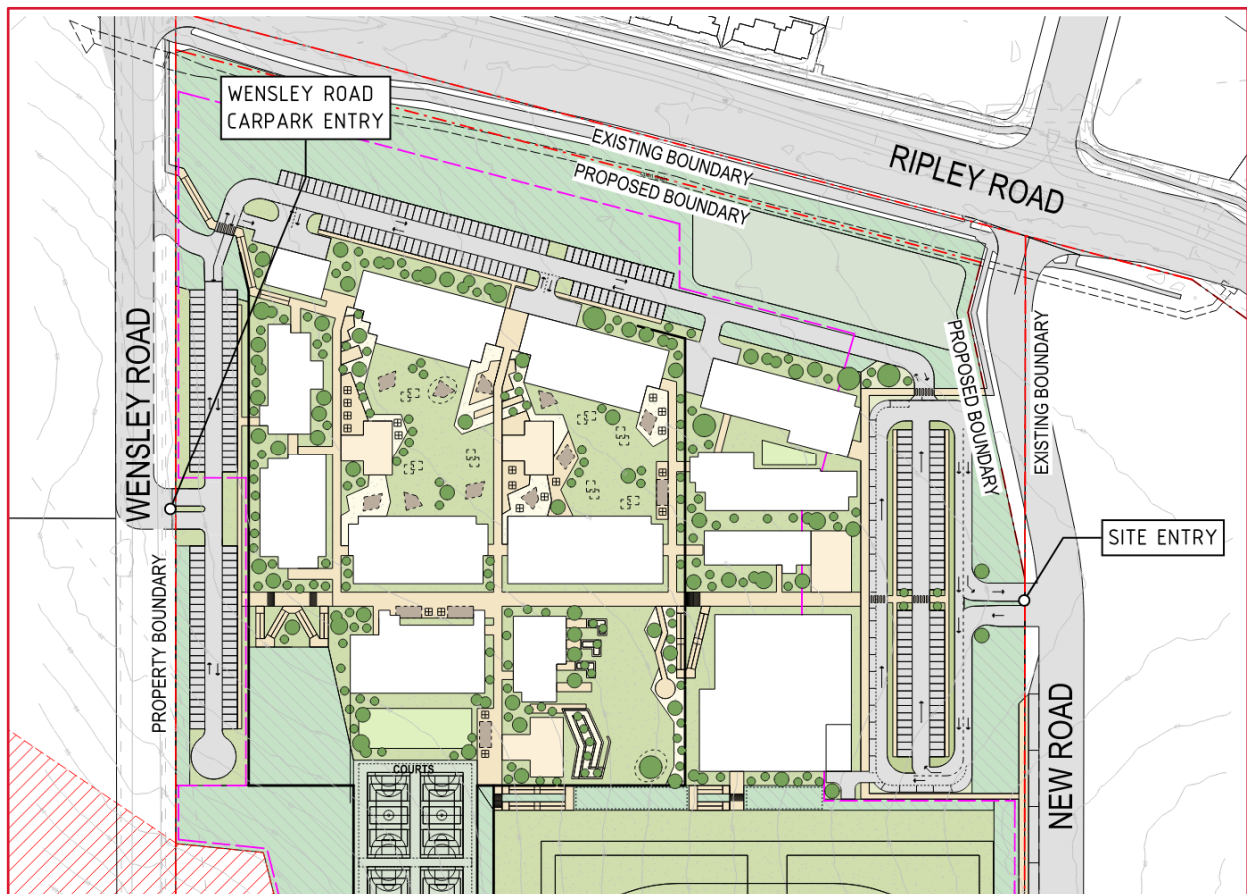


Figure 3 – Proposed Site Access

6. Flood Management

The northern and southern portions of the site fall within Ipswich City Council's Flood Risk and Overland Flow Overlay. In its current state, a portion of the site along the northern boundary falls within the Very Low to High Risk Flood Risk category. A Flood Impact Assessment (FIA) has been completed by StormFlood (Ref: SF-25-0658, Rev 2), modelling design events from the 39% to the 0.5% AEP. Figure 4 below shows the modelled 0.5% AEP peak flow depths and flood levels for the pre-development scenario.

The governing flood planning level (FPL) for the site is the 0.5% AEP peak flood level plus 300mm freeboard, in accordance with the ICC Planning Scheme, which is more conservative than the DoE's minimum standard of the 1% AEP plus 500mm freeboard. The maximum peak flood level identified was 55.25m AHD, located at the north-west corner of the site extent, resulting in an FPL of 55.55m AHD. The FIA demonstrates that the proposed building pad levels comply with the required FPLs across the site, with the earthworks design making the development immune from overland flooding up to and including the 0.5% AEP event. No material adverse flood impacts are predicted beyond the site boundary as a result of the development.

The predominant site access to the school will require a road culvert or bridge design to achieve flood free access. Site access from Wensley Road to the west is located outside the flood overlay and will provide flood free access to the site, with the FIA confirming this access remains trafficable up to and including the 1% AEP design event, with a short duration of inundation (less than 30 minutes) and a low associated flood risk.

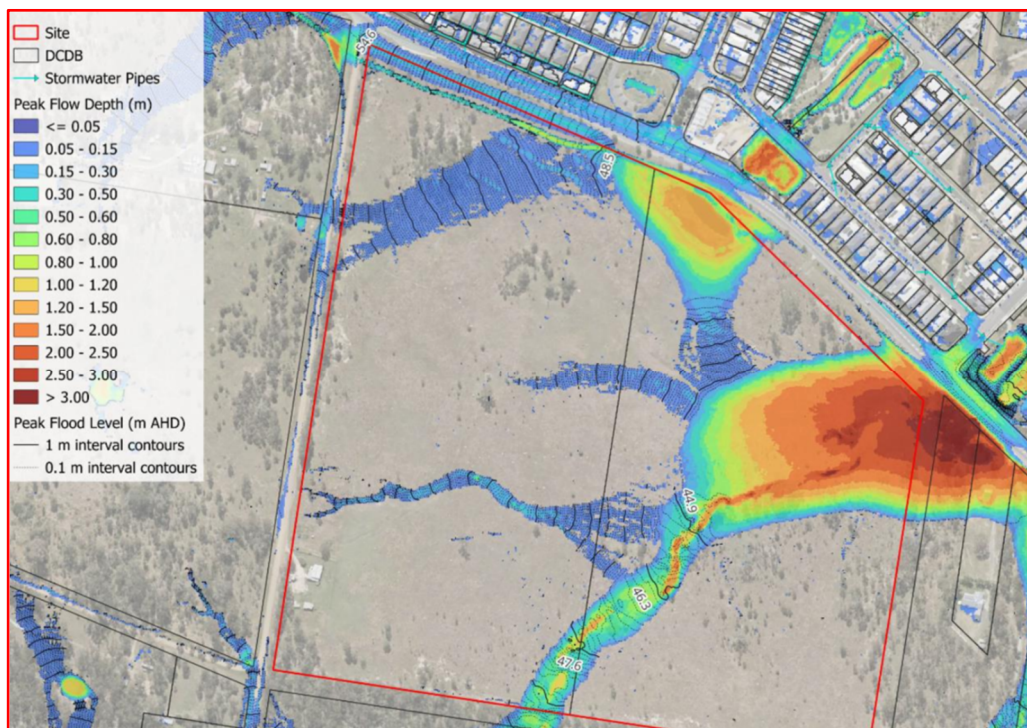


Figure 4 – 0.5% AEP Peak Flow Depths and Flood Levels Pre-development (StormFlood, 2026)

7. Stormwater Drainage

This section addresses the stormwater quality and quantity management scheme for the proposed development and should be referred to for full details of the stormwater management strategy. A brief summary of the proposed stormwater strategy is provided below.

7.1. Existing Stormwater Drainage Scheme

The subject site generally grades from west to east towards to the eastern boundary at a grade of 5-6%. There is no stormwater infrastructure located within the site and all site discharge overland flow over the eastern boundary. There are two lawful points of discharge for the site, the existing dam to the north east and the mapped waterway to the south east. Figure 7-1 below shows the existing catchment split for the site.

The site has an external catchment to the west which overland flows over the western boundary. The external catchment discharging north (EXT1) is captured by the existing roadside swale along Wensley Road for the minor event. In the major event, the existing roadside swale overtops the western site boundary and flows through the site.

The proposed QR Corridor located to the South is planned to manage the upstream external catchment (EXT2) via culverts under the rail line and swales along the corridor to the eastern boundary. At the time of this report the final details of the QR Corridor were not publicly available and will need to be reviewed prior to detail design of the school site. As the Queensland rail corridor is anticipated to be delivered after the school site is developed, a swale along the boundary of the railway corridor is proposed to convey upstream flows to the downstream LPOD.



Figure 5 - Existing Site Catchments

7.2. Proposed Stormwater Management Objectives

Stormwater management for the proposed development has been designed in accordance with the following documents:

- Design standards for Queensland Government Education Facilities, V6.0, December 2025
- Ipswich City Council Planning Scheme
- State Planning Policy (SPP), 2017
- Environmental Protection (Water) Policy, 2009
- Queensland Urban Drainage Manual (QUDM) Fourth Edition, 2016
- Water By Design MUSIC Modelling Guidelines, Version 3.0, 2018
- Water by Design - Construction and Establishment Guidelines: Swales, Bioretention Systems and Wetlands V1.1, 2010
- Plumbing and Drainage Code AS3500.3
- Australian Rainfall and Runoff Guideline (ARR)
- International Erosion Control Association – Best Practice Erosion and Sediment Control, 2008
- The stormwater management objectives for the development are summarised below: Avoid the creation of nuisance flow or hazard problems
- Protect the quality of surface and ground waters during construction and operation of new development
- Maintain the natural hydrologic behavior of catchments
- Protect existing natural features and ecological processes
- Integrate stormwater management infrastructure carefully in the urban and natural landscape.

The achievement of these objectives is summarised in the following section of this report.

7.3. Proposed Stormwater Drainage Infrastructure

The proposed development will introduce a new internal pit and pipe system sized to capture the minor event (5% AEP). Flows will discharge to two proposed bioretention basins as follows:

- **Northern bioretention basin** – Located at the north-eastern corner of the site. Discharge from this basin will drain to the proposed new swale located on the northern boundary of the site.
- **Southern bioretention basin** – Located at the south-eastern corner of the site. Discharge from this basin will drain over the eastern boundary via a level spreader.

Stormwater quantity and quality modelling has been prepared for the proposed development to demonstrate compliance with the objectives defined above in Section 7.2 using above-ground bio-basins. The bio-basin has been sized to ensure there is no actionable nuisance in the external stormwater system as a result of the proposed development. Stormwater quality is implemented in the basins by adding a bioretention component to the base of the basin to ensure the stormwater quality objectives are achieved prior to discharge from the site.

7.4. Stormwater Conveyance Management

The northern external catchment is proposed to be captured and conveyed via roadside swale along Wensley Rd and connect into the proposed stormwater infrastructure within Ripley Road Upgrade. Alternatively, the external catchment (EXT1) will be captured and conveyed in a separate pipe system sized for the 1% AEP which will discharge downstream of the proposed northern basin into the downstream infrastructure.

As the railway corridor will be developed after the school site a boundary swale is proposed along the QR corridor. The proposed southern swale will drain to western waterway, similar to the existing scenario. The proposed swale will be sized to cater for the upstream 1% AEP flow event with consideration for Climate Change Event. The external flows will bypass the southern detention basin. As such, the southern external catchment was not modelled in the assessment of the southern basin. The school development does not proposed any worsening within the QR corridor.

7.5. Stormwater Quantity Management

7.5.1. HYDROLOGICAL MODELLING (DRAINS)

Hydrological modelling of the existing and developed site has been modelled using DRAINS software. The IL-CL hydrological model was adopted as the hydrological model to model the existing and developed site.

The DRAINS model was setup using BOM rainfall parameters and hydrological model parameters listed in Table 2. The catchment breakdown adopted in the DRAINS model is the same as detail in Table 3.

Table 2 - IL-CL Hydrological Model Parameters

Model Parameters	Pre Development ¹
Impervious Area Initial Loss (mm)	1
Impervious Area Continuing Loss (mm)	0
Pervious Area Initial Loss (mm)	21
Pervious Area Continuing Loss (mm)	0.8
IFD Data	2019 rainfall depths from ARR Data Hub using site coordinates
Time of Concentration	Kinematic Wave Equation using detailed catchment parameters

¹parameters adopted directly from ARR Data Hub

Table 3 - Hydrological Model Catchment Parameters

Catchment ID	Catchment Description	Catchment Area Ha	Fi %	Impervious Tc mins	Pervious Tc mins
E1+EXT1	Northern Existing	10.28	5	15	21.2
E2	South Existing	5.75	0	0	13.6
D1	Northern Developed	4.525	80	7	10
D2	Southern Developed	5.42	40	6	10
D3	Northern Landscape Bypass	0.875	0	0	10
D4	Southern Landscape Bypass	0.739	0	0	10

7.5.2. ON-SITE DETENTION (OSD) SYSTEM DESIGN

An OSD system has been designed to achieve the stormwater quantity objectives listed in Section 7.2. Each basin parameter is summarised below in Table 4.

The detention basins have been sized to ensure post development flows do not exceed pre-development flows for the entire catchment. The north-west external catchment has been considered in the northern basin design to allow for the change in catchment runoff characteristics that occur when re-routing the external catchment via Ripley Road swale. Each basin has been sized to ensure non-worsening is achieved at the northern LPOD.

Tables 5 and 6 summarise that the site post-development flows are restricted to the pre-development flows for all storm events up to and including the 1% AEP Event.

Table 4 - OSD Basin Parameters

OSD Parameters	North Basin	South Basin
Required Basin Volume	800 m ³	1400 m ³
Total Basin Area	1500 m ²	2000 m ²
Maximum Water Depth	670 mm	570 mm
Low Flow Outlet	1200x1200 Dome Grate Field Inlet (DN750) @ top of extended detention	1200x1200 Field Inlet (DN600) @ top of extended detention
High Flow Outlet	700x200 Orifice @ 100mm above extended detention 3 x 1200x1200 Field Inlet Pit (DN900) @ 560mm above top of extended detention	700x200 Orifice @ 210mm above extended detention 2 x 1200x1200 Field Inlet Pit (DN750) @ 500mm above top of extended detention

Table 5 - Comparison of Pre and Post Development Flows (Northern Basin)

ARI (years)	E1+EXT1 Existing - Unmitigated	D1+D3+EXT1 Total Developed - Unmitigated	D1+D3+EXT1 Total Developed - Mitigated
1	0.815	0.976	0.702
2	1.16	1.24	1.09
5	1.74	1.86	1.69
10	2.28	2.4	2.19
20	2.95	2.98	2.73
50	3.51	3.7	3.24
100	4.07	4.26	3.76

Table 6 - Comparison of Pre and Post Development Flows (Southern Basin)

ARI (years)	E2 Existing - Unmitigated	D2+D4 Total Developed - Unmitigated	D2+D4 Total Developed - Mitigated
1	0.57	0.658	0.508
2	0.802	0.942	0.579
5	1.41	1.6	0.809
10	1.78	1.93	0.952
20	2.2	2.43	1.38
50	2.58	3.01	1.96
100	3.09	3.36	2.52

7.6. Stormwater Quality Management – Construction Phase

7.6.1. EROSION AND SEDIMENT CONTROL

Prior to construction commencing, it is the principal contractor's responsibility to ensure adequate erosion and sediment control measures are installed around the subject site to minimise disturbance and ensure the quality of runoff discharging from the site is of an acceptable standard.

An erosion and sediment control plan (ESCP) will be included in the Civil Engineering drawings in Appendix A. The ESCP will be prepared in accordance with the Best Practice Erosion and Sediment Control Manual (ICEA 2009) based on Type 1 techniques. Erosion and sediment control techniques used for the site include:

- Sediment barriers to be installed on all entrances to stormwater inlet pits
- Construction entry and exit shakedown areas
- Sediment fences are to be installed on the downstream boundaries of the subject site
- Construction of temporary bunds at the top of all earthworks batters to ensure runoff is directed away from exposed batters
- Construction of temporary diversion drains to divert water to sediment basins and around any stockpiles
- Sediment fences to be installed on the downstream side of any stockpiles
- Stabilisation of all batters upon reaching the finished earthworks levels
- Dust control measures which includes covering stockpiles, maintain site fences and watering exposed areas
- Sediment basin in accordance with IECA Best Practice Erosion and Sediment Control

7.7. Stormwater Quality Management – Operational Phase

7.7.1. PROPOSED STORMWATER QUALITY IMPROVEMENT DEVICES (SQID'S)

During the operational phase of the development, it is proposed the following stormwater quality improvement devices (SQID's) to achieve the stormwater quality objectives summarised Section 7.2;

- 300 m² bioretention basin located within the north detention basin
- 350 m² bioretention basin located within the south detention basin

7.7.2. BIO-RETENTION BASIN

A bio-retention basin is a landscaped basin used to slow and treat on-site runoff. Stormwater runoff is directed to the basin and is filtered through a filter media layer (e.g. sandy loam) that treats stormwater through a combination of physical, chemical and biological processes as stormwater percolates downwards to a receiving underlying drainage. Specific vegetation is essential in the design to ensure excess nutrients are removed through evapotranspiration and nutrient cycling, which effectively reduce nutrient loads discharging from the site.

7.7.3. STORMWATER QUALITY MODELLING (MUSIC) METHODOLOGY

Stormwater quality modelling for the site was prepared using 'Model for Urban Stormwater Improvement Conceptualisation' (MUSIC) Version 6.3. The model has been built to assess the adequacy of the proposed SQID's and to ensure that the quality of stormwater meets the WQO's for the development. A diagrammatic layout of the MUSIC Model is presented in Figure 6 below.

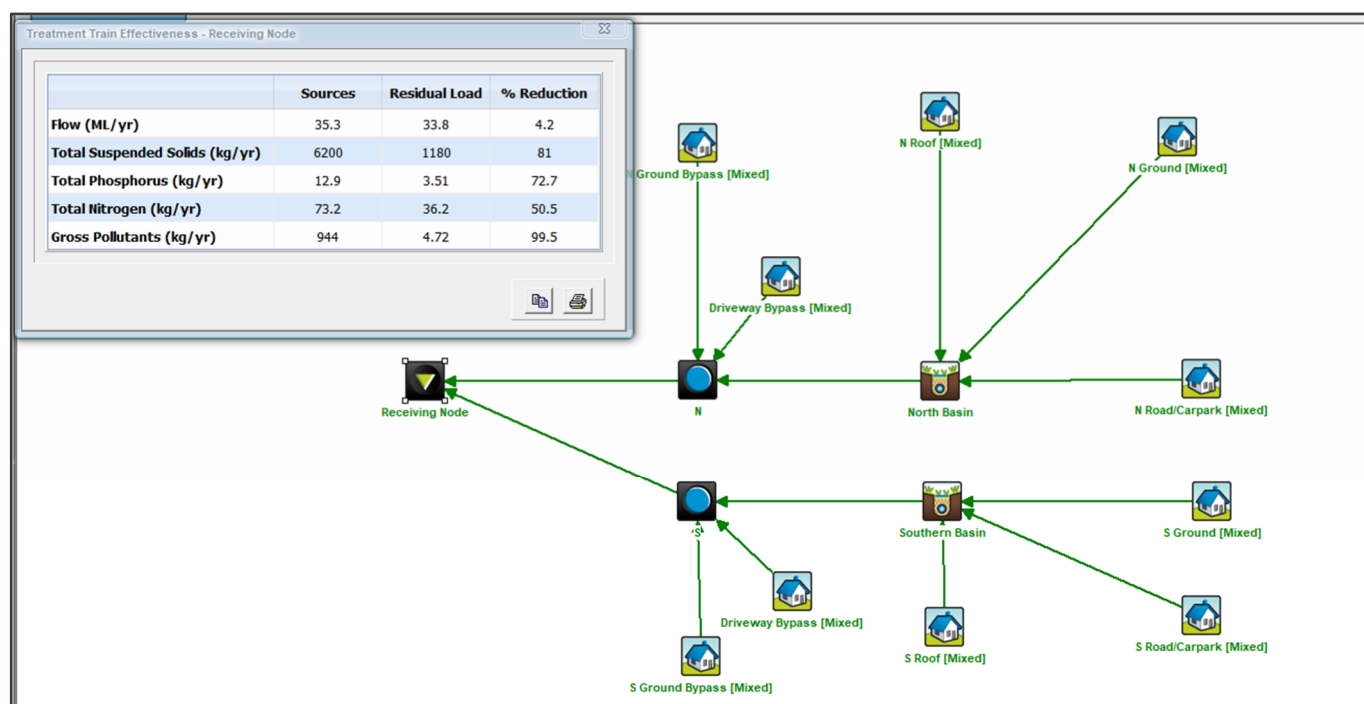


Figure 6 - MUSIC Link and Node Diagram

For the analysis of the MUSIC modelling, Meteorological data (average potential evapotranspiration (PET) and Rainfall Station) was based on the recommendations listed in WBD MUSIC Modelling Guidelines for SEQ, Table 3.1. The rainfall data was obtained from the Bureau of Meteorology for Station No. 40004 at Amberley. The analysis was undertaken using a 6 min time step for the period 01/01/1990 to 31/12/1999.

The following rainfall and runoff parameters shown in Table 7 have been utilised.

Table 7 - Rainfall Runoff Parameters

Parameter	Value*
Land Use Category	Urban Residential
Rainfall Threshold (mm/day)	1.0
Soil Storage Capacity (mm)	500
Initial Storage (% of Capacity)	10
Field Capacity (mm)	200
Infiltration Capacity Coefficient – a	211
Infiltration Capacity Exponent – b	5.0
Initial Depth (mm)	50
Daily Recharge Rate (%)	28
Daily Base flow Rate (%)	27
Daily Deep Seepage Rate (%)	0

* Parameter values taken from WBD – MUSIC Modelling Guidelines for SEQ, V3.0 (2018), Table A1.2

The catchments used for MUSIC modelling were broken down into land use category to accurately model the pollutant runoff characteristics for all land-use categories. The Source node catchments are summarised below in Table 8.

Table 8 - Catchment Source Node Summary

Catchment ID	MUSIC Source Nodes	Catchment Area (Ha)	Impervious %
North Basin	Roof	1.275	100%
	Ground	2.840	15%
	Road	0.953	100%
	Driveway Bypass	0.013	100%
	Landscape Bypass	0.258	0%
South Basin	Roof	0.707	100%
	Ground	4.676	15%
	Road	0.132	100%
	Driveway Bypass	0.013	100%
	Landscape Bypass	0.200	0%

The pollutant concentration parameters used in the model were based on information provided in Water By Design – MUSIC Modelling Guidelines for South East Queensland V1.0 (2010). The parameters are listed in Table 9 below:

Table 9 - Water Quality Parameters for MUSIC Source Nodes

Land- Use Category		Log TSS (mg/L)		Log TP (mg/L)		Log TN (mg/L)	
		Storm Flow	Base flow	Storm Flow	Base Flow	Storm Flow	Base Flow
Roof Areas (Urban Residential)	Mean	1.30	N/A	-0.89	N/A	0.26	N/A
	Std Dev	0.39	N/A	0.31	N/A	0.23	N/A
Roads (Urban Residential)	Mean	2.43	1.00	-0.30	-0.97	0.26	0.20
	Std Dev	0.39	0.34	0.31	0.31	0.23	0.20
Ground Level (Urban Residential)	Mean	2.18	1.00	-0.47	-0.97	0.26	0.20
	Std Dev	0.39	0.34	0.31	0.31	0.23	0.20

**Parameter values taken from WBD – MUSIC Modelling Guidelines for SEQ, V3.0 (2018), Table 3.9.*

Table 10 - Bioretention Sizing Summary

Parameter	North Basin	South Basin
Extended Detention Depth (mm)	300	300
Surface Detention Area (m ²)	300	350
Minimum Filter Area (m ²)	300	350
Minimum Filter Media Depth (mm)	0.5	0.5
Saturated Hydraulic Conductivity (mm/hour)	200	200
TN Filter Media Content (mg/kg)	400	400
Orthophosphate Filter Media Content (mg/kg)	30	30

Table 11 - MUSIC Model Results

Pollutant	Annual Loads (kg/yr)		% Reduction		Compliance
	Source	Residual	Actual	Target	
TSS	6200	1180	81	80	OK
TP	12.9	3.51	72.7	60	OK
TN	73.2	36.2	50.5	45	OK
GP	944	4.72	99.5	90	OK

The modelling results shown in Table 11 demonstrate that the treatment train will achieve the water quality targets set out in the State Planning Policy.

8. Water Supply

8.1. Existing Water Supply Infrastructure

The following existing water mains have been identified near the site based on detailed site survey (refer to Appendix B) and a DBYD search (refer to Appendix C):

- DN450mm DI trunk water reticulation main located on Wensley Road
- DN355mm PE water main located on Ripley Road

8.2. Proposed Water Supply Infrastructure

PROPOSED CONNECTION

A single metered water connection is proposed to service the school development. It is expected that a connection can be made to the existing DN450mm DI trunk main located on Wensley Road to the west of the site. Subject to the Service Advice Notice from Urban Utilities, the development will either connect directly to this main or a new reticulation main will be constructed to service the site and connect to the DN355mm PE water main on Ripley Road. The proposed connection locations are shown in Figure 7 below. Development demands are expected to be accommodated by the existing water infrastructure in the vicinity of the site.



Figure 7 - Proposed Water Connection Locations (UU GIS Mapping, 2026)

INTERNAL WATER NETWORK

As part of the building works, internal water reticulation service will be provided throughout the site. This will require a full water network design to be prepared by a qualified hydraulic engineer, designed to service all internal firefighting flows and service demands.

FIRE SYSTEM

In accordance with the SEQ WS&S D&C Code, the site is permitted to draw the following fire flows

- Commercial/ Industrial – 30L/sec for 4 hours
- Residential – 15L/sec for 2 hours

The water connection and internal water reticulation network for the development will be designed as part of future Operational Works applications for the site.

9. Sewerage Reticulation

9.1. Existing Sewer Reticulation

The following existing sewer mains have been identified near the site based on detailed site survey (refer to Appendix B) and a DBYD search (refer to Appendix C):

- DN160mm PE sewer gravity main located on Ripley Road
- DN400mm PE sewer gravity main located on Lot 190 SL18 to the East

9.2. Proposed Sewer Reticulation

PROPOSED CONNECTION

The site is expected to connect to the existing DN400mm PE gravity sewer main located to the east of the site, via a proposed gravity sewer main constructed beneath the future road corridor on the eastern boundary. The approximate connection location is shown in Figure 8 below. Development demands are expected to be accommodated by the existing sewer infrastructure in the vicinity of the site.



Figure 8 - Proposed Sewer Connection Location (UU GIS Mapping, 2026)

INTERNAL NETWORK

The internal wastewater network will form part of the design required for the Building Application approval.

10. Electrical Supply

Existing underground and above-ground power infrastructure have been identified through detailed site survey (refer to Appendix B) and a DBYD search (refer to Appendix C). High-voltage (HV) overhead power lines and underground electrical cables (<33kV) have been identified within the Wensley Road and Ripley Road reserves. The proposed development will require an extension of the existing underground electrical cables (<33kV) located within the Ripley Road reserve. The proposed development is required to incorporate low-voltage electricity supply to all facilities within the development to comply with Ipswich City Council and Energex legislation.

The need for a pad mount transformer to be located within the development site is subject to further design discussion with Energex; however sufficient provisions have been made within the proposed plan of development to accommodate one if required

11. Gas Supply

The DBYD search information (refer to Appendix C) indicates the presence of an existing gas service located on the northern boundary of the site within the Ripley Road reserve. It is anticipated that gas supply will be required for the development.

Should gas services be required for the development, connection and extension requirements shall be undertaken by a specialist consultant and will form part of the future building works applications to both APA and Ipswich City Council.

12. Telecommunications

Telecommunication services have been identified within all road reserves bounding the subject site. It is proposed to utilise this existing surrounding infrastructure to provide telecommunication services to the proposed development.

Connection from the proposed development to the above-mentioned services will be undertaken by a specialist consultant and will form part of the future building works applications to both appropriate Telecommunications entity and Council.

13. Conclusion

Northop has prepared this CER on behalf of the State of Queensland, represented by the Department of Education, in support of a PDA development application over part of land at 54 Wensley Road, and 581 – 617 Ripley Road, Ripley QLD 4306 and described as Lots 190 and 191 on SL18.

This report demonstrates that the proposed development can connect to local stormwater, potable water, sewerage reticulation, electrical, telecommunications and transport infrastructure. The proposed servicing strategy is summarised below:

- **Site Access** – Two vehicular access points are proposed for the school development. Site access is proposed from the future road along the eastern boundary and a western access from Wensley Road. All internal hardstand and carpark will be designed in accordance with Department of Education's civil design guidelines.
- **Earthworks** – The development will require bulk earthworks cut/fill operations to achieve the desired surface levels to accommodate for the development and ensure it interfaces with the existing road reserves and boundary levels.
- **Stormwater Management** – The proposed school development will maintain a split catchment stormwater strategy similar to the existing site catchments. The northern portion of the site is proposed to discharge to the external roadside swale drain located on Ripley Road to the north-east of the site. The southern portion of the school site will outlet to the adjacent creek located to the east of the site. Stormwater quality and quantity for the development will be managed through two bioretention/detention basins located at each discharge location.
- **Water Supply** – The development's internal water network will have a single metered connection to the existing DN450 DI trunk main on Wensley Road, or alternatively to the DN355 PE water main on Ripley Road via a new reticulation main, subject to the Service Advice Notice from Urban Utilities. It is expected that the proposed development loads will not increase from the projected loads for the site.
- **Sewer Reticulation** – The development's internal network will connect to the existing DN400 PE gravity sewer main to the east, via a proposed gravity sewer main constructed beneath the future road corridor on the site's eastern boundary. It is expected that the proposed development loads will not increase from the projected loads for the site.
- **Electrical Supply** – The development will require an extension of the existing electrical cables (<33kV) from the Ripley Road reserve, with low-voltage supply provided to all on-site facilities in accordance with Ipswich City Council and Energex requirements.
- **Gas Supply** – An existing gas service has been identified within the Ripley Road reserve. It is anticipated that gas supply will be required for the school development, connection will be undertaken by a specialist consultant as part of future building works applications.
- **Telecommunications** – Connection to the existing telecommunications infrastructure surrounding the site will be made via underground cables, with all work to be undertaken by a specialist consultant.
- **Future Rail Corridor** – Engineering Works for the proposed school site will remain outside the future railway corridor. All earthworks and retaining structures should not undermine any railway infrastructure. The school development does not propose any worsening over the corridor in the 1% AEP plus climate change event

NORTHROP



Glossary

GLOSSARY

Term	Definition
ADP	Area Development Plan
ADWF	Average Dry Weather Flow
ARI	Average Recurrence Interval
EP	Equivalent Persons
ESCP	Erosions and Sediment Control Plan
CER	Civil Engineering Report
DoE	Department of Education
ET	Equivalent Tenants
ICC	Ipswich City Council
PDWF	Peak Dry Weather Flow
PWWF	Peak Wet Weather Flow
QUDM	Queensland Urban Drainage Manual
SBSMP	Site Based Stormwater Management Plan
SQID	Stormwater Quality Improvement Device

CODE RESPONSE TABLES

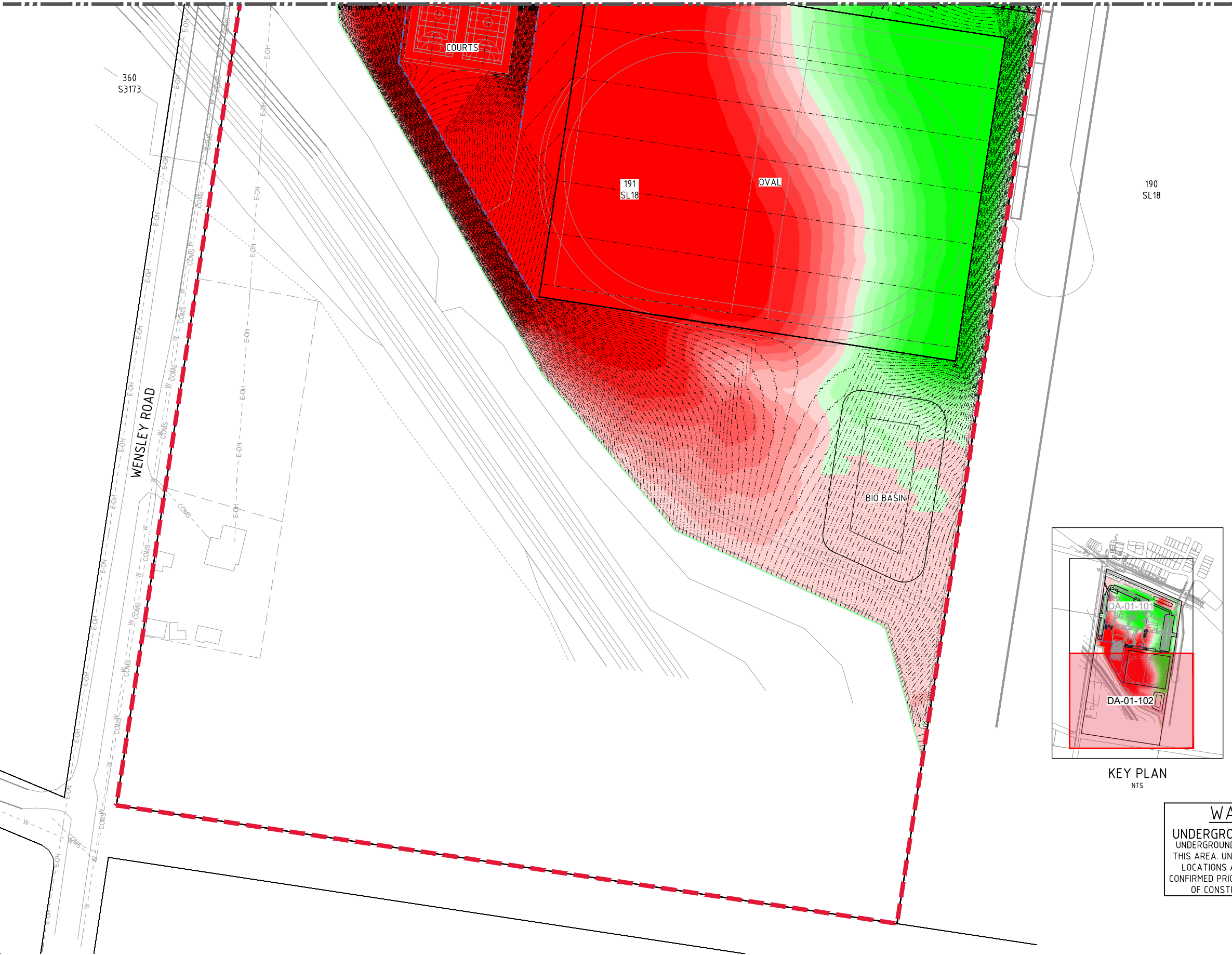
Waterway Corridors and Wetlands Overlay Code
General Works and Infrastructure Code
Earthworks Code

MAPS CATEGORY

Overlay Maps Category	Comment
Acid Sulfate Soils	Refer to Section 4.2.
Filling and Excavation Code	Refer to Section 4.1.
Stormwater Code	Refer to Appendix E and brief commentary in Section 7.
Infrastructure Design Code	Refer to Section 3, 5, 6, 8, 9, 10, 11 and 12.

Appendix A – Civil Engineering Plans

FOR CONTINUATION REFER TO SHEET DA-01-101



- LEGEND**
- XX.XX--- PROPOSED SURFACE CONTOURS
 - XX.XX--- EXISTING SURFACE CONTOURS
 - EXISTING PROPERTY BOUNDARY
 - WORKS BOUNDARY
 - W --- EXISTING WATER MAIN
 - S --- EXISTING SEWER PIPE
 - SWD --- EXISTING STORMWATER DRAINAGE
 - E-OH --- EXISTING ELECTRICITY (OVERHEAD)
 - E --- EXISTING ELECTRICITY
 - COMS --- EXISTING TELECOMMUNICATIONS
 - G --- EXISTING GAS

CUT/FILL DEPTH		
DEPTH COLOUR	LOWER DEPTH	UPPER DEPTH
	-9.99m	-14.0m
	-14.0m	-12.0m
	-12.0m	-10.0m
	-10.0m	-8.0m
	-8.0m	-6.0m
	-6.0m	-4.0m
	-4.0m	-2.0m
	-2.0m	0.0m
	0.0m	1.0m
	1.0m	2.0m
	2.0m	3.0m
	3.0m	4.0m
	4.0m	6.0m
	6.0m	7.0m
	7.0m	8.0m
	8.0m	9.99m

PRELIMINARY BULK EARTHWORKS VOLUMES		
CUT	FILL	BALANCE
128,222 m ³	81,555 m ³	46,667 m ³ (CUT)

STRIP VOLUMES		
AREA	DEPTH	VOLUME
115,455 m ²	100mm (TBC)	11,545 m ³

BOXING DEPTHS:

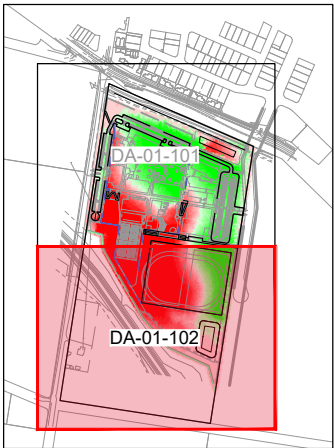
SMALL CAR PARKING AREAS
35mm AC + 150mm CBR80 BASE COARSE + 150mm CBR45 SUBBASE COARSE = 335mm

LARGE CAR PARKING AREAS
35mm AC + 150mm CBR80 BASE COARSE + 190mm CBR45 SUBBASE COARSE = 375mm

BUILDING SLABS
100mm THICK SLAB + 100mm CBR + 20mm SAND = 220mm

FOOTPATHS
100mm THICK SLAB + 20mm SAND = 120mm

SPORTS COURTS AND CENTRAL COURT YARDS
120mm THICK SLAB + 100mm CBR + 20mm SAND = 240mm



KEY PLAN
NTS

WARNING
UNDERGROUND SERVICES
EXIST IN THIS AREA. UNDERGROUND SERVICE
LOCATIONS AND DEPTHS TO BE
CONFIRMED PRIOR TO COMMENCEMENT
OF CONSTRUCTION WORKS.

FIRE ANT TREATMENT ZONE
MOVEMENT OF MATERIAL SHALL BE IN ACCORDANCE
WITH THE DEPARTMENT OF AGRICULTURE AND
FISHERIES ACTS AND REGULATIONS. FOR MORE
INFORMATION CALL BIOSECURITIES QUEENSLAND ON 13
25 23 OR VISIT WWW.DAF.QLD.GOV.AU FOR MORE
INFORMATION.

NOT FOR CONSTRUCTION

DRAWN: J. PIANO
DESIGNED: A. TATHAM
JOB MANAGER: S. KILLORAN
VERIFIER: S. KILLORAN

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	CONCEPT DESIGN	JP	SK	SK	20.02.26
B	CONCEPT DESIGN	BH	SK	SK	22.05.26

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS
VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
GROUP USA
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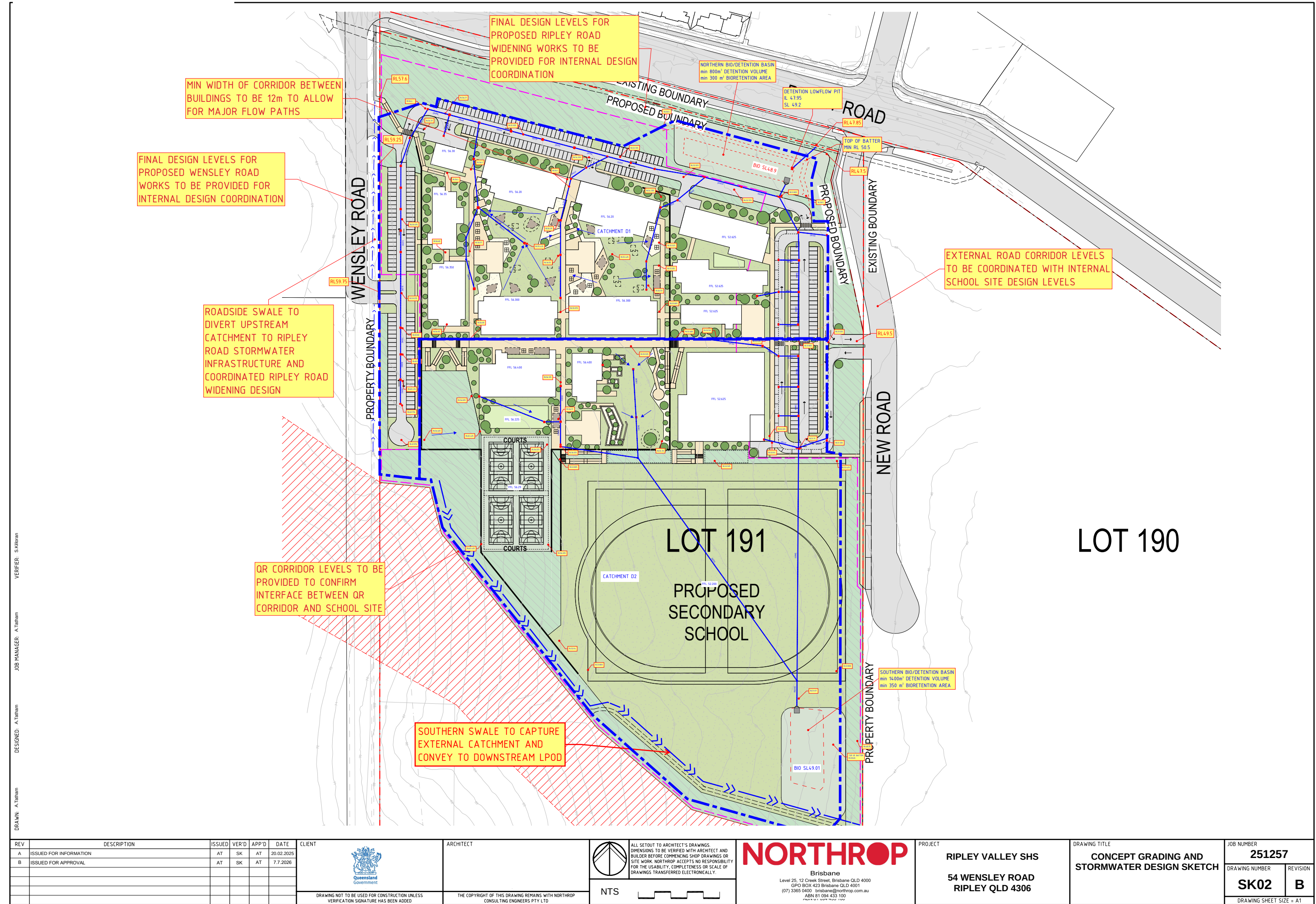
	ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.
SCALE 1:750@A1	

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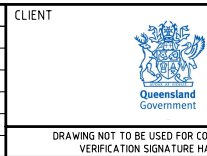
PROJECT
RIPLEY VALLEY SHS
18 PARKWAY AVE SOUTH RIPLEY QLD 4306

DRAWING TITLE
BULK EARTHWORKS LAYOUT PLAN SHEET 2 OF 2

JOB NUMBER	
251257	
DRAWING NUMBER	REVISION
DA-01-102	B
DRAWING SHEET SIZE = A1	



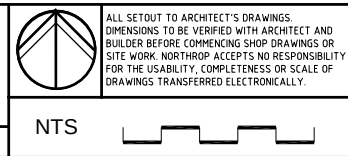
REV	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR INFORMATION	AT	SK	AT	20.02.2025
B	ISSUED FOR APPROVAL	AT	SK	AT	7.7.2026



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ABN 81 094 433 100

PROJECT

RIPLEY VALLEY SHS

54 WENSLEY ROAD

RIPLEY QLD 4306

DRAWING TITLE

**CONCEPT GRADING AND
STORMWATER DESIGN SKETCH**

JOB NUMBER	251257
DRAWING NUMBER	SK02
REVISION	B
DRAWING SHEET SIZE	A1

Appendix B – Detailed Site Survey

NOTES

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(2) Datum for all provided information is Plane Scale MGA2020. For true MGA coordinates and distances scale all information by 0.9996005. Datum point PSM 58130.

(3) The contours and levels shown on this plan are derived from a 5m grid digital elevation model extracted from LiDAR captured by the Department of Resources over Ipswich LGA between 12/08/2023 and 01/09/2023. Quoted Vertical Accuracy: +/- 0.2m @ 95% CI (2 Sigma).

(4) Property Boundaries
The lot boundaries and descriptions shown on this plan are extracted from the Queensland Digital Cadastre and are a general representation of the boundaries only. General accuracies of each parcel of land are included in the digital data. Data extracted on 23-09-2025.

A Cadastral Survey as defined by the Surveying and Mapping Infrastructure Act 2003 and Surveyors Act 2003 is required for accurate boundary positions and dimensions.

(5) All site features have been digitised from Nearmap imagery captured on 19 July 2025. Digitised features and Nearmap imagery provided for site layout and context.

(6) Provided utility locations are generated from BYDA Responses - Enquiry 51243159. This plan generally complies with Australian Standard 5488: Classification of Subsurface Utility Information (SUI).

Definitions:
Quality Level D (QL-D): Least accurate data and if used on its own has a high risk of damage. Includes Alignments that have been scaled or digitized from service provider's records.

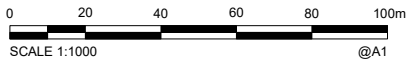
Only information with Quality Level A should be relied upon for detailed design. For more information see AS5488.

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Join Sheet 2



Symbols

- Electrical Light Pole
- Line Marking Bike Symbol
- Line Marking Chevron
- Line Marking Turning Arrow
- Permanent Survey Mark

Linework

- Building Line
- Electrical OverHead
- Electrical Located - Quality Level 'D'
- Fence Line
- Gas Located - Quality Level 'D'
- Line Marking - Chevron
- Line Marking - Continuity
- Line Marking - Solid
- Line Marking - Solid (Double)
- Line Marking - Turning
- Road Kerb Lip
- Road Footpath
- Road Track
- Sewer Located - Quality Level 'D'
- Storm Located - Quality Level 'D'
- Telecomms Located - Quality Level 'D'
- Water Located - Quality Level 'D'



CLIENT
GroupGSA
(Brisbane)

PROJECT
Proposed New Secondary School Site
Ripley Valley

PROJECT NO.
25-0325S

DRAWING NAME

Site Plan

Local Authority: Ipswich City Description: Lot 191 on SL18
Datum: PM58130 Origin: Supplied
Co-ord System: Plane Scale MGA2020

REVISION TABLE

REV	DESCRIPTION	DRAWN	APPROVED	DATE
A	Original Issue	KB	NM	09-10-2025

DRAWING NO.
25-0325S-02
SHEET NO.
1 of 2
REVISION
A



Join Sheet 1



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Definitions:
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- Electrical Light Pole
- Line Marking Bike Symbol
- Line Marking Chevron
- Line Marking Turning Arrow
- Permanent Survey Mark

Linework

- Building Line
- Electrical OverHead
- Electrical Located - Quality Level 'D'
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- Line Marking - Continuity
- Line Marking - Solid
- Line Marking - Solid (Double)
- Line Marking - Turning
- Road Kerb Lip
- Road Footpath
- Road Track
- Sewer Located - Quality Level 'D'
- Storm Located - Quality Level 'D'
- Telecomms Located - Quality Level 'D'
- Water Located - Quality Level 'D'



CLIENT
GroupGSA
(Brisbane)

PROJECT
Proposed New Secondary School Site
Ripley Valley

PROJECT NO.
25-0325S

DRAWING NAME

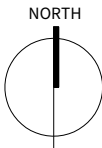
Site Plan

Local Authority: Ipswich City Description: Lot 191 on SL18
Datum: PM58130 Origin: Supplied
Co-ord System: Plane Scale MGA2020

REVISION TABLE

REV	DESCRIPTION	DRAWN	APPROVED	DATE
A	Original Issue	KB	NM	09-10-2025

DRAWING NO.
25-0325S-02
SHEET NO.
2 of 2
REVISION
A



Appendix C – DBYD Information

Response Cover Letter

OptiComm
Level 1/22 Salmon Street
Port Melbourne
VIC 3207

Date: 23/09/2025

To:
Therefor Group Search
Therefor Group Pty Ltd
PO Box 436
New Farm QLD 4005

Please find attached our response regarding your enquiry (as detailed below). Ensure you review all other documents included with this response to identify any OptiComm assets in the vicinity of your enquiry.

Sequence No: 261529847

Job No: 51243159

Location: 54 Wensley Road
Ripley QLD 4306

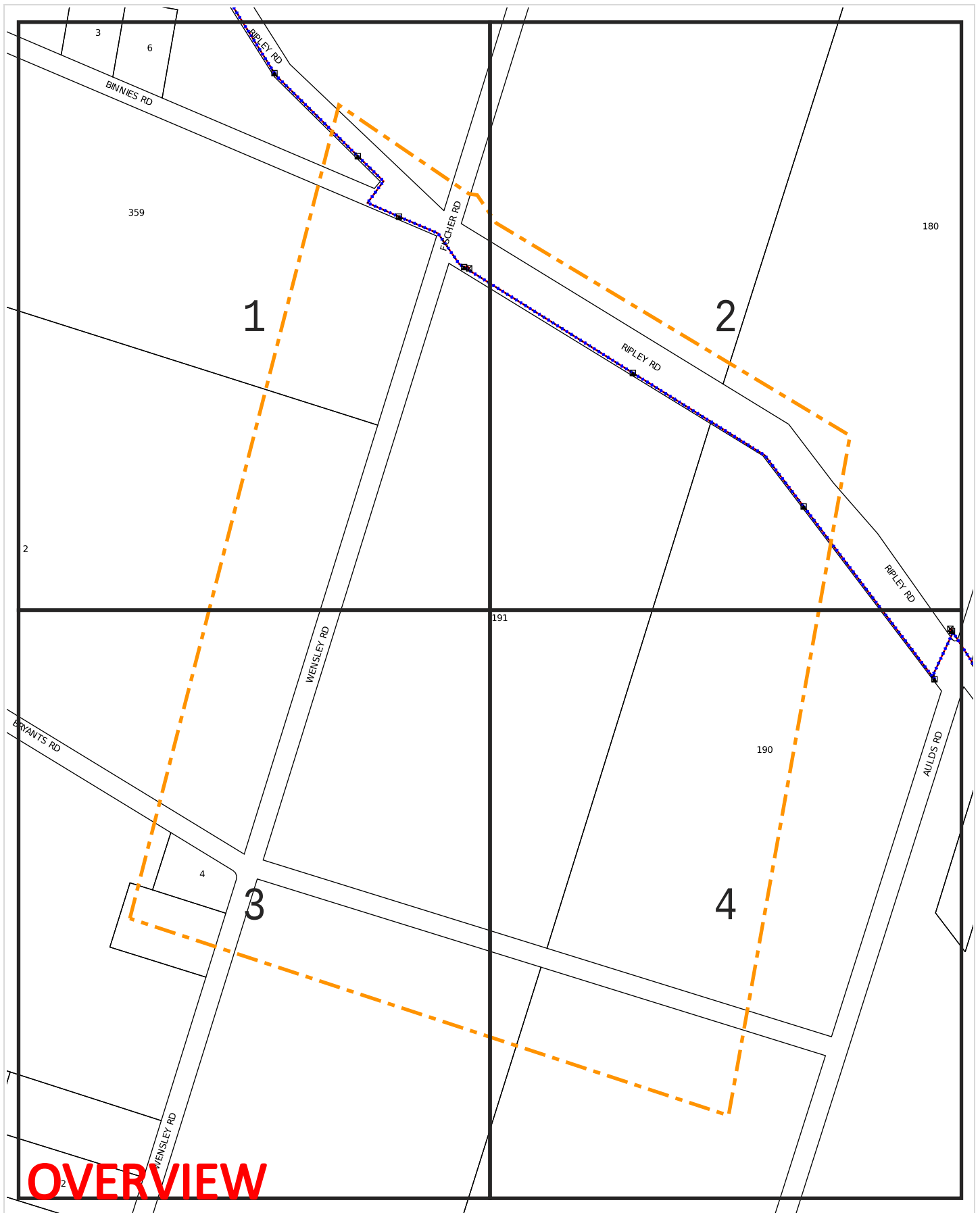
If you require further information, please contact the OptiComm on 1300 743 462 or DBYD@OptiComm.net.au

Important Notice: This enquiry response, including any associated documentation, has been assessed and compiled from the information detailed within the DBYD enquiry outlined above. Please ensure that the DBYD enquiry details and this response accurately reflect your proposed works.

This response is intended for use only by the addressee. If you have received the enquiry response in error, please let us know by telephone and delete all copies; you are advised that copying, distributing, disclosing or otherwise acting in reliance on the response is expressly prohibited.



While reasonable measures have been taken to ensure the accuracy of the information contained in this plan response, neither OptiComm nor PelicanCorp shall have any liability whatsoever in relation to any loss, damage, cost or expense arising from the use of this plan response or the information contained in it or the completeness or accuracy of such information. Use of such information is subject to and constitutes acceptance of these terms.



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Sequence Number: 261529849

Date Generated: 23 Sep 2025



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





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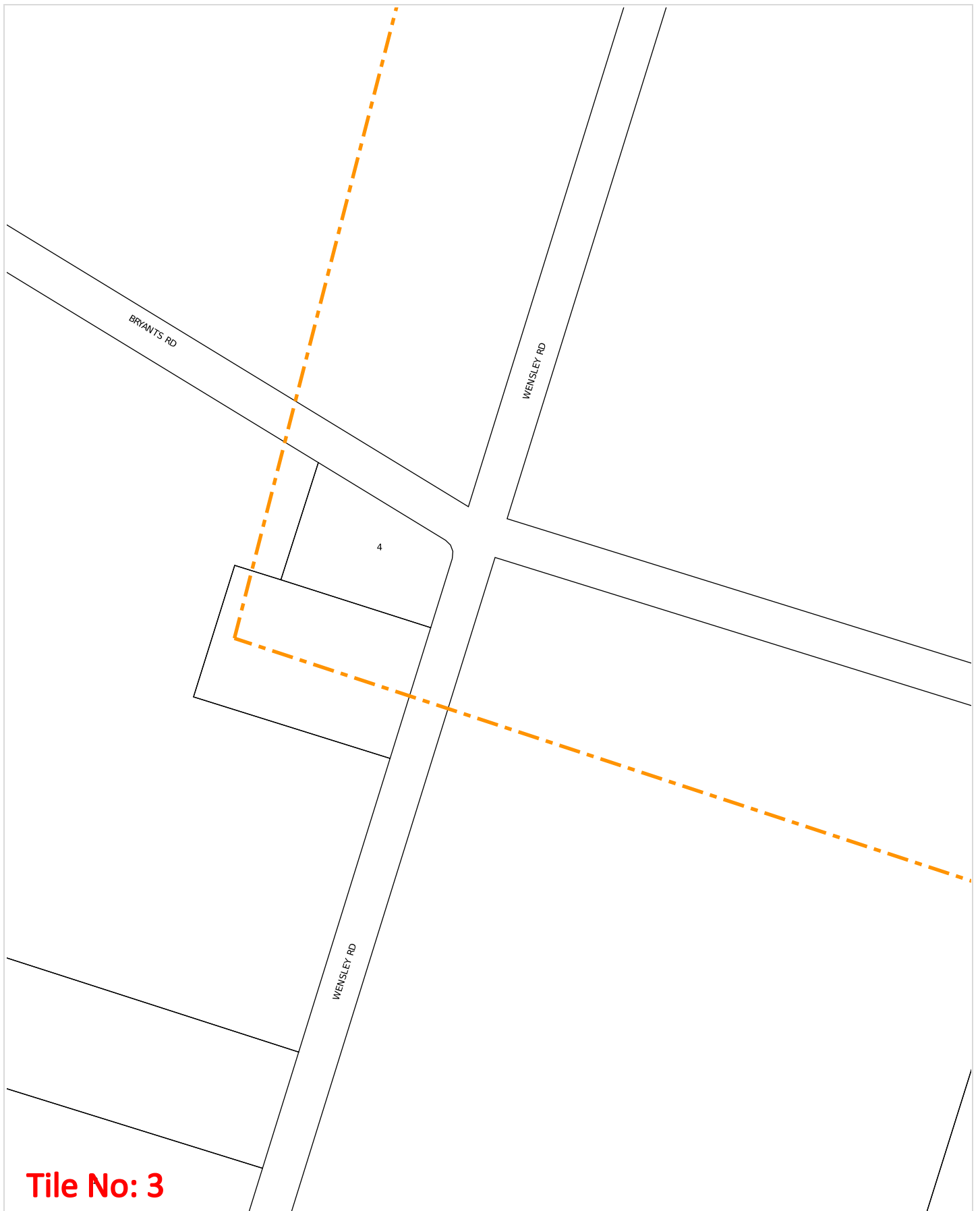
Sequence Number: 261529849

Date Generated: 23 Sep 2025



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For urgent onsite assistance contact 1800 505 777
Optus Limited ACN 052 833 208





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Sequence Number: 261529849

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Sequence Number: 261529849

Date Generated: 23 Sep 2025



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For urgent onsite assistance contact 1800 505 777
Optus Limited ACN 052 833 208





BYDA

Sequence: 261529850
Date: 23/09/2025

Scale: 1:4383
Tile No: **OVERVIEW**

CAUTION - HIGH VOLTAGE

LEGEND

- Substation
- Cable Marker
- Pit
- Pole
- Pillar
- LV Cable (up to 1kV)
- HV Cable (1kV – <33kV)
- HV Cable (33kV and over)
- Pit Boundary
- Planned Work Area

AS5488 Category "D" Plan



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

For Emergency Situations
Please Call 13 19 62



BYDA

Sequence: 261529850
Date: 23/09/2025

Scale: 1:500
Tile No: **Tile No: 1**

**CAUTION - HIGH
VOLTAGE**

LEGEND

- Substation
- Cable Marker
- Pit
- Pole
- Pillar
- LV Cable (up to 1kV)
- HV Cable (1kV - <33kV)
- HV Cable (33kV and over)
- Pit Boundary
- Planned Work Area

AS5488 Category "D" Plan



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BYDA

Sequence: 261529850
Date: 23/09/2025
Scale: 1:500
Tile No: **Tile No: 2**

CAUTION - HIGH VOLTAGE

LEGEND

- Substation
- Cable Marker
- Pit
- Pole
- Pillar
- LV Cable (up to 1kV)
- HV Cable (1kV - <33kV)
- HV Cable (33kV and over)
- Pit Boundary
- Planned Work Area

AS5488 Category "D" Plan



DISCLAIMER: While reasonable measures have been taken to ensure the accuracy of the information contained in this plan response, neither Energex nor Pelican Corp shall have any liability whatsoever in relation to any loss, damage, cost or expense arising from the use of this plan response or the information contained in it or the completeness or accuracy of such information. Use of such information is subject to and constitutes acceptance of these terms.

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

For Emergency Situations
Please Call 13 19 62



BYDA

Sequence: 261529850
Date: 23/09/2025

Scale: 1:500
Tile No: **Tile No: 3**

CAUTION - HIGH VOLTAGE

LEGEND

- Substation
- Cable Marker
- Pit
- Pole
- Pillar
- LV Cable (up to 1kV)
- HV Cable (1kV – <33kV)
- HV Cable (33kV and over)
- Pit Boundary
- Planned Work Area

AS5488 Category “D” Plan



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BYDA

Sequence: 261529850
Date: 23/09/2025

Scale: 1:500
Tile No: **Tile No: 4**

**CAUTION - HIGH
VOLTAGE**

LEGEND

- Substation
- Cable Marker
- Pit
- Pole
- Pillar
- LV Cable (up to 1kV)
- HV Cable (1kV - <33kV)
- HV Cable (33kV and over)
- Pit Boundary
- Planned Work Area

AS5488 Category "D" Plan



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For Emergency Situations
Please Call 13 19 62



BYDA

Sequence: 261529850
Date: 23/09/2025

Scale: 1:500
Tile No: **Tile No: 5**

CAUTION - HIGH VOLTAGE

LEGEND

- Substation
- Cable Marker
- Pit
- Pole
- Pillar
- LV Cable (up to 1kV)
- HV Cable (1kV - <33kV)
- HV Cable (33kV and over)
- Pit Boundary
- Planned Work Area

AS5488 Category "D" Plan



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BYDA

Sequence: 261529850
Date: 23/09/2025

Scale: 1:500
Tile No: **Tile No: 6**

**CAUTION - HIGH
VOLTAGE**

LEGEND

-  Substation
-  Cable Marker
-  Pit
-  Pole
-  Pillar
-  LV Cable (up to 1kV)
-  HV Cable (1kV - <33kV)
-  HV Cable (33kV and over)
-  Pit Boundary
-  Planned Work Area

AS5488 Category "D" Plan



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For Emergency Situations
Please Call 13 19 62



BYDA

Sequence: 261529850
Date: 23/09/2025

Scale: 1:500
Tile No: **Tile No: 7**

CAUTION - HIGH VOLTAGE

LEGEND

- Substation
- Cable Marker
- Pit
- Pole
- Pillar
- LV Cable (up to 1kV)
- HV Cable (1kV - <33kV)
- HV Cable (33kV and over)
- Pit Boundary
- Planned Work Area

AS5488 Category "D" Plan



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For Emergency Situations
Please Call 13 19 62



BYDA

Sequence: 261529850
Date: 23/09/2025

Scale: 1:500
Tile No: **Tile No: 8**

**CAUTION - HIGH
VOLTAGE**

LEGEND

- Substation
- Cable Marker
- Pit
- Pole
- Pillar
- LV Cable (up to 1kV)
- HV Cable (1kV - <33kV)
- HV Cable (33kV and over)
- Pit Boundary
- Planned Work Area

AS5488 Category "D" Plan



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For Emergency Situations
Please Call 13 19 62



BYDA

Sequence: 261529850
Date: 23/09/2025

Scale: 1:500
Tile No: **Tile No: 9**

CAUTION - HIGH
VOLTAGE

LEGEND

-  Substation
-  Cable Marker
-  Pit
-  Pole
-  Pillar
-  LV Cable (up to 1kV)
-  HV Cable (1kV – <33kV)
-  HV Cable (33kV and over)
-  Pit Boundary
-  Planned Work Area

AS5488 Category “D” Plan



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For Emergency Situations
Please Call 13 19 62



BYDA

Sequence: 261529850
Date: 23/09/2025

Scale: 1:500
Tile No: **Tile No: 10**

CAUTION - HIGH VOLTAGE

LEGEND

- Substation
- Cable Marker
- Pit
- Pole
- Pillar
- LV Cable (up to 1kV)
- HV Cable (1kV - <33kV)
- HV Cable (33kV and over)
- Pit Boundary
- Planned Work Area

AS5488 Category "D" Plan



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For Emergency Situations
Please Call 13 19 62



BYDA

Sequence: 261529850
Date: 23/09/2025

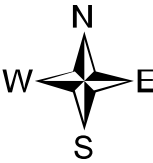
Scale: 1:500
Tile No: **Tile No: 11**

CAUTION - HIGH VOLTAGE

LEGEND

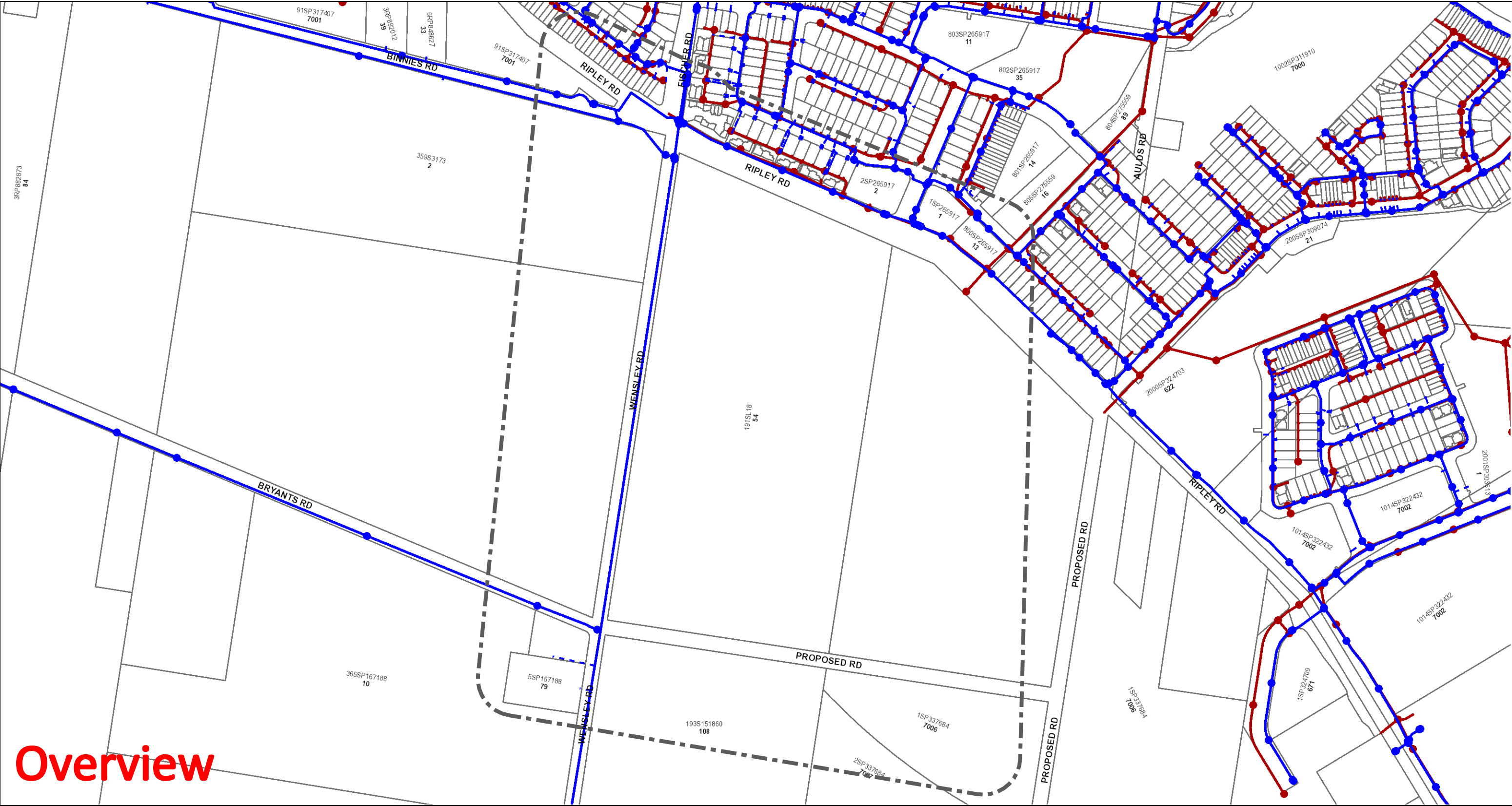
- Substation
- Cable Marker
- Pit
- Pole
- Pillar
- LV Cable (up to 1kV)
- HV Cable (1kV – <33kV)
- HV Cable (33kV and over)
- Pit Boundary
- Planned Work Area

AS5488 Category “D” Plan



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Urban Utilities - Water, Recycled Water and Sewer Infrastructure





N



Map Scale
1:4966

Before You Dig Australia- Urban Utilities Water, Recycled Water and Sewer Infrastructure

BYDA Reference No: 261529851

Date BYDA Ref Received: 23/09/2025
Date BYDA Job to Commence: 24/09/2025
Date BYDA Map Produced: 22/09/2025

This Map is valid for 30 days Produced By: Urban Utilities

Sewer	Water	Recycled Water
● Infrastructure	● Infrastructure	● Infrastructure
◆ Major Infrastructure	◆ Major Infrastructure	◆ Major Infrastructure
— Network Pipelines	— Network Pipelines	— Network Pipelines
▨ Network Structures	▨ Network Structures	▨ Network Structures
	--- Water Service (Indicative only)	

While reasonable measures have been taken to ensure the accuracy of the information contained in this plan response, neither Urban Utilities nor PelicanCorp shall have any liability whatsoever in relation to any loss, damage, cost or expense arising from the use of this plan response or the information contained in it or the completeness or accuracy of such information. Use of such information is subject to and constitutes acceptance of these terms.

The plans are indicative and approximate only and provided without warranties of any kind, express or implied including in relation to accuracy, completeness, correctness, currency or fitness for purpose.

Urban Utilities takes no responsibility and accepts no liability for any loss, damage, costs or liability that may be incurred by any person acting in reliance on the information provided on the plans.

This plan should be used as guide only. Any dimensions should be confirmed on site by the relevant authority.

Based on or contains data provided by the State of Queensland (Department of Natural Resources and Mines) [2020]. In consideration of the State permitting the use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws. © State of Queensland Department of Natural Resources and Mines [2020]

For further information, please call Urban Utilities on 13 26 57 (8am-6pm weekdays). Faults and emergencies 13 23 64 (24/7).

www.urbanutilities.com.au

ABN 86 673 835 011

APA

Australia's energy
infrastructure partner



Before You Dig Australia

Classification: Networks

Enquiry date	23/09/2025
Sequence number	261529852
Work site address	54 Wensley Road Ripley QLD 4306





For your immediate information

**THERE IS A GAS PIPELINE OR INFRASTRUCTURE ASSETS
(GAS ASSETS)**

located in close vicinity to your works.

Enquiry Date: 23/09/2025
Enquirer: Therefor Group Search
Sequence Number: 261529852
Work Site Address: 54 Wensley Road
Ripley
QLD 4306

Thank you for your Before You Dig enquiry regarding the location of gas assets.

We confirm there are Gas Assets located in close vicinity of the above location.

Caution: Damage to gas assets may result in explosion, fire and personal injury.

Please ensure you read all the relevant information contained in this response to your BYDA enquiry including reviewing the **APA Guidelines for Works Near Existing Gas Assets** and clearly understand and comply with all requirements relating to your scope of work.

If you have any queries relating to this information, or you are unable to comply with requirements of the APA Guidelines for Works Near Existing Gas Assets contact the APA Before You Dig Officer

- Phone 1800 085 628
- Email BYDA_APA@apa.com.au

for clarification before proceeding with any work.

Before You Dig Checklist



1. Plan

- Review maps provided with this BYDA response and confirm the location of your work site is correct.
 - Review the **APA Guidelines for Works Near Existing Gas Assets** and clearly understand requirements relating to my scope of work.
-



2. Prepare

- Electronically locate gas assets and mark locations.
 - Note: Look for visible evidence of gas assets at the worksite which may not be shown on plans.
-



3. Pothole

- Physically confirm ('prove') the location of gas assets by potholing by hand excavation or non- destructive vacuum excavation methods in accordance with **APA Guidelines for Works Near Existing Gas Assets**.
 - Road authorities, councils, utilities and their authorised contractors and agents are responsible to pothole or use other suitable methods to verify the location and depth of all gas assets, including gas (inlet) services, prior to commencing any works.
-



4. Protect

- Protect gas assets by maintaining clearances whilst excavating and following conditions provided by APA.
 - Where required by APA, only conducting work in proximity to gas assets while Site Watch is on site.
 - Where applicable, APA Authority To Work permit conditions are clearly understood and complied with.
 - Strap and support exposed mains and inlet services. Cover exposed mains to prevent damage until the excavation can be permanently restored.
-



5. Proceed

- Only proceed with your work once you have completed all the planning, preparation, potholing and protection requirements.
 - APA BYDA response (including maps) are on site for reference at all times, and less than 30 days old.
-

Contacts

Contacts APA Group	
Enquiry	Contact Numbers
General enquiries or feedback regarding this information or gas assets.	APA – Before You Dig Officer Phone: 1800 085 628 Email: BYDA_APA@apa.com.au
Gas Emergencies	Phone: 1800 GAS LEAK (1800 427 532)

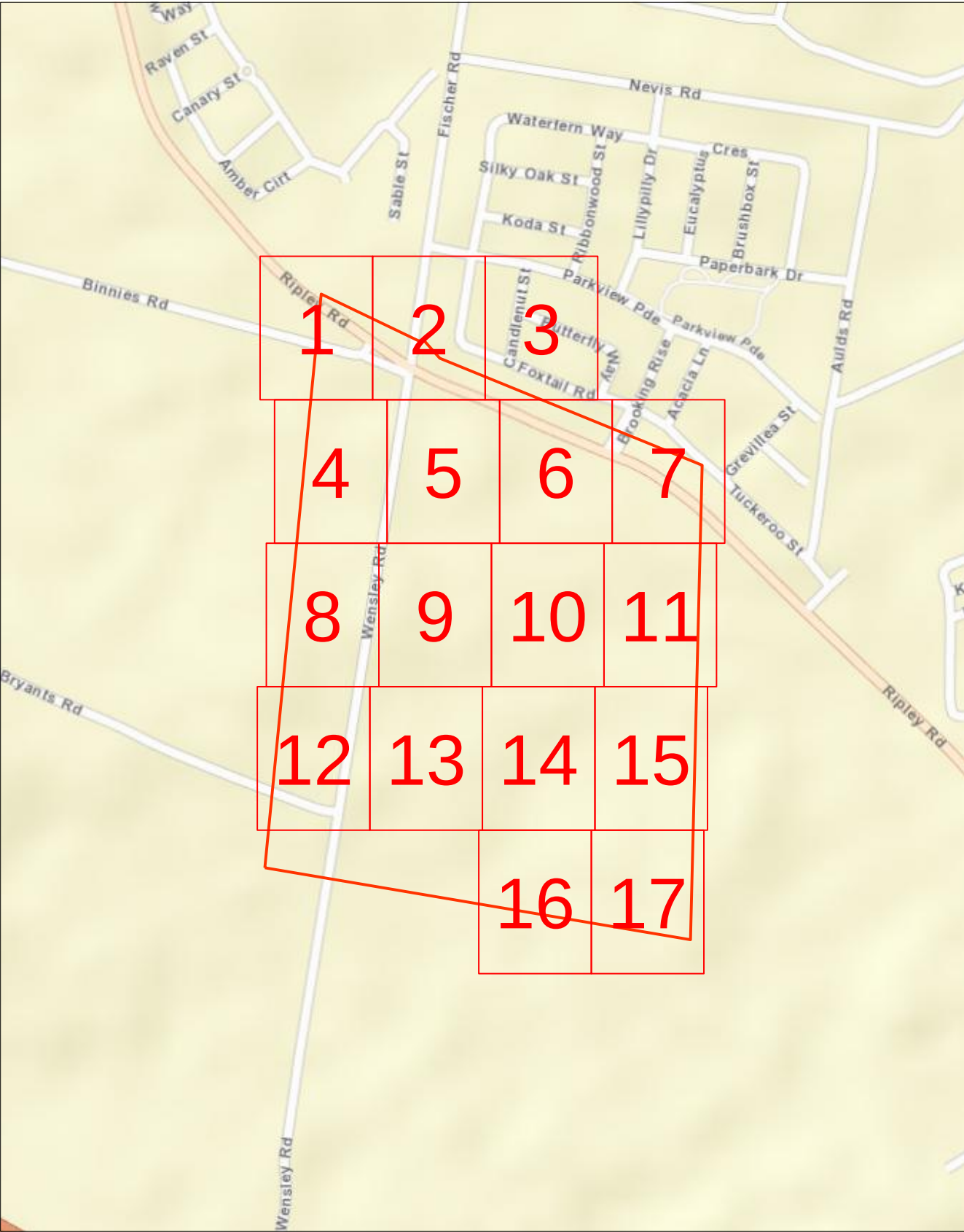
Site Watch

Site Watch is where an APA field officer attends your work site to monitor and ensure controls are in place to protect critical gas assets from damage during work.

The following rates apply for this service (1 hour minimum charge):

Item	Rate (excl. gst)
Site Watch – Business Hours	\$143.42 per hour
Site Watch – After Hours	\$175.06 per hour
Cancellation Fee	\$286.84
<i>Fee applies where cancelations received after 12pm (midday), 1 business day prior to the booking.</i>	

Contact APA – Before You Dig officer for state specific hours of business.



Scale 1: 6000

Map Sources: Esri, Garmin, HERE, FAO, NOAA, USGS,
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Enquiry Area

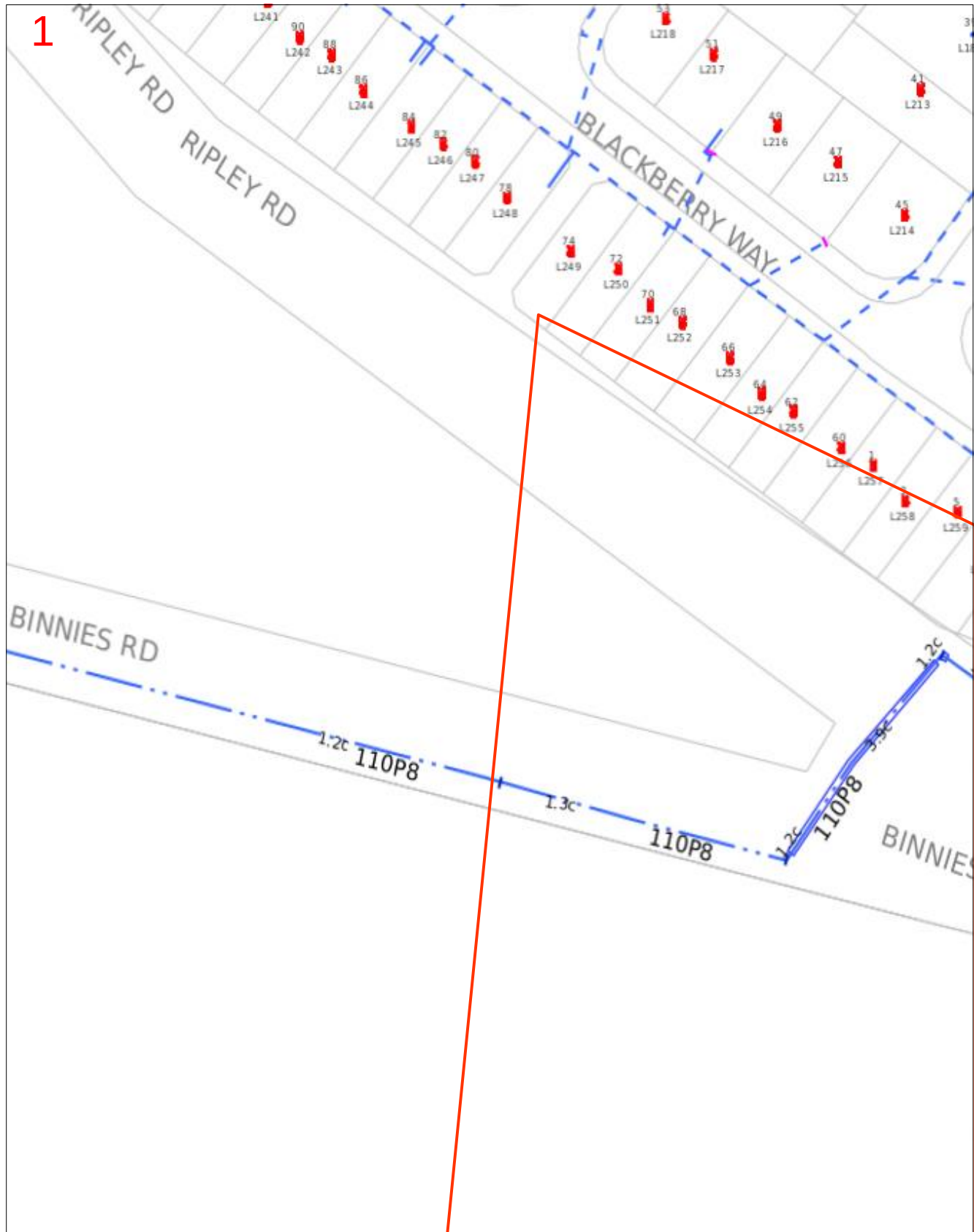


Map Key Area



Site 54 Wensley Road
Address: Ripley
QLD 4306

Sequence 261529852
Number:



Scale 1: 700

Map Sources: Esri, Garmin, HERE, FAO, NOAA, USGS,
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Enquiry Area

Map Key Area



Site 54 Wensley Road
Address: Ripley
QLD 4306

Sequence 261529852
Number:



Scale 1: 700

Map Sources: Esri, Garmin, HERE, FAO, NOAA, USGS,
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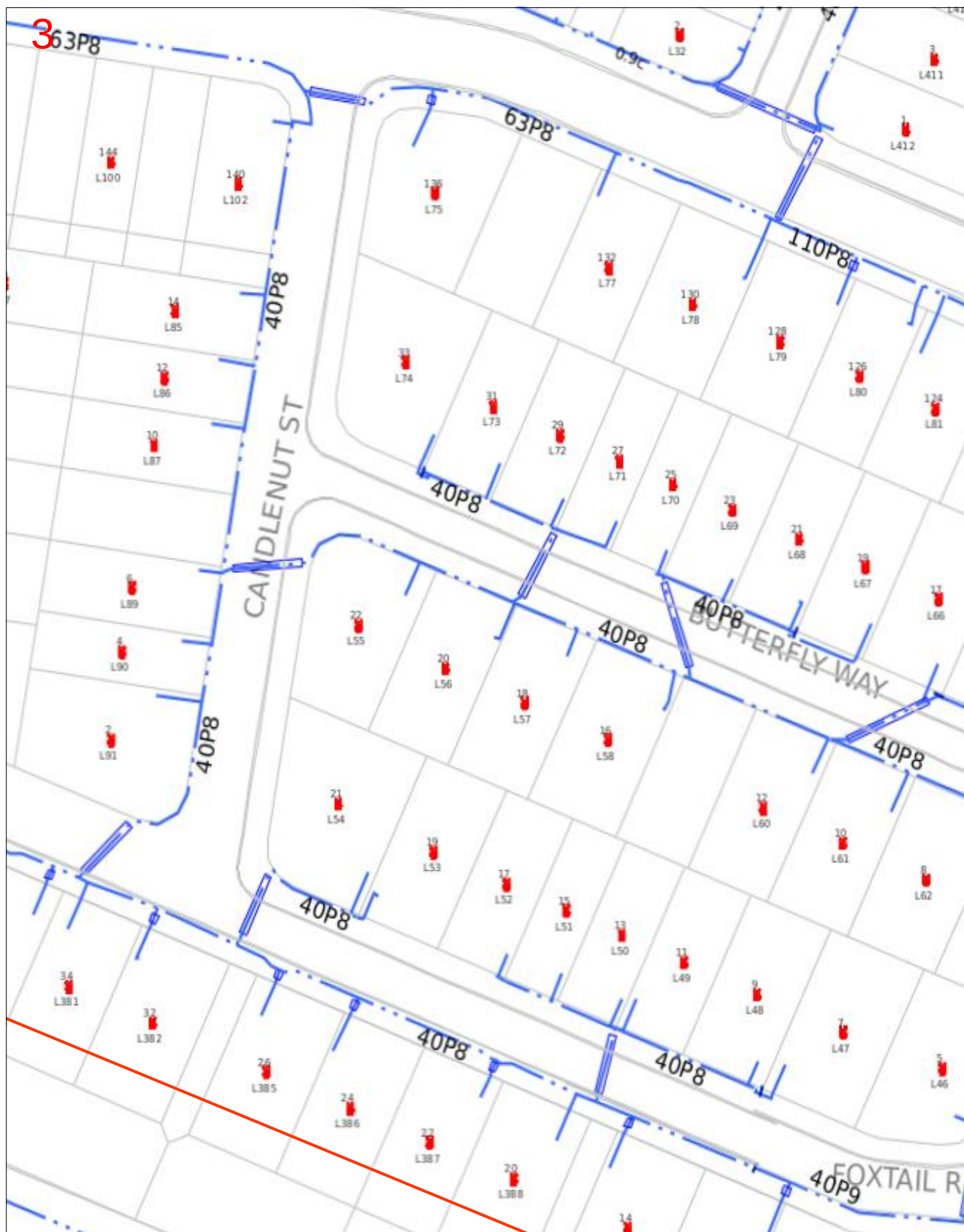
Enquiry Area

Map Key Area



Site 54 Wensley Road
Address: Ripley
QLD 4306

Sequence 261529852
Number:



Scale 1: 700

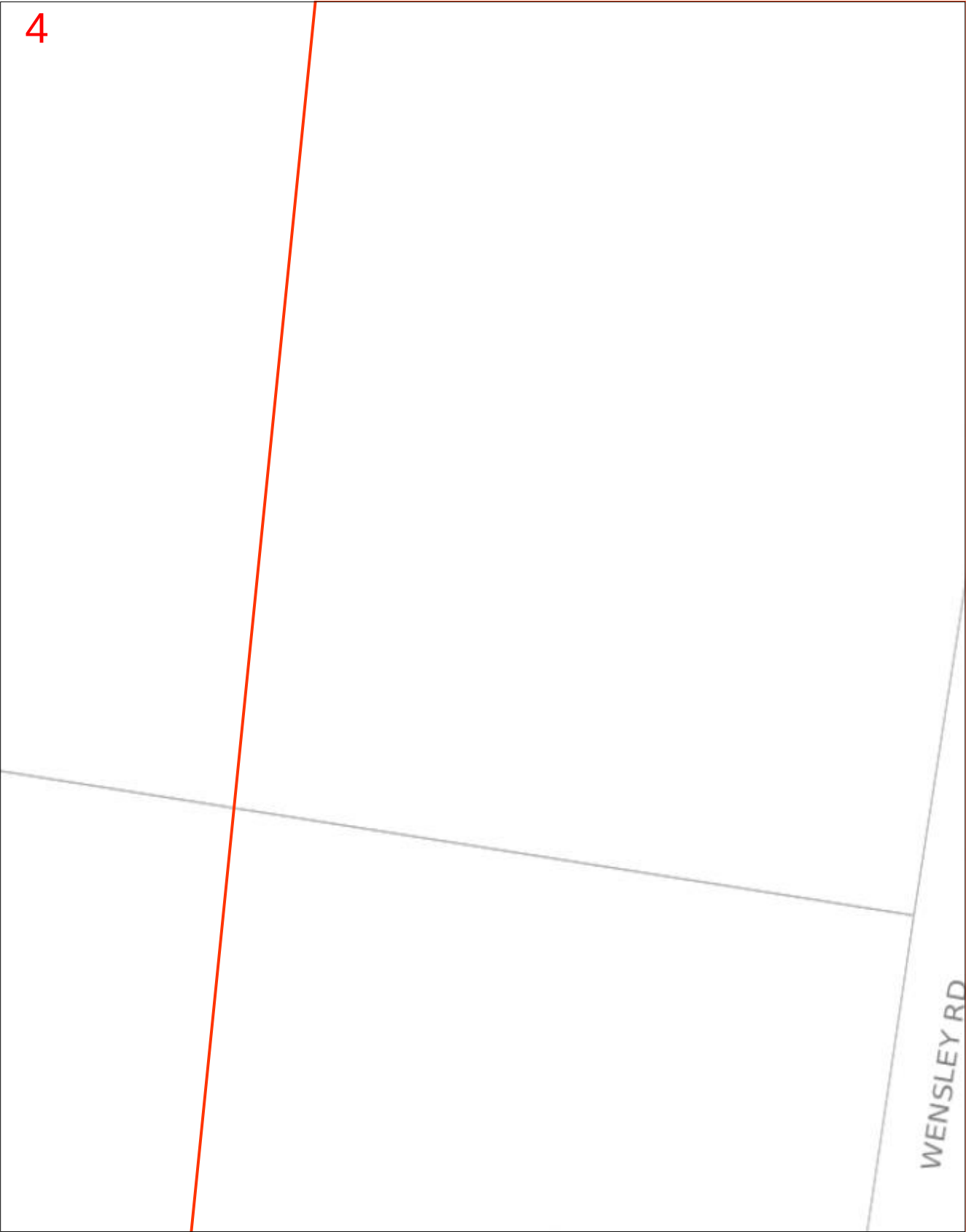
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Enquiry Area

Map Key Area





Scale 1: 700

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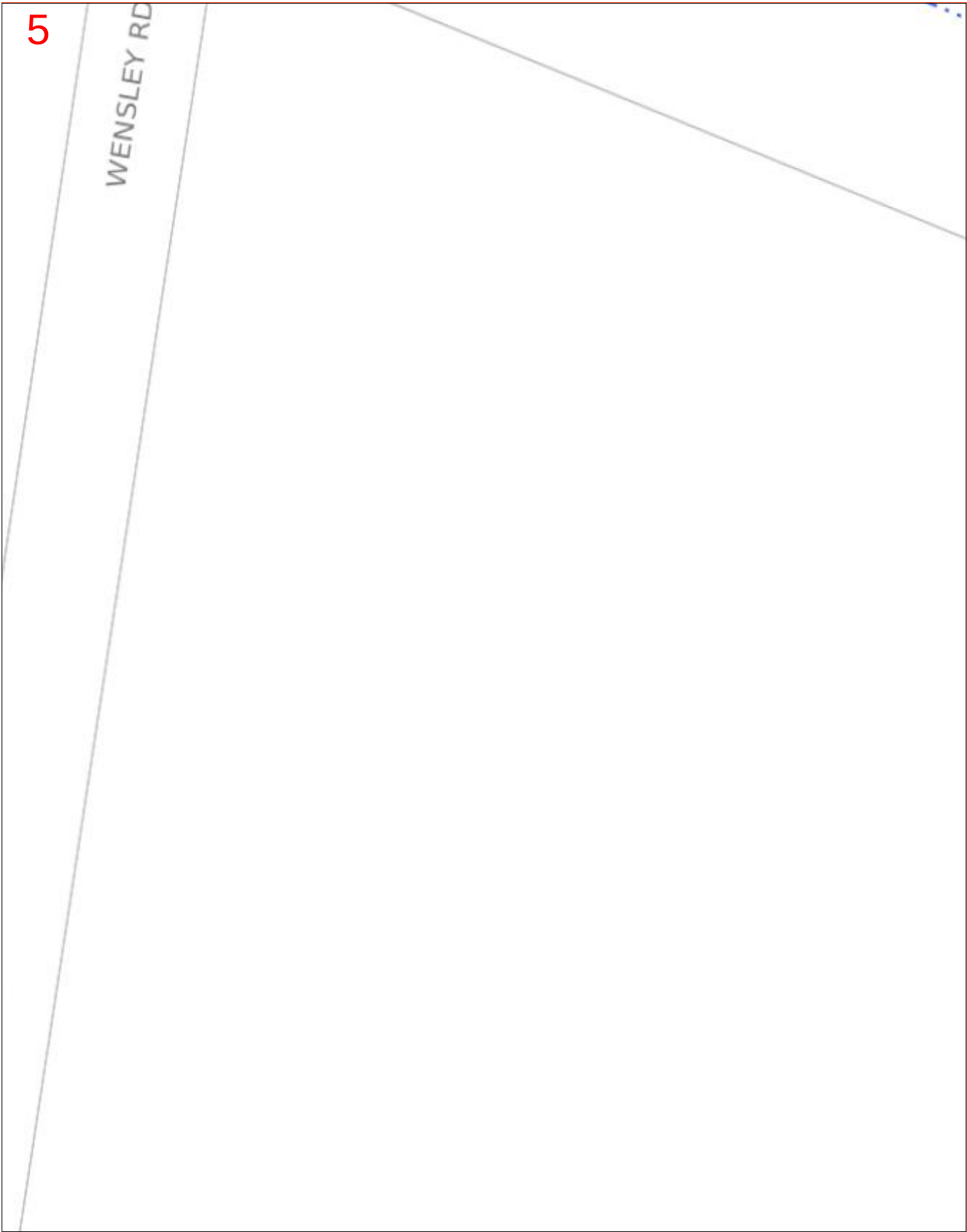


Enquiry Area



Map Key Area





Scale 1: 700

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Enquiry Area

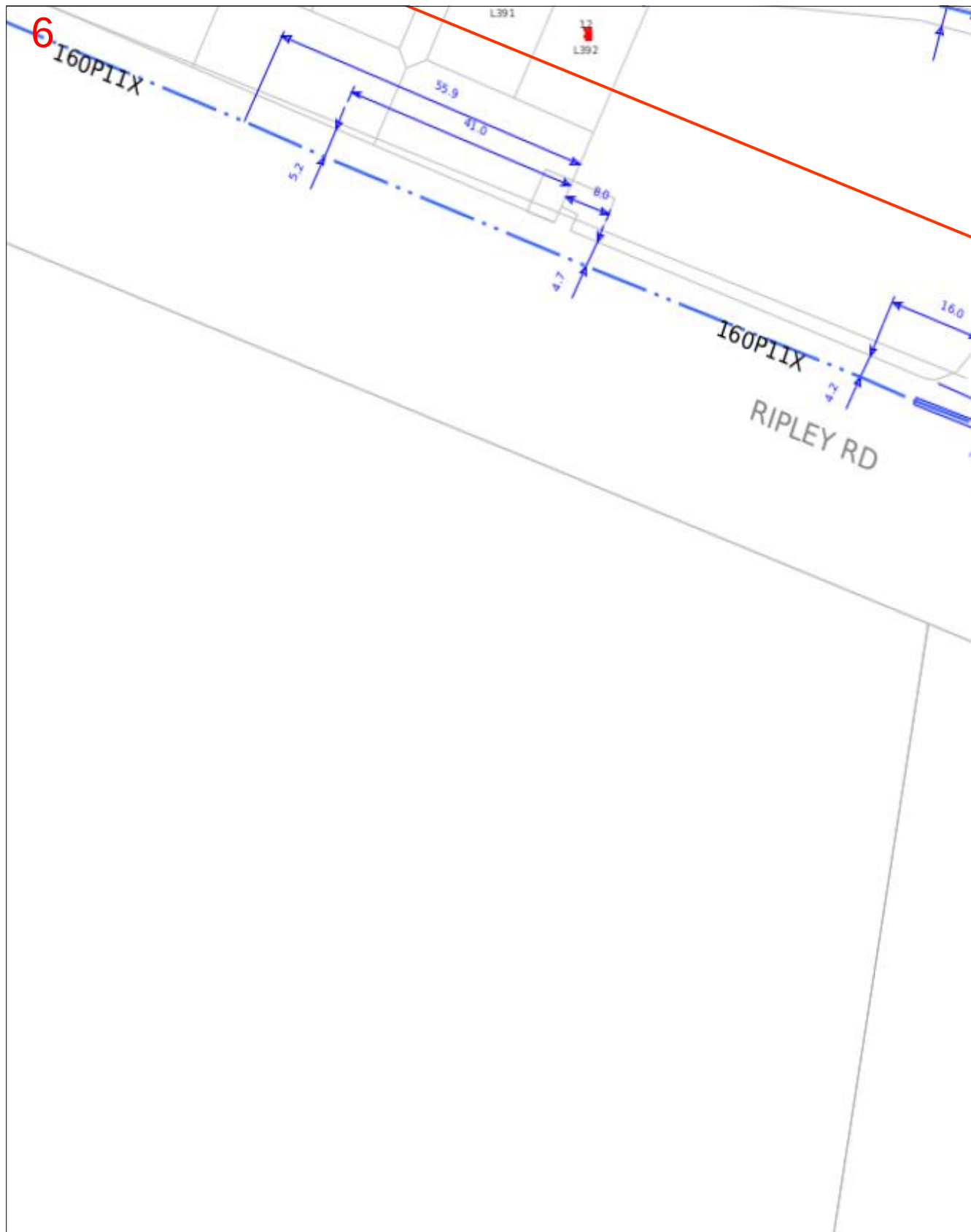


Map Key Area



Site 54 Wensley Road
Address: Ripley
QLD 4306

Sequence 261529852
Number:



Scale 1: 700

Map Sources: Esri, Garmin, HERE, FAO, NOAA, USGS,
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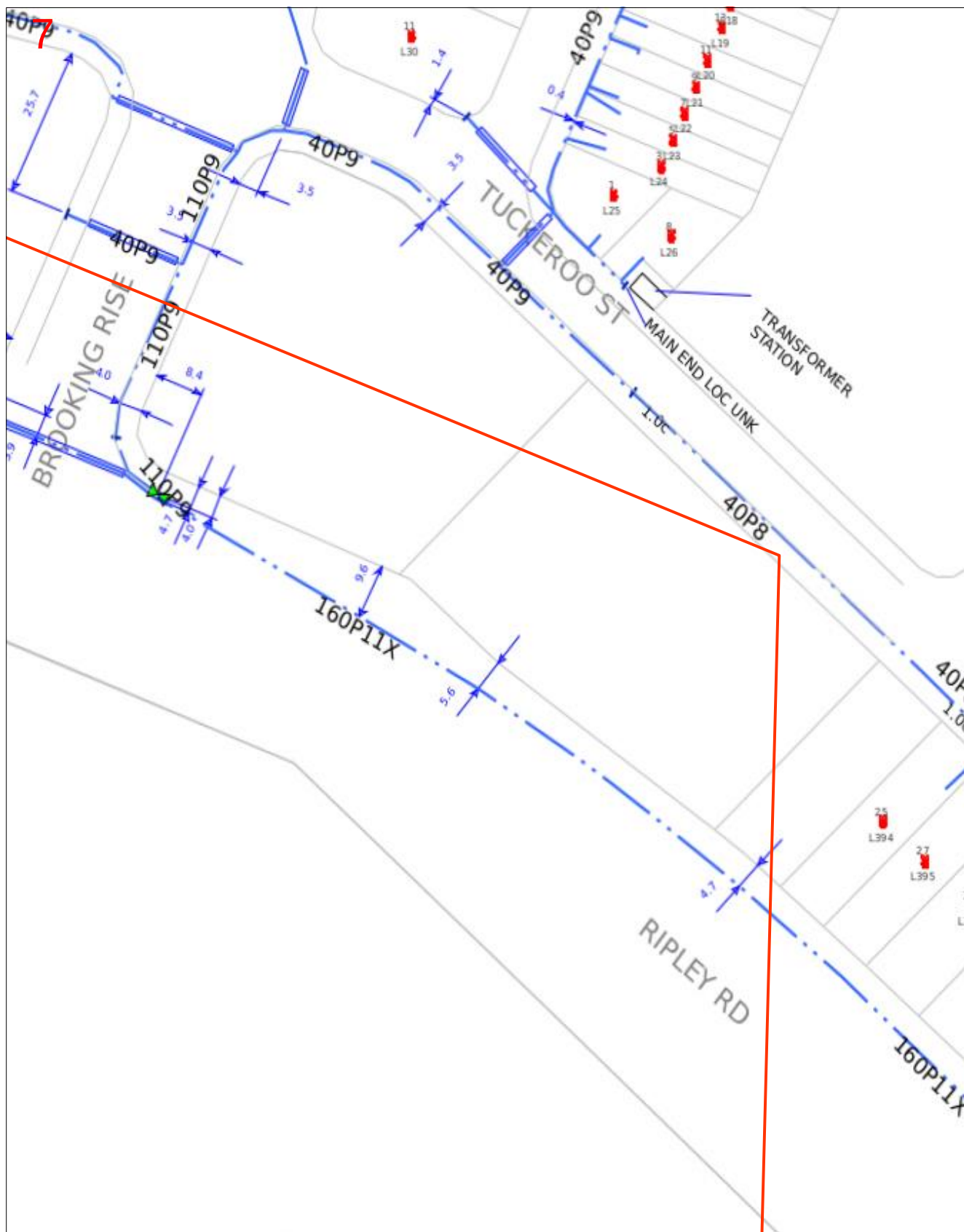
Enquiry Area

Map Key Area



Site 54 Wensley Road
Address: Ripley
QLD 4306

Sequence 261529852
Number:



Scale 1: 700

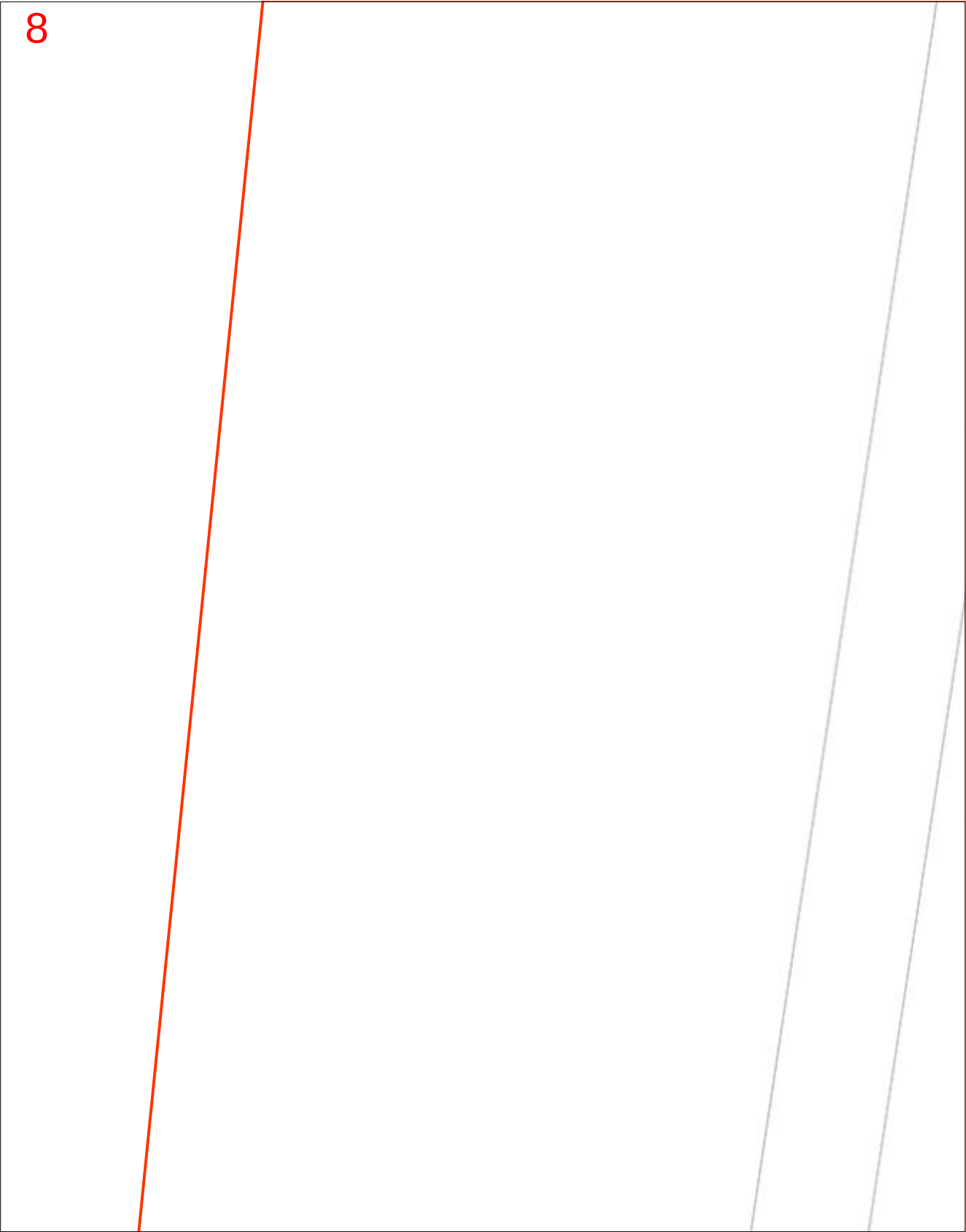
Map Sources: Esri, Garmin, HERE, FAO, NOAA, USGS,
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Enquiry Area

Map Key Area





Scale 1: 700

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Enquiry Area



Map Key Area





Scale 1: 700

Map Sources: Esri, Garmin, HERE, FAO, NOAA, USGS,
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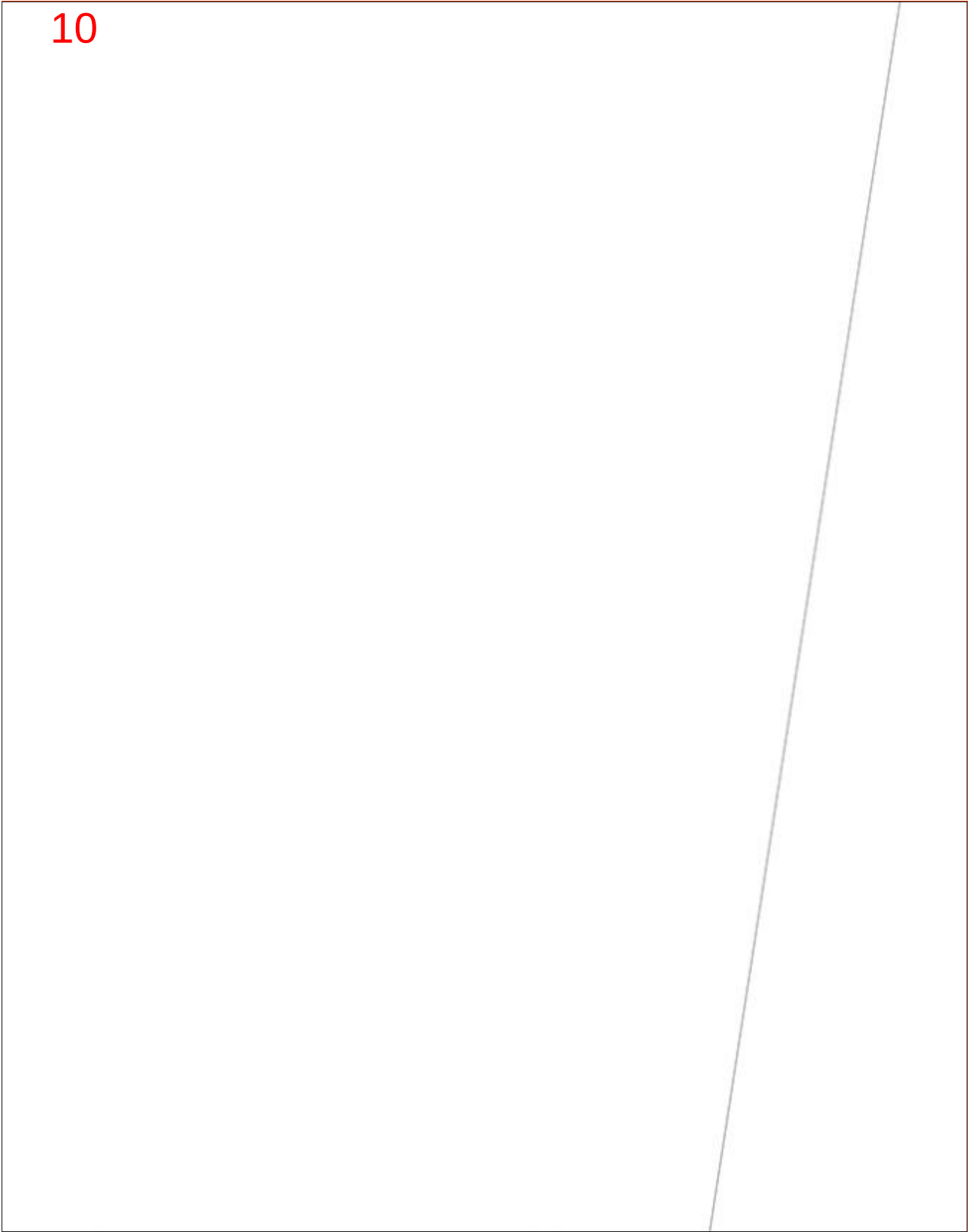


Enquiry Area



Map Key Area





Scale 1: 700

Map Sources: Esri, Garmin, HERE, FAO, NOAA, USGS,
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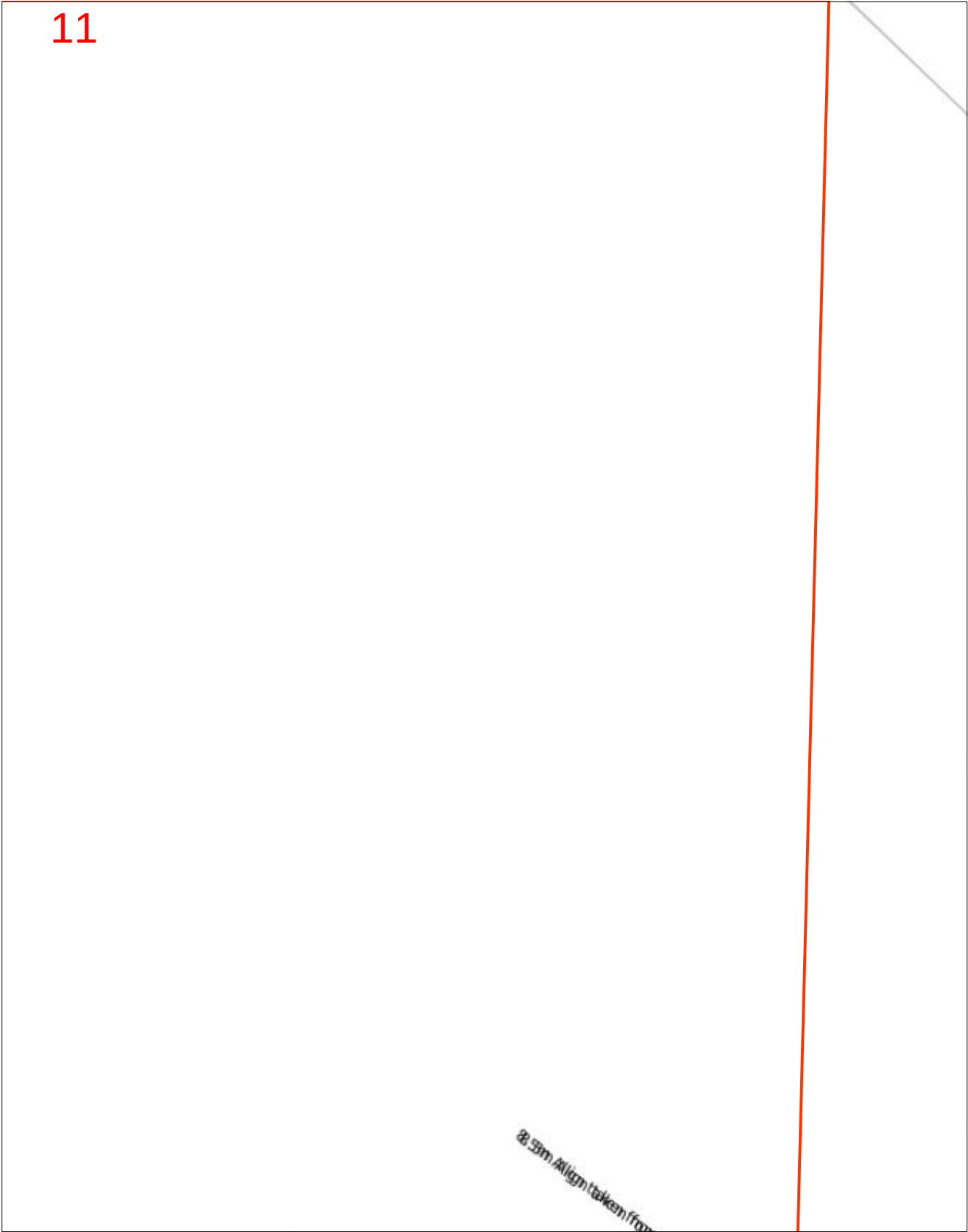


Enquiry Area



Map Key Area





Scale 1: 700

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Enquiry Area



Map Key Area





Scale 1: 700

Map Sources: Esri, Garmin, HERE, FAO, NOAA, USGS,
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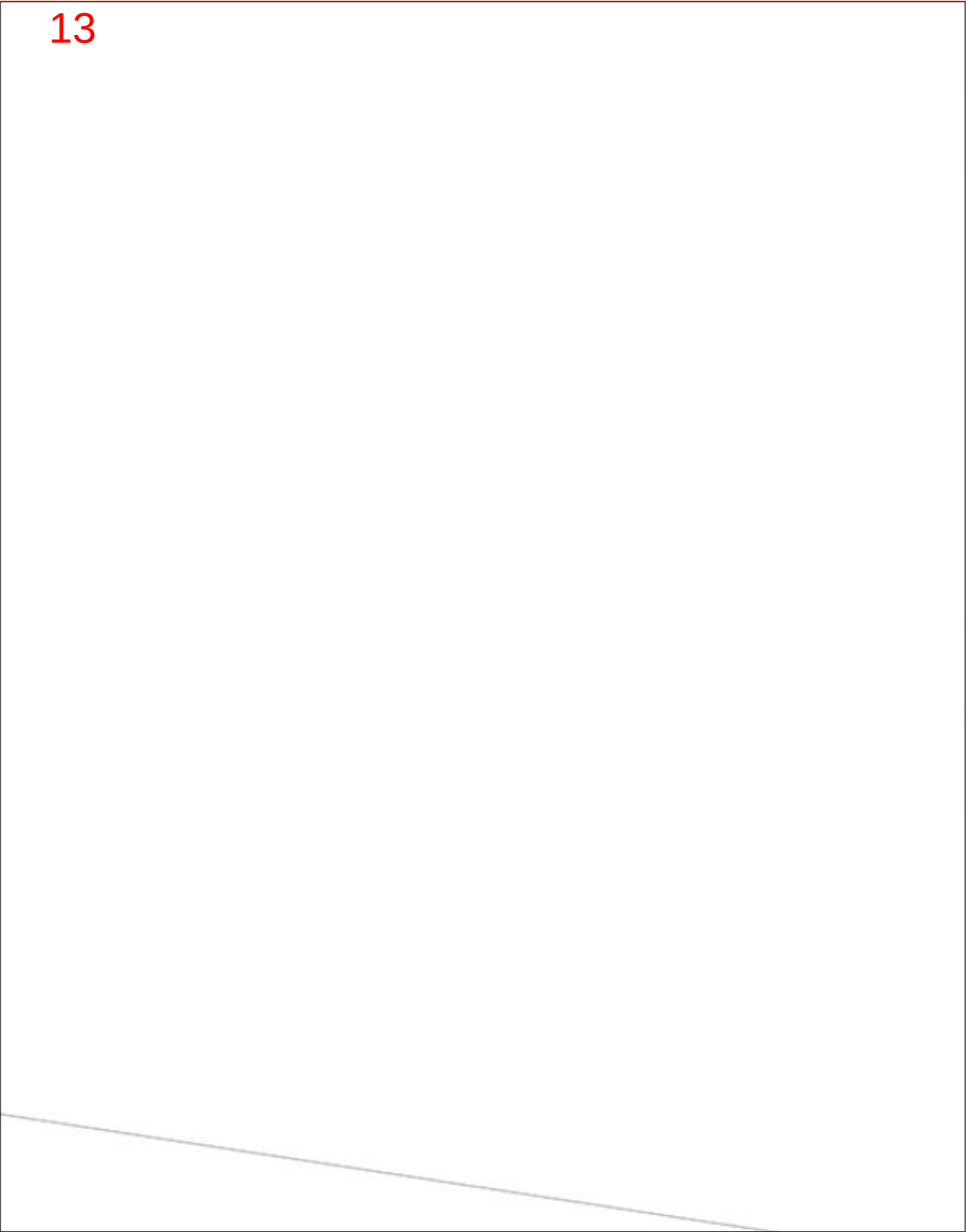


Enquiry Area



Map Key Area





Scale 1: 700

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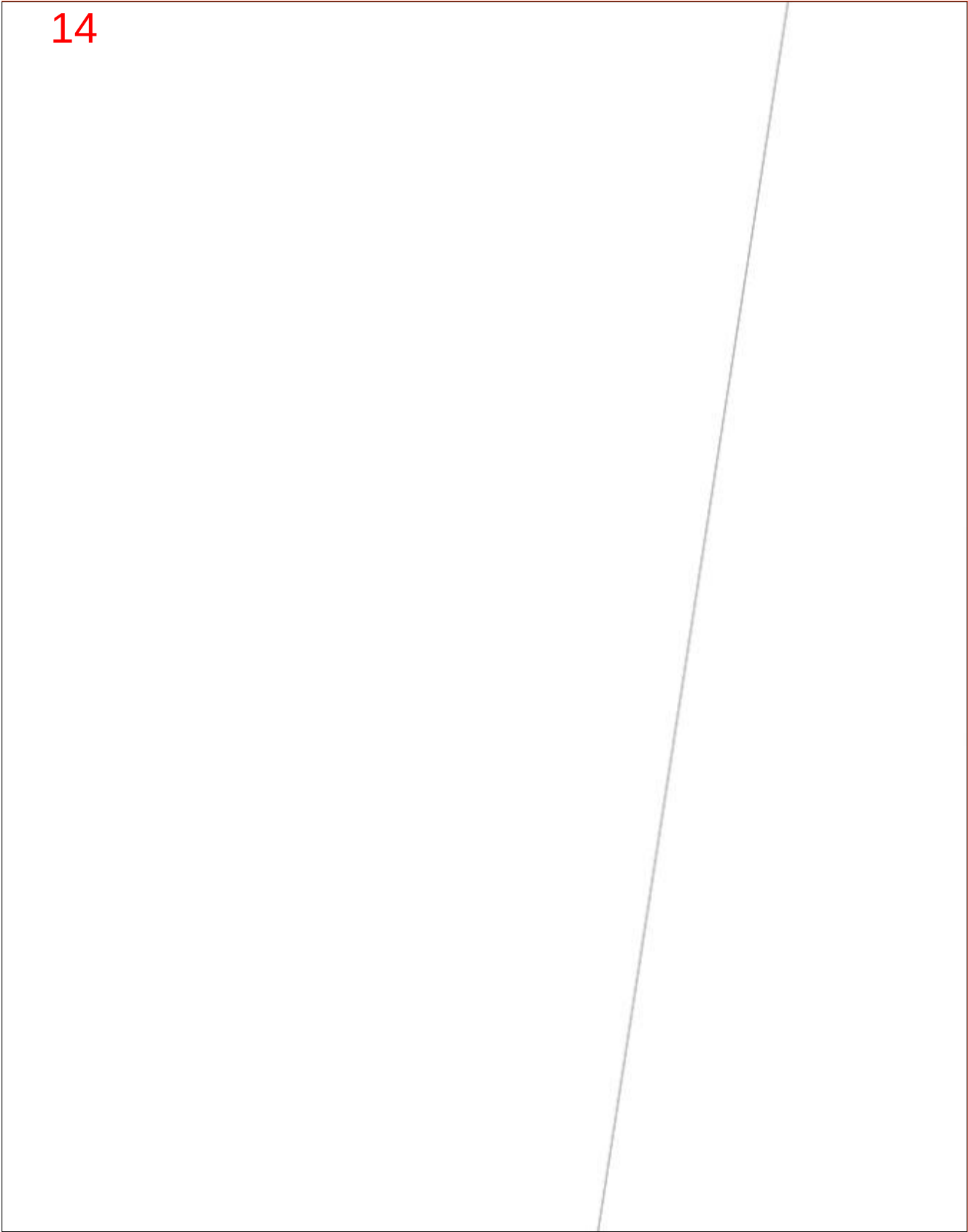


Enquiry Area



Map Key Area





Scale 1: 700

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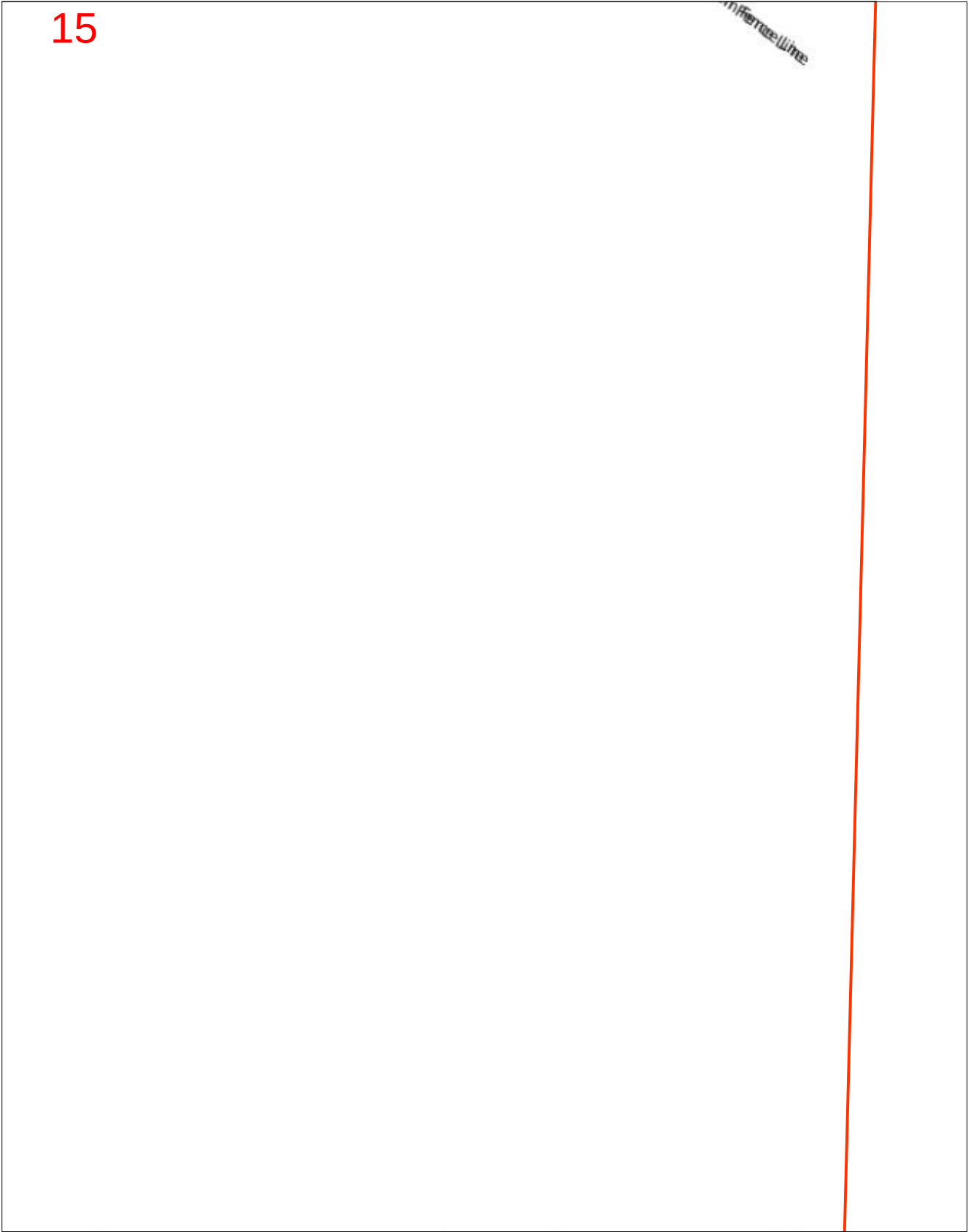


Enquiry Area



Map Key Area





Scale 1: 700

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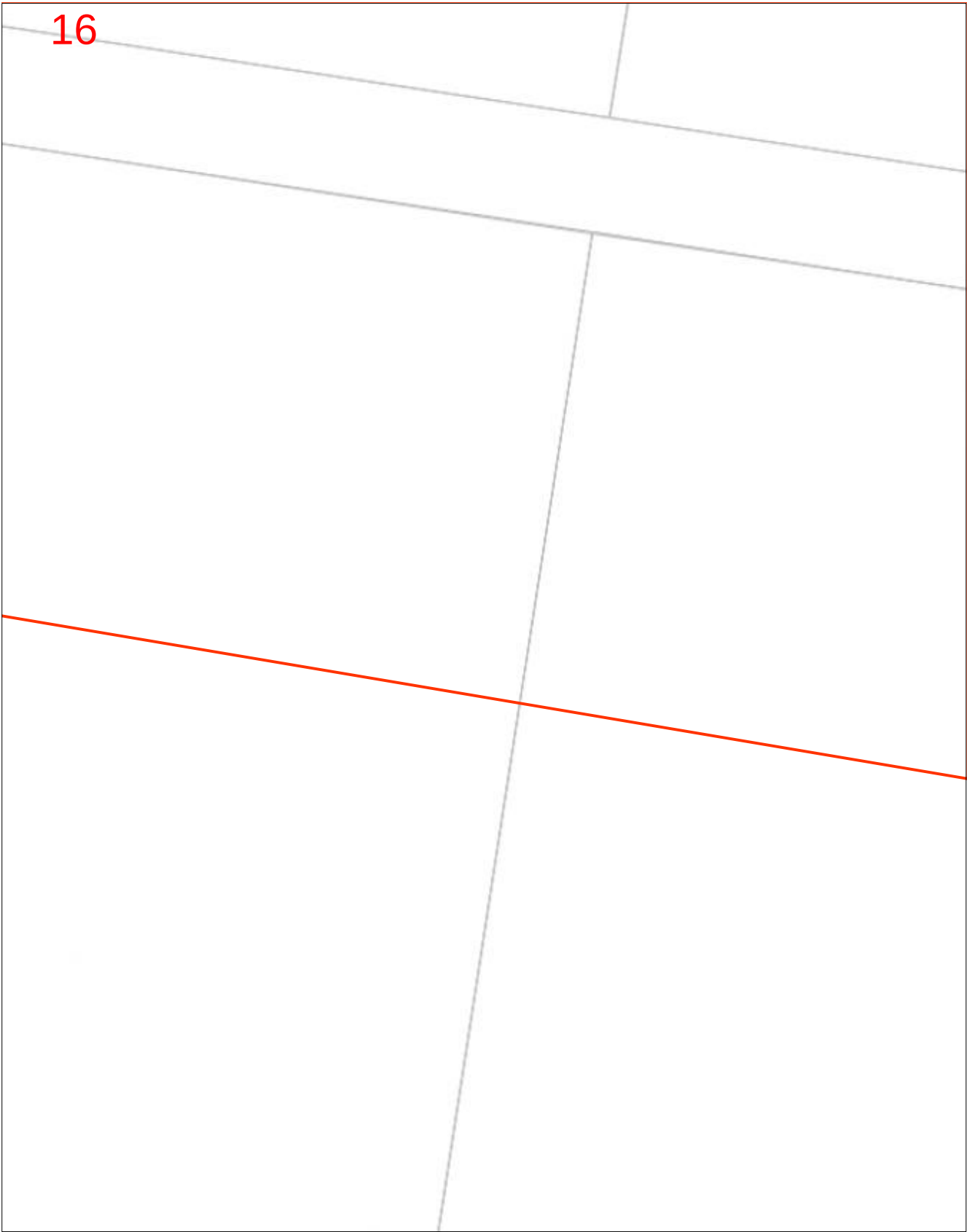


Enquiry Area



Map Key Area





Scale 1: 700

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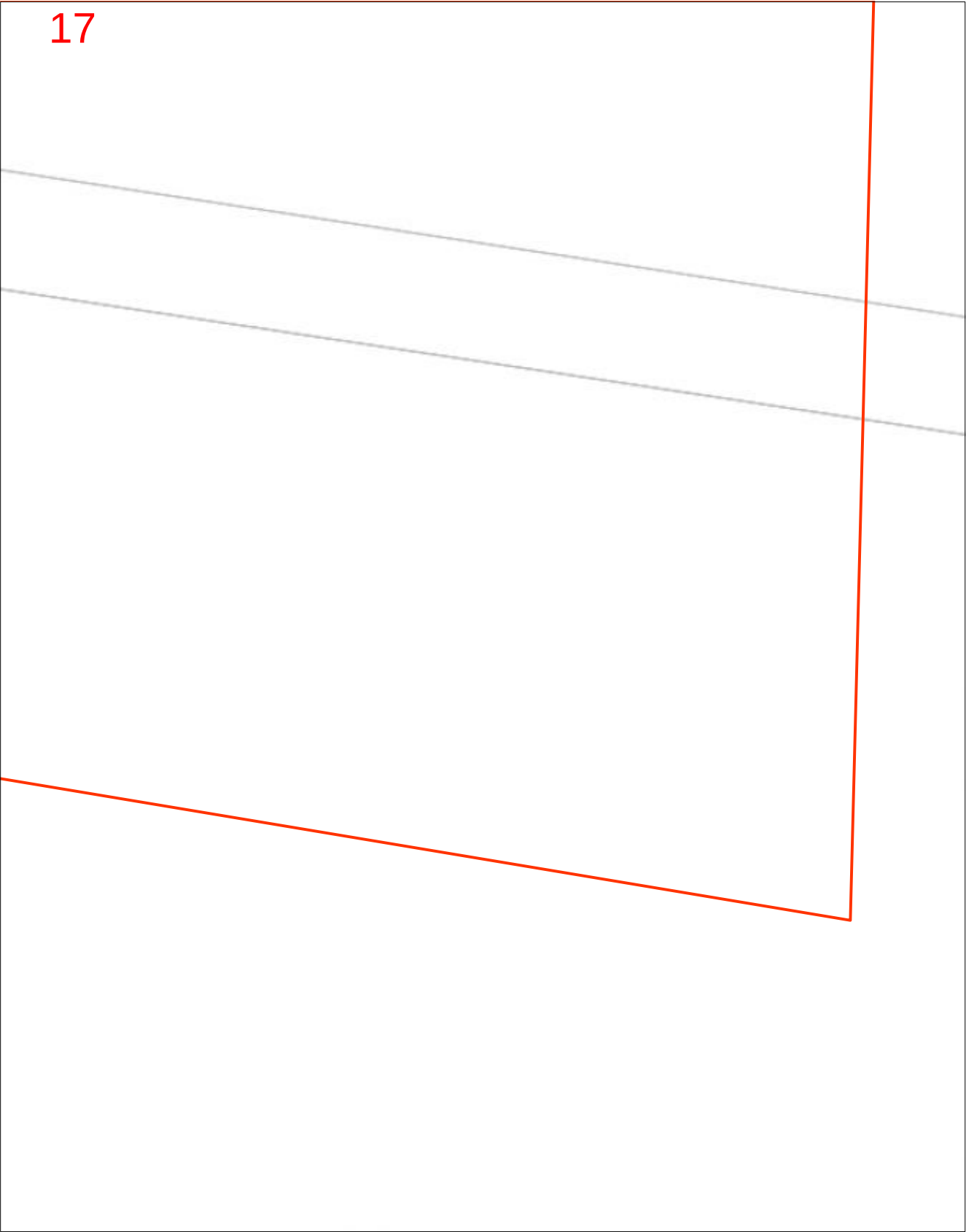


Enquiry Area



Map Key Area





Scale 1: 700

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Enquiry Area



Map Key Area



Legend

Pipe	Pipe code and material	Object
Low pressure	C* (for example, C2) Cast iron	Valve
Medium pressure	CU Copper	Buried valve
High pressure	N2 Nylon	Regulator
Transmission pressure	P* Polyethylene (PE)	Gas supplied = yes
Critical main (behind pipe)	P3 Polyvinyl chloride (PVC)	CP rectifier terminal
Proposed (pressure by colour)	P6, P7, P9–P12 Medium density PE	CP test station
LPG (pressure by colour)	P2, P4, P8 High density PE	CP anode
Hydrogen blended (pressure by colour)	S* Steel	CP bond wire
Abandoned	W2 Wrought galv iron	Syphon
Idle/inactive	W3 PE coat wrought galv iron	Trace wire point
Sleeve		
Casing (behind pipe)		
Area	Abbreviation	
BYDA area of interest	BoK Back of kerb	FoK Front of kerb
	C Depth of cover	Galv Galvanized
	CP Cathodic protection	NTI Not tied in
Example		
Pipe	Pipe code	
40P6 in 80C2	Pipe diameter in millimetres is shown before pipe code.	This map was created in colour and should be printed in colour
63S8	40P6 = 40 mm nominal diameter	

Important information

- Refer to requirements relating to construction, excavation and other work activities in the **APA Guidelines for Works Near Existing Gas Assets** document with this BYDA response.
- BYDA enquiries are valid for 30 days. If your works commence after 30 days from the date of this response a new enquiry is required to validate location information.
- For some BYDA enquiries, you may receive two (2) responses from APA. Please read both responses carefully as they relate to different assets.
- Gas (inlet) services connecting Gas Assets in the street to the gas meter on the property are not marked on the map. South Australia Only – if a meter box is installed on the property, a sketch of the gas service location may be found inside the gas meter box. APA does not guarantee the accuracy or completeness of these sketches.

Free Gas Pipeline Awareness Training and Information

PROFESSIONALS

APA offers online and in-person toolbox forums to support safe work near underground gas assets. Topics include distribution and transmission pipelines, the permit process, and gas emergencies, with content suited for companies of all sizes. A Continuing Professional Development certificate is available upon completion.

Scan the QR code to register for an online toolbox, or email damageprevention@apa.com.au to request an in-person presentation.

HOMEOWNERS

If you're working near your home's gas pipes stay safe and view APA's video guide '**Working Safely Near Gas Lines: A DIY Homeowner's Guide**' which offers simple tips to avoid damaging gas pipes.

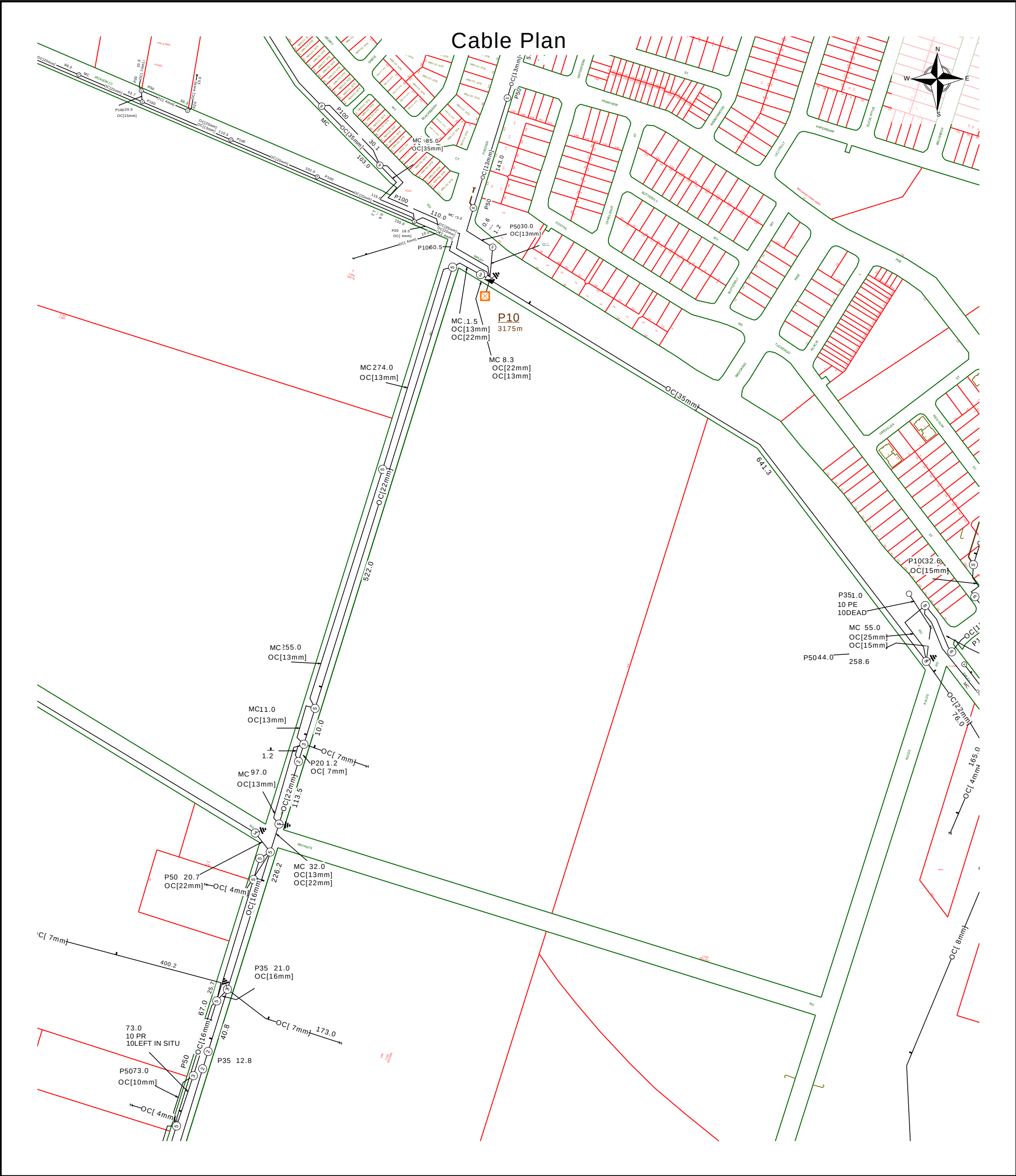
Scan the QR code to view the video, or for more information email damageprevention@apa.com.au



Disclaimer and legal details

- This information is valid for 30 days from the date of this response.
- This information has been generated by an automated system based on the area highlighted in your BYDA request and has not been independently verified.
- Map location information is provided as AS5488-2022 Quality Level D, as such supplied location information is indicative only.
- Whilst APA has taken reasonable steps to ensure that the information supplied is accurate, the information is provided strictly on the condition that no assurance, representation, warranty or guarantee (express or implied) is given by APA in relation to the information (including without limitation quality, accuracy, reliability, completeness, currency, sustainability, or suitability for any particular purpose) except that the information has been disclosed in good faith.
- Any party who undertakes activities in the vicinity of APA operated assets has a legal duty of care that must be observed. This legal obligation requires all parties to adhere to a standard of reasonable care while performing any acts that could foreseeably harm these assets.





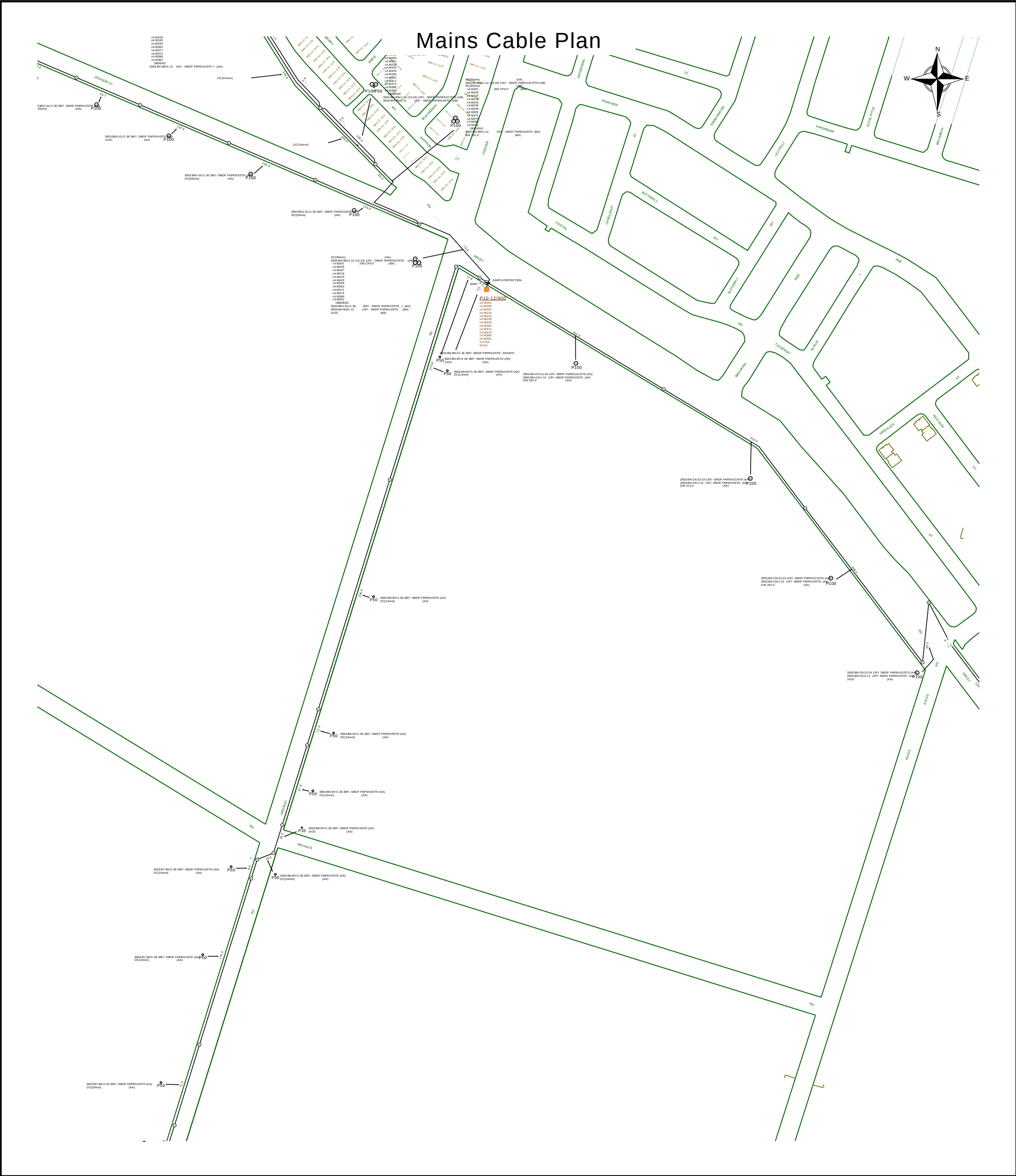
	Report Damage:https://service.telstra.com.au/customer/general/forms/report-damage-to-telstra Ph - 13 22 03 Email - Telstra.Plans@team.telstra.com Planned Services - ph 1800 653 935 (AEST bus hrs only) General Enquiries	Sequence Number: 261529853
TELSTRA LIMITED A.C.N. 086 174 781 Generated On 23/09/2025 07:53:56		CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

WARNING
Telstra plans and location information conform to Quality Level "D" of the Australian Standard AS 5488-Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. The exact position of Telstra assets can only be validated by physically exposing it. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy. Further on site investigation is required to validate the exact location of Telstra plant prior to commencing construction work. A Certified Locating Organisation is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works.

See the Steps- Telstra Duty of Care that was provided in the email response.

Page 1 of 2

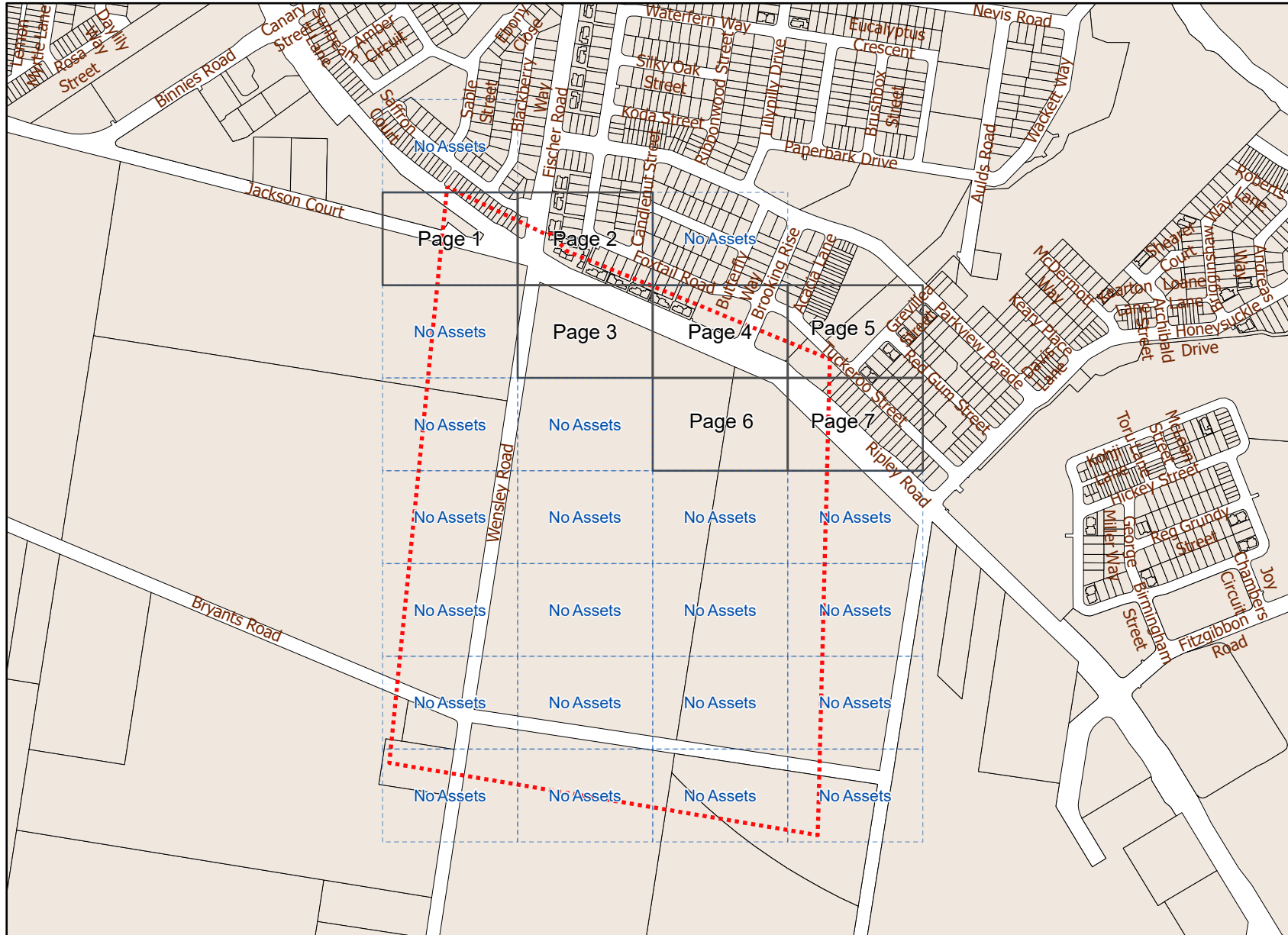


	Report Damage:https://service.telstra.com.au/customer/general/forms/report-damage-to-telstra- Ph - 13 22 03 Email - Telstra.Plans@team.telstra.com Planned Services - ph 1800 653 935 (AEST bus hrs only) General Enquiries	Sequence Number: 261529853
TELSTRA LIMITED A.C.N. 086 174 781 Generated On 23/09/2025 07:53:57		CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

WARNING
Telstra plans and location information conform to Quality Level "D" of the Australian Standard AS 5488-Classification of Subsurface Utility Information. As such,Telstra supplied location information is indicative only.Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. The exact position of Telstra assets can only be validated by physically exposing it. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy. Further on site investigation is required to validate the exact location of Telstra plant prior to commencing construction work. A Certified Locating Organisation is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works.

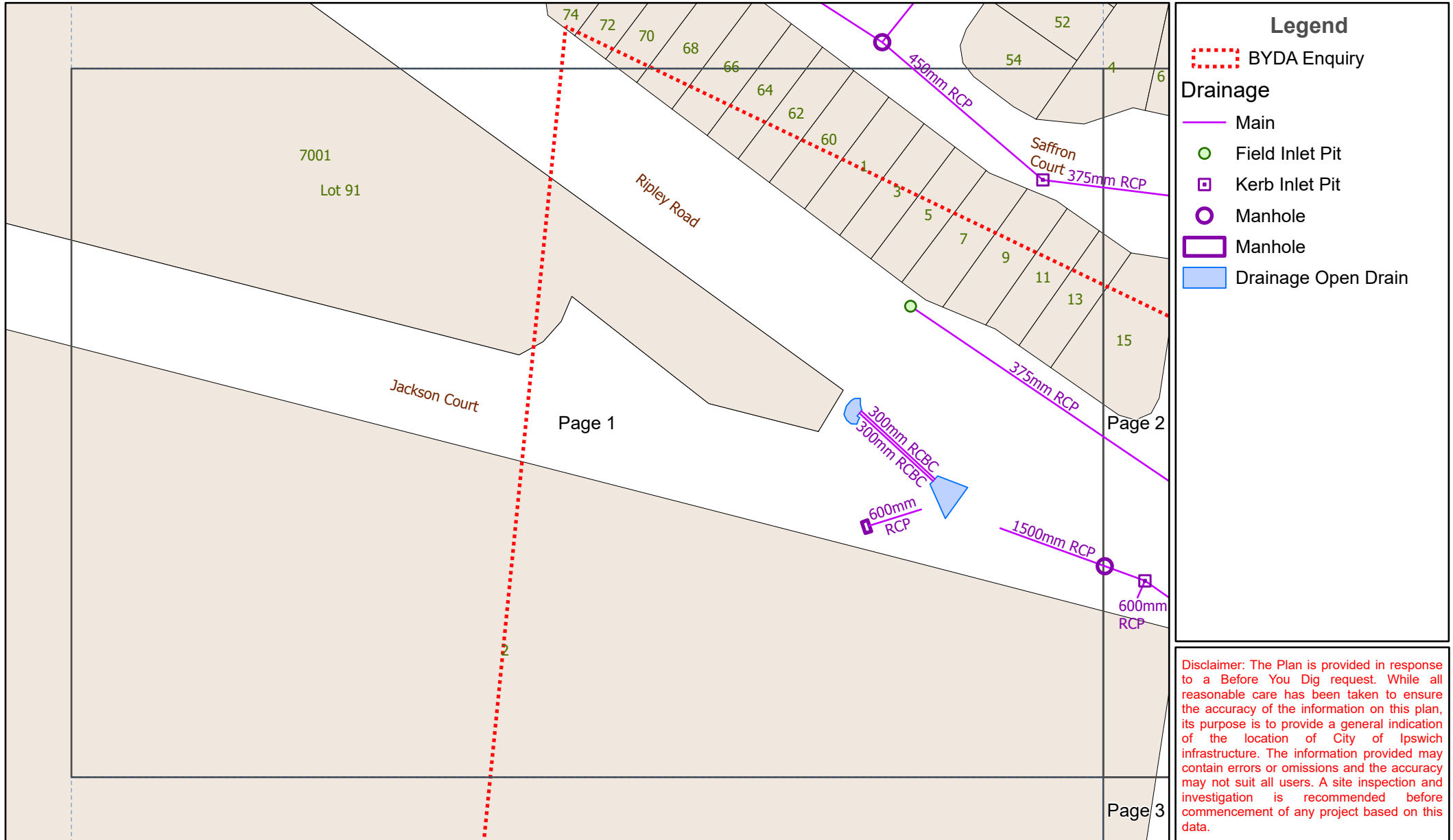
See the Steps- Telstra Duty of Care that was provided in the email response.

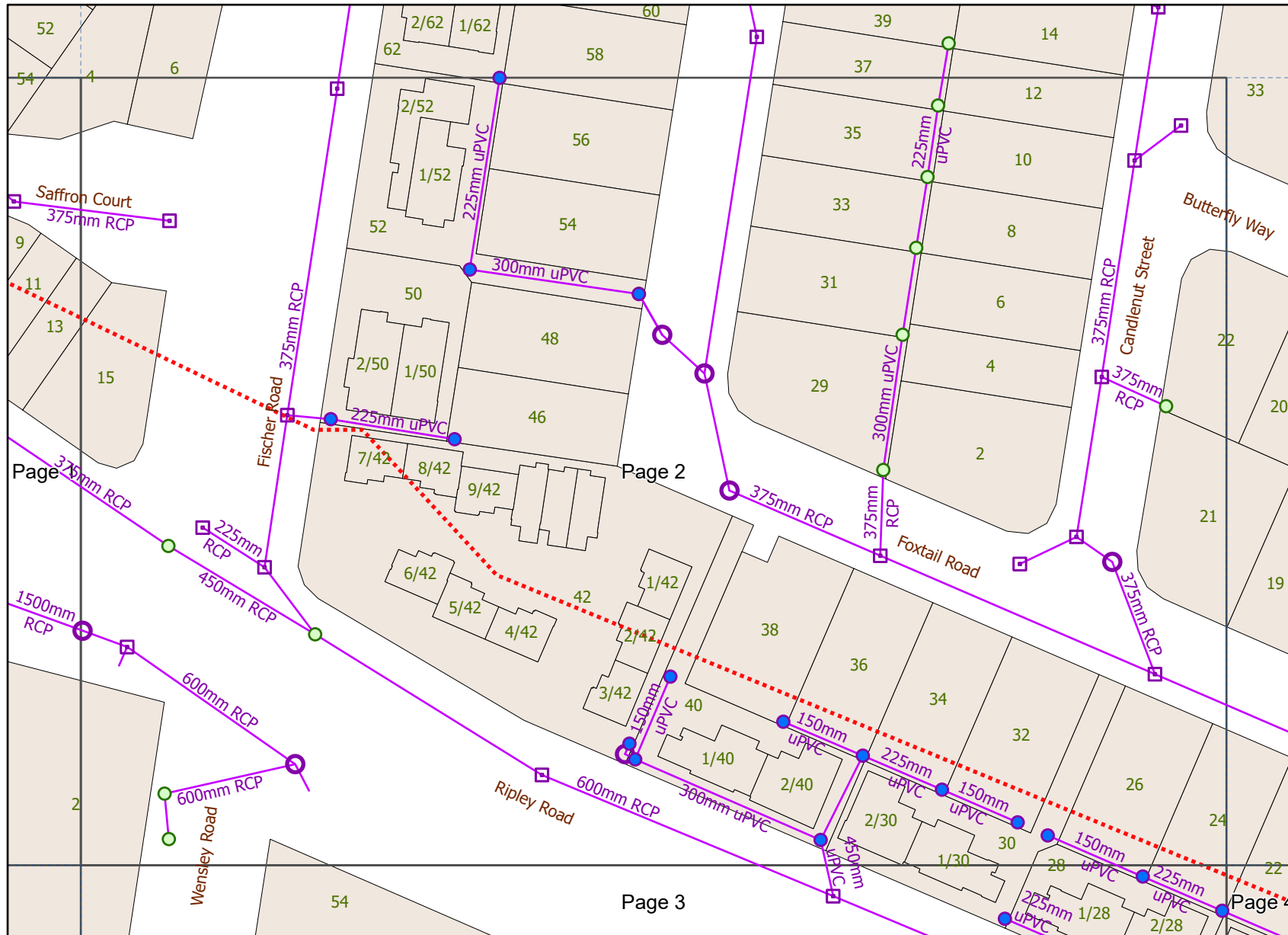


Legend

- BYDA Enquiry
- Detailed map page
- No dig site assets

Disclaimer: The Plan is provided in response to a Before You Dig request. While all reasonable care has been taken to ensure the accuracy of the information on this plan, its purpose is to provide a general indication of the location of City of Ipswich infrastructure. The information provided may contain errors or omissions and the accuracy may not suit all users. A site inspection and investigation is recommended before commencement of any project based on this data.





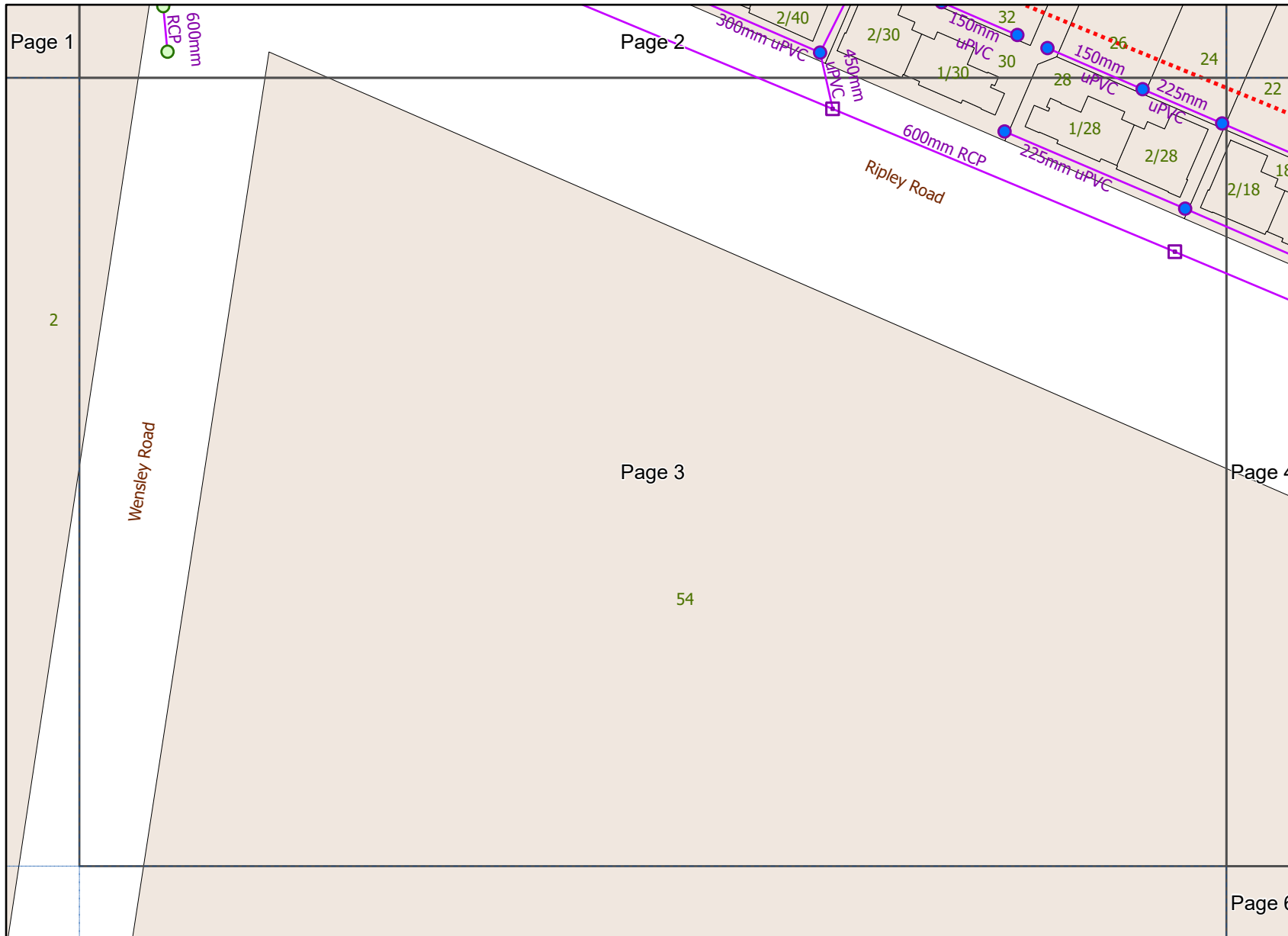
Legend

 BYDA Enquiry

Drainage

-  Main
-  Field Inlet Pit
-  Kerb Inlet Pit
-  Manhole
-  Roof Water Pit

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Legend

 BYDA Enquiry

Drainage

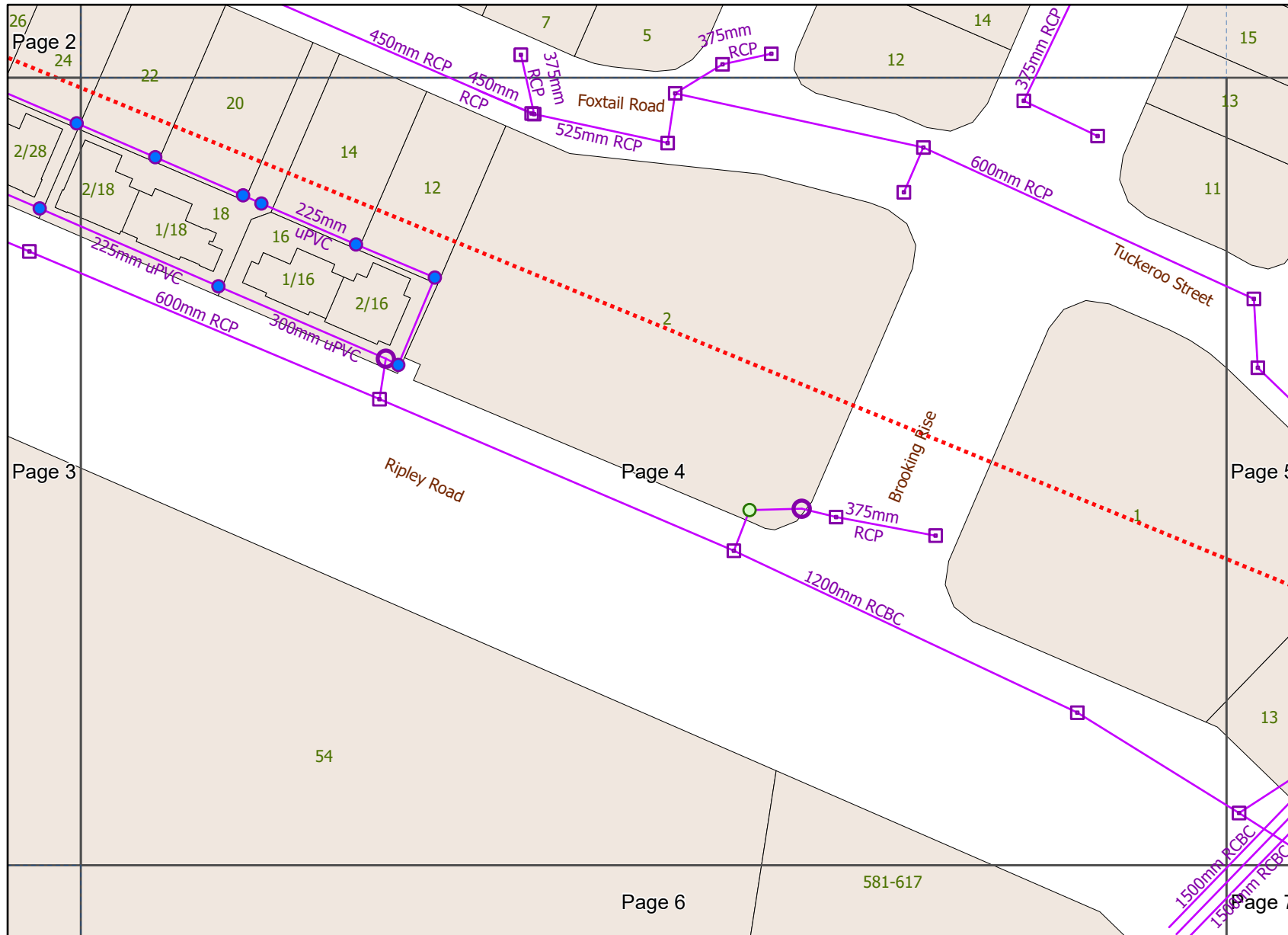
 Main

 Field Inlet Pit

 Kerb Inlet Pit

 Roof Water Pit

Disclaimer: The Plan is provided in response to a Before You Dig request. While all reasonable care has been taken to ensure the accuracy of the information on this plan, its purpose is to provide a general indication of the location of City of Ipswich infrastructure. The information provided may contain errors or omissions and the accuracy may not suit all users. A site inspection and investigation is recommended before commencement of any project based on this data.



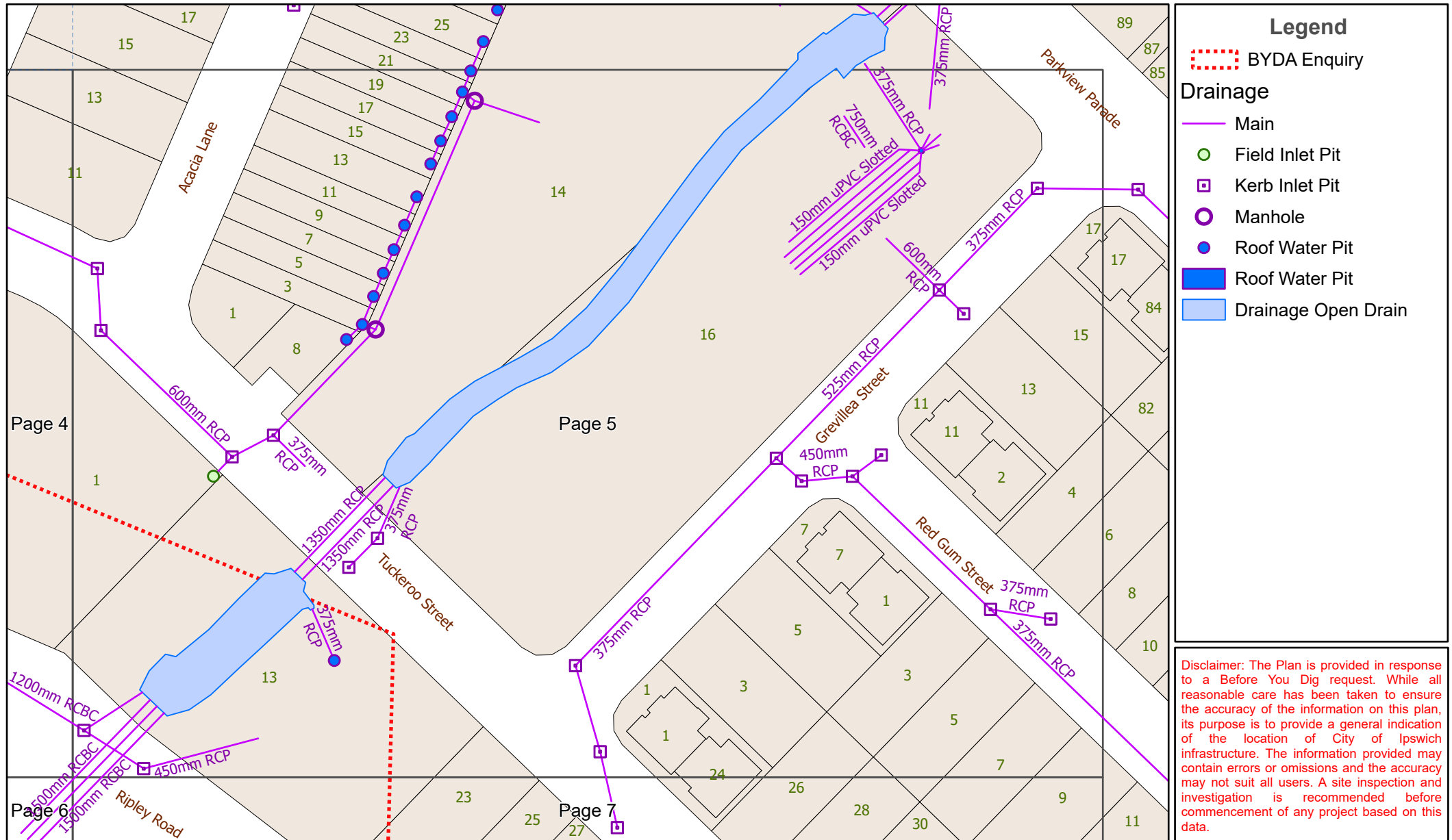
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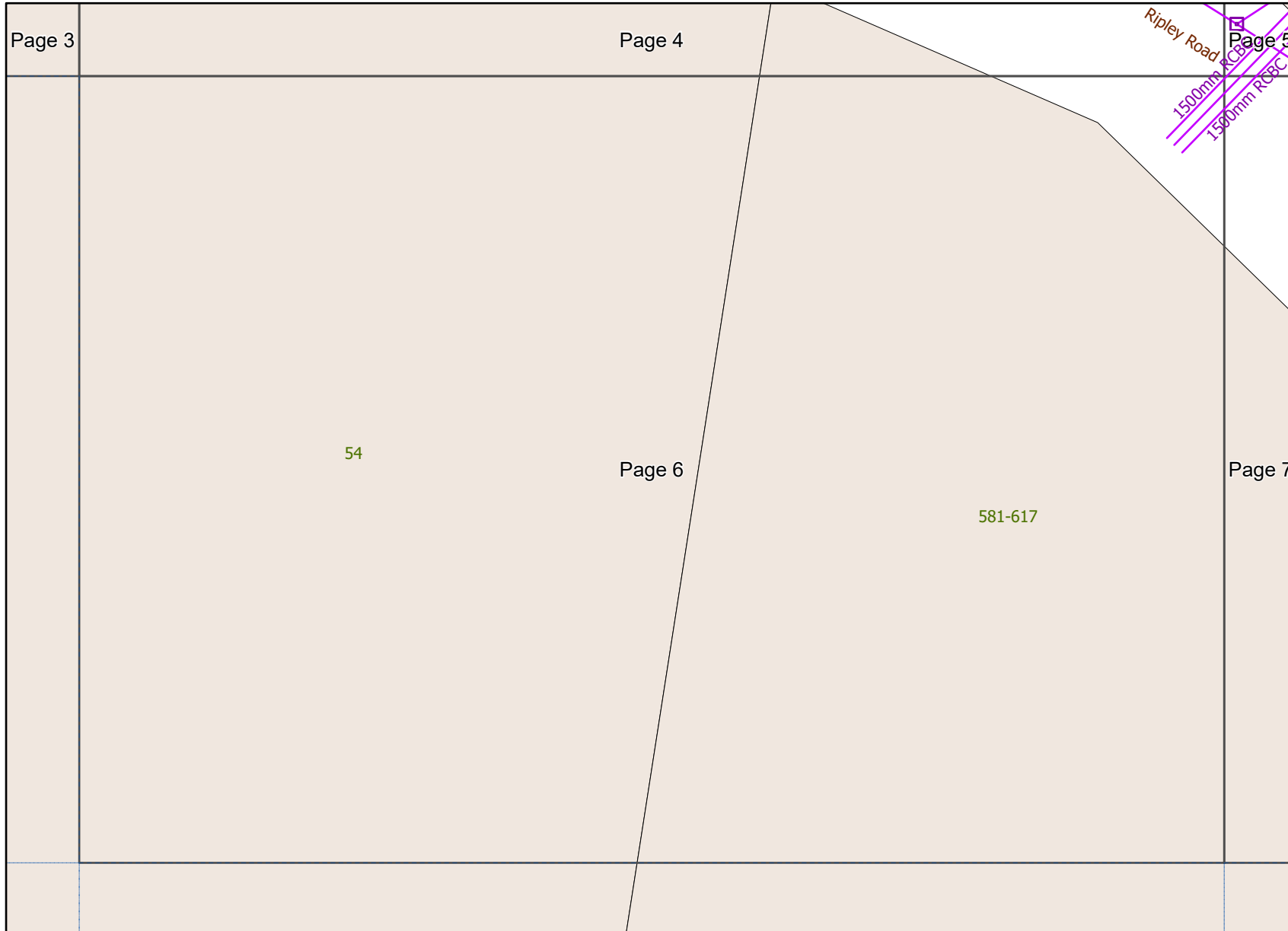
 BYDA Enquiry

Drainage

-  Main
-  Field Inlet Pit
-  Kerb Inlet Pit
-  Manhole
-  Roof Water Pit

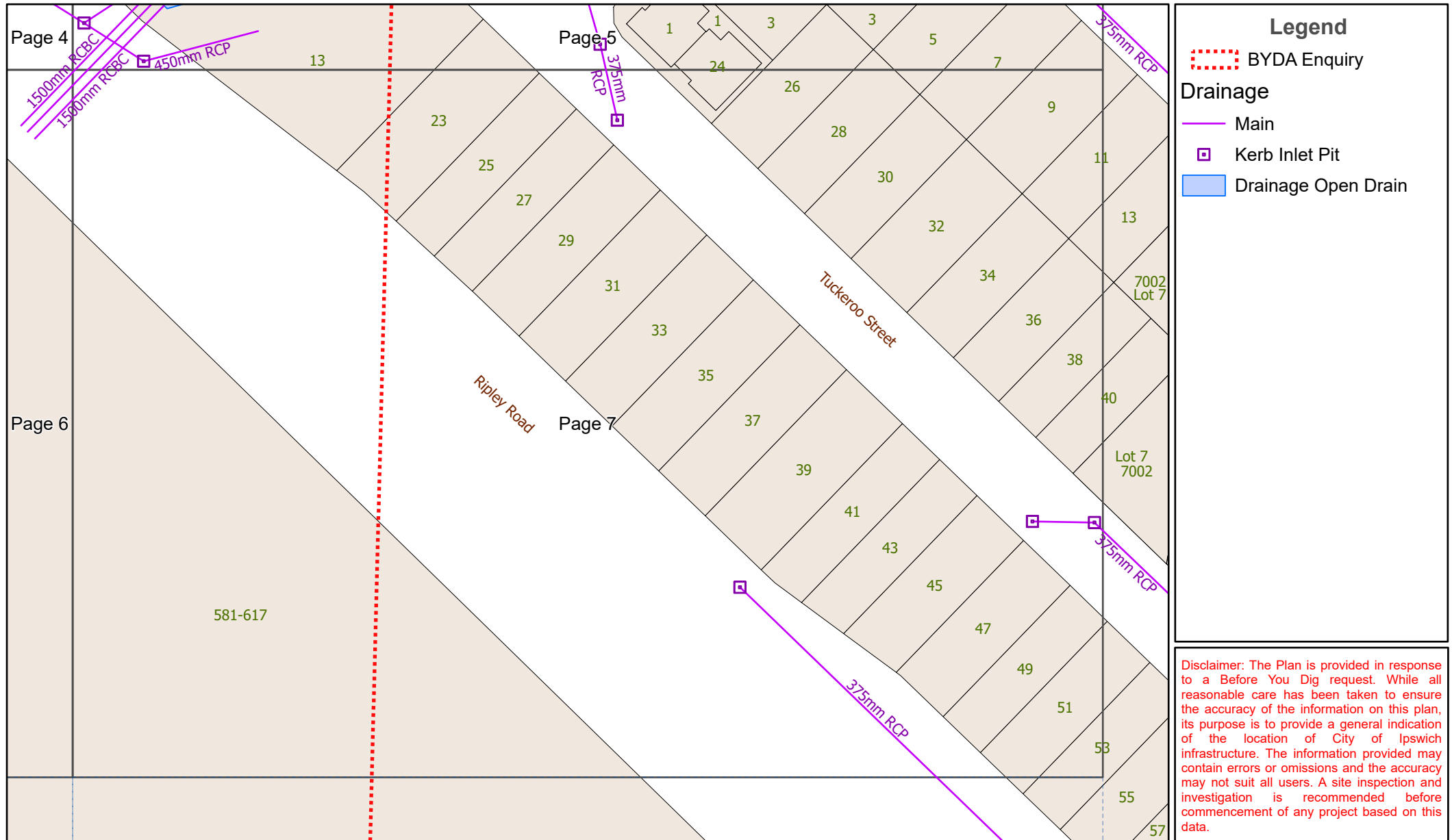
Disclaimer: The Plan is provided in response to a Before You Dig request. While all reasonable care has been taken to ensure the accuracy of the information on this plan, its purpose is to provide a general indication of the location of City of Ipswich infrastructure. The information provided may contain errors or omissions and the accuracy may not suit all users. A site inspection and investigation is recommended before commencement of any project based on this data.





- Legend**
-  BYDA Enquiry
- Drainage**
-  Main
-  Kerb Inlet Pit

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Legend

- BYDA Enquiry
- Main
- Kerb Inlet Pit
- Drainage Open Drain

Disclaimer: The Plan is provided in response to a Before You Dig request. While all reasonable care has been taken to ensure the accuracy of the information on this plan, its purpose is to provide a general indication of the location of City of Ipswich infrastructure. The information provided may contain errors or omissions and the accuracy may not suit all users. A site inspection and investigation is recommended before commencement of any project based on this data.

Zero damage - Zero harm - Zero disruption

Contact Details

Contact	Contact number	Company	Enquirer ID
Therefor Group Search	(07) 3666 5200	Therefor Group Pty Ltd	3013731
Email		Address	
dbyd@wolterconsulting.com.au		PO Box 436 New Farm QLD 4005	

Job Site and Enquiry Details

WARNING: The map below only displays the location of the proposed job site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.

Enquiry date	Start date	End date	On behalf of	Job purpose	Locations	Onsite activities
23/09/2025	24/09/2025	01/10/2025	Private	Design	Both Footpath, Nature Strip, Road	Planning & Design



Check that the location of the job site is correct. If not, you must submit a new enquiry.

If the scope of works change or plan validity dates expire, you must submit a new enquiry.

Do NOT dig without plans. Safe excavation is your responsibility. If you don't understand the plans or how to proceed safely, please contact the relevant asset owners.

User Reference	Address	Notes/description
25-0325	54 Wensley Road Ripley QLD 4306	Ripley

Your Responsibility and Duty of Care

- Lodging an enquiry does not authorise project commencement.** Before starting work, you must obtain all necessary information from all affected asset owners.
- If you don't receive plans within 2 business days, contact the asset owner & quote their sequence number.
- Always follow the 5Ps of Safe Excavation (page 2), and locate assets before commencing work.
- Ensure you comply with State legislative requirements for Duty of Care and safe digging.
- If you damage an underground asset, you MUST advise the asset owner immediately.
- By using the BYDA service, you agree to the [Privacy Policy](#) and [Term of Use](#).
- For more information on safe digging practices, visit www.byda.com.au

Asset Owner Details

Below is a list of asset owners with underground infrastructure in and around your job site. It is your responsibility to identify the presence of these assets. Plans issued by Members are indicative only unless specified otherwise. Note: not all asset owners are registered with BYDA. You must contact asset owners not listed here directly.

Referral ID (Seq. no)	Authority Name	Phone	Status
261529852	APA Group Gas Networks (70710)	1800 085 628	NOTIFIED
261529850	Energex QLD	13 12 53	NOTIFIED
261529848	Ipswich City Council	(07) 3810 6666	NOTIFIED
261529846	NBN Co Qld	1800 687 626	NOTIFIED
261529847	OptiComm Ltd (QLD)	1300 137 800	NOTIFIED
261529849	Optus and or Uecomm Qld	1800 505 777	NOTIFIED
261529851	Queensland Urban Utilities	13 26 57	NOTIFIED
261529853	Telstra QLD FA	1800 653 935	NOTIFIED

END OF UTILITIES LIST



Plan

Plan your job. Use the BYDA service at least one day before your job is due to begin, and ensure you have the correct plans and information required to carry out a safe project.



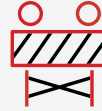
Prepare

Prepare by communicating with asset owners if you need assistance. Look for clues onsite. Engage a skilled Locator.



Pothole

Potholing is physically sighting the asset by hand digging or hydro vacuum extraction.



Protect

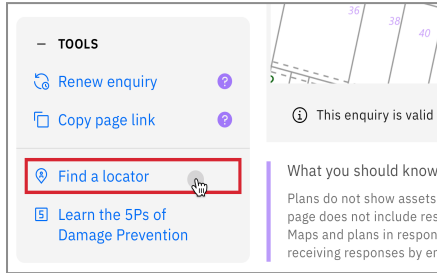
Protecting and supporting the exposed infrastructure is the responsibility of the excavator. Always erect safety barriers in areas of risk and enforce exclusion zones.



Proceed

Only proceed with your excavation work after planning, preparing, potholing (unless prohibited), and having protective measures in place.

Engage a skilled Locator



When you lodge an enquiry you will see skilled Locators to contact

Visit the Certified Locator website directly and search for a locator near you

certloc.com.au/locators

Get FREE Quotes for Contractors & Equipment Fast



Use isseekplant's FREE marketplace to get quotes for the equipment or services you need on your project. Compare quotes from trusted local contractors and get your project done on time and in budget.

1. Fill out your job details in our FREE quick quote form.
2. We send the request to trusted local contractors.
3. The local contractors will contact you directly with quotes

GET QUOTE

Use isseekplant to find trusted contractors near you today, visit:
blog.isseekplant.com.au/byda-isp-get-quotes

Book a FREE BYDA Session



BYDA offers free training sessions to suit you and your organisation's needs covering safe work practices when working near essential infrastructure assets. The free sessions are offered in two different formats - online and face-to-face.

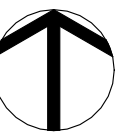
To book a session, visit:
byda.com.au/contact/education-awareness-enquiry-form

BOOK NOW

Appendix D – Architectural Drawings



Amendments		
Issue	Description	Date
A	FINAL CMP ISSUE	02/04/2026
B	ISSUE FOR PLANNING APPROVAL	07/04/2026
C	REVISED ISSUE FOR PLANNING APPROVAL	15/05/2026



PRELIMINARY

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Client
PC BUNDLE - RIPLEY VALLEY
Client Details

GROUP GSA

Group GSA Pty Ltd ABN 76 002 113 779
Level 07, 260 Queen St Brisbane QLD
Australia 4000
www.groupgsa.com

T +617 3112 3079

architecture interior design urban design landscape
nom architect Lisa-Maree Carrigan 5696

Project Title
RIPLEY VALLEY SHS

Drawing Title

90% CMP OVERALL

Scale 1 : 1200

Drawing Created (date) AUGUST 2025

Drawing Created (by) GM

Plotted and checked by GM

Verified LM

Approved LM

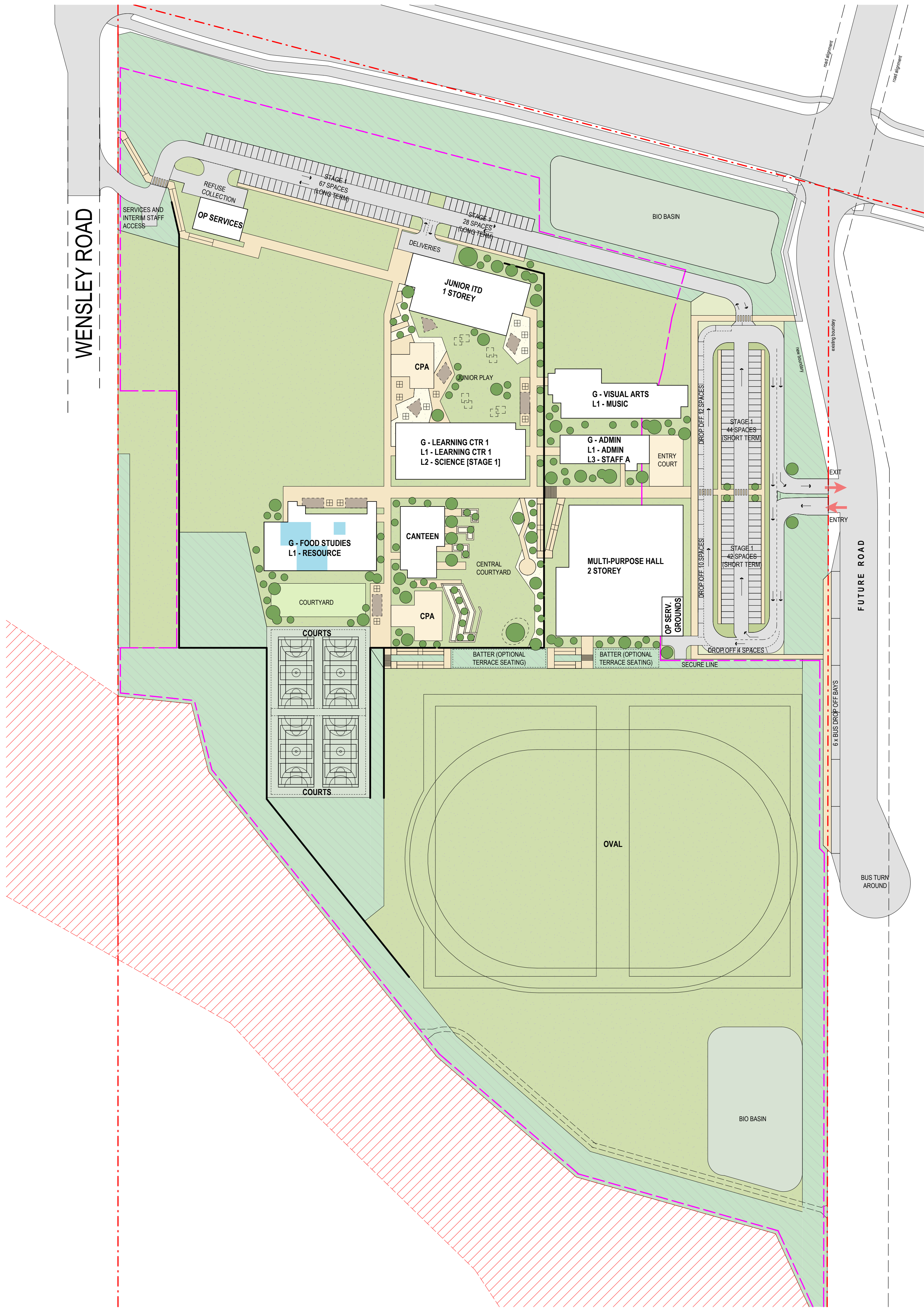
Project No Drawing No Issue

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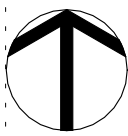
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15/05/2026 12:47:22 PM



Amendments		
Issue	Description	Date
A	FINAL CMP ISSUE	02/04/2026
B	ISSUE FOR PLANNING APPROVAL	07/04/2026
C	REVISED ISSUE FOR PLANNING APPROVAL	15/05/2026



PRELIMINARY

Consultant

Consultant Company
Consultant Details

Consultant

Consultant Company
Consultant Details

Consultant

Consultant Company
Consultant Details

Consultant

Consultant Company
Consultant Details

Client

PC BUNDLE - RIPLEY VALLEY
Client Details



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Level 07, 260 Queen St Brisbane QLD
Australia 4000
www.groupgsa.com

T +617 3112 3079

architecture interior design urban design landscape
nom architect Lisa-Maree Carrigan 5696

Project Title

RIPLEY VALLEY SHS

Drawing Title

90% CMP STAGE 1

Scale 1 : 1000

Drawing Created (date) AUGUST 2025

Drawing Created (by) GM

Plotted and checked by GM

Verified LM

Approved LM

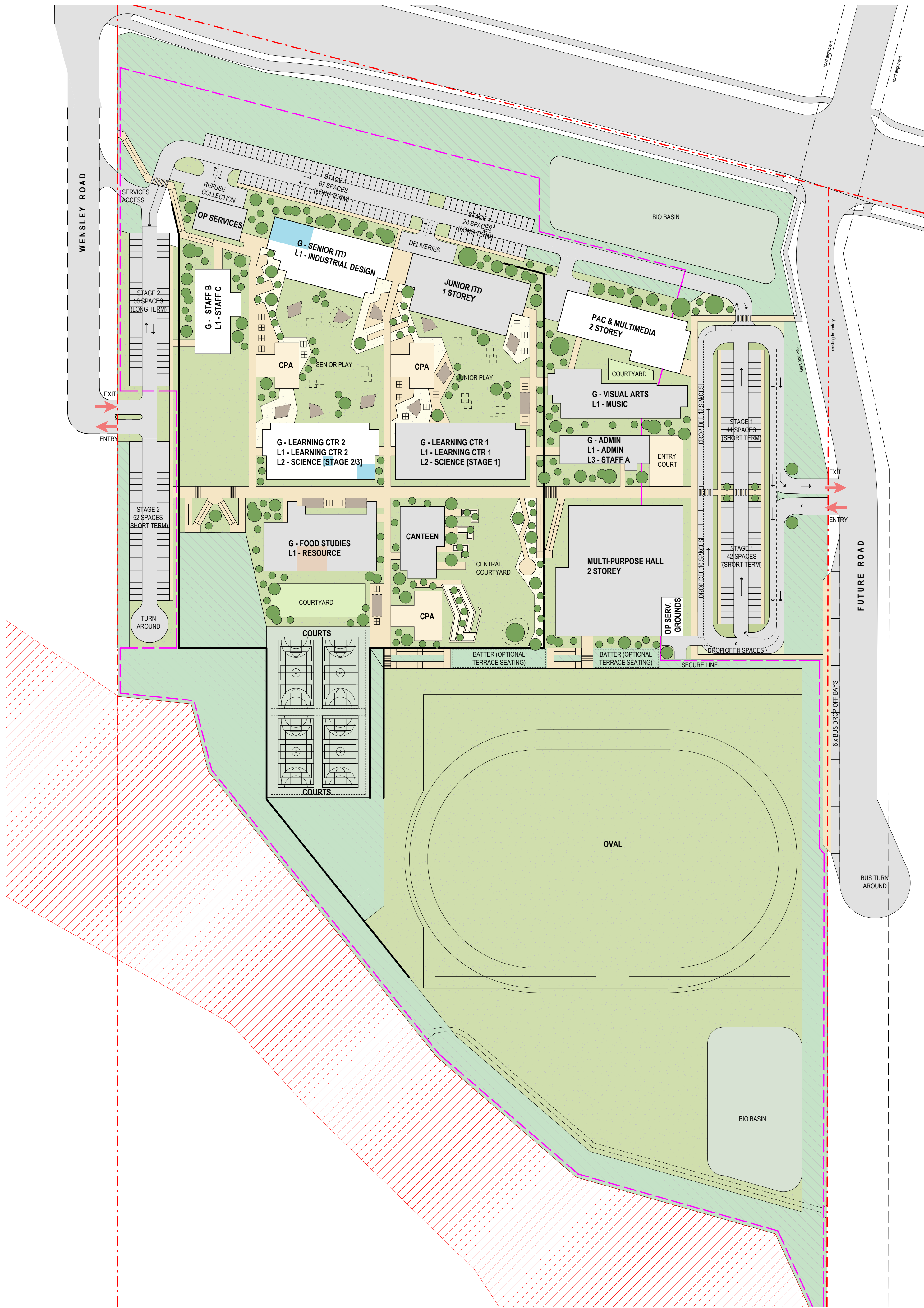
Project No Drawing No Issue

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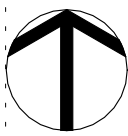
C

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Amendments		
Issue	Description	Date
A	FINAL CMP ISSUE	02/04/2026
B	ISSUE FOR PLANNING APPROVAL	07/04/2026
C	REVISED ISSUE FOR PLANNING APPROVAL	15/05/2026



PRELIMINARY

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Client
PC BUNDLE - RIPLEY VALLEY
Client Details



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architecture interior design urban design landscape
nom architect Lisa-Maree Carrigan 5696
Project Title

RIPLEY VALLEY SHS

Drawing Title

90% CMP STAGE 2

Scale 1 : 1000

Drawing Created (date) AUGUST 2025

Drawing Created (by) GM

Plotted and checked by GM

Verified LM

Approved LM

Project No Drawing No Issue

A252264 A1152

C

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15/05/2026 12:47:28 PM



Amendments		
Issue	Description	Date
A	FINAL CMP ISSUE	02/04/2026
B	ISSUE FOR PLANNING APPROVAL	07/04/2026
C	REVISED ISSUE FOR PLANNING APPROVAL	15/05/2026



PRELIMINARY

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Client
PC BUNDLE - RIPLEY VALLEY
Client Details



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architecture interior design urban design landscape
nom architect Lisa-Maree Carrigan 5696
Project Title

RIPLEY VALLEY SHS

Drawing Title

90% CMP STAGE 3

Scale 1 : 1000

Drawing Created (date) AUGUST 2025

Drawing Created (by) GM

Plotted and checked by GM

Verified LM

Approved LM

Project No Drawing No Issue

A252264 A1153

C

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15/05/2026 12:47:39 PM

Appendix E – Code Response Tables

9.4.2 General Works and Infrastructure Code

9.4.2.1 Application

- (1) This code applies to accepted development subject to requirements and assessable development for which the General Works and Infrastructure Code is identified in the Category of Development and Assessment Benchmarks and Required Outcomes column in Table 5.7.2 - Categories of Development and Level of Assessment — Operational Works.
- (2) This code also applies to any development that includes the provision of infrastructure, including Material Change of Use and Reconfiguring a Lot development.
- (3) When using this code, reference should be made to Part 5.2 Reading the Tables and Part 5.3 Categories of Development and Assessment to determine the requirements for assessment of particular development.

9.4.2.2 Purpose and Overall Outcomes

- (1) The purpose of the General Works and Infrastructure Code is to ensure that:
 - a. all works, including operational work relating to development requiring an approval, result in finished works that are designed and constructed to an appropriate standard;
 - b. development protects existing infrastructure and future planned infrastructure;
 - c. suitable cost-effective infrastructure is provided to service the development and continues to provide a high level of service over an appropriate design life; and
 - d. amenity is preserved during construction and once the use has commenced, and community and personal health and safety, surrounding premises and the environment are all protected from any adverse consequences that could result from development.
- (2) The purpose of this code will be achieved through the following overall outcomes:
 - a. works and infrastructure are designed and constructed to an appropriate standard, do not adversely impact on existing or future public utilities or infrastructure, are cost effective, provide a high level of service over an appropriate design life,

- and maintain the expected level of amenity during and after construction;
- b. infrastructure that is intended to become a Council asset is safe, aesthetically pleasing, functional, fit for purpose, durable, minimises environmental impacts and has minimal whole-of-life cost;
- c. movement networks are designed and constructed to be functional, resilient and safe;
- d. development is provided with a safe and reliable transport network for all modes that has a minimal whole-of-life cost;
- e. vehicular crossings provide safe access from the edge of the road carriageway to the property boundary;
- f. vehicular crossings are located and constructed to avoid adverse impacts on existing street trees, utilities and infrastructure;
- g. stormwater management systems maintain and enhance natural catchment hydrological processes;
- h. the efficiency and integrity of the existing stormwater infrastructure network is maintained or enhanced;
- i. development achieves acceptable levels of stormwater run-off quality;
- j. outdoor lighting provides effective illumination whilst minimising the adverse impacts of spill lighting on adjoining uses;
- k. development promotes a safe environment and reduces any potential for crime;
- l. public utilities and services are provided to standards acceptable to Council and to meet the requirements of the relevant infrastructure provider;
- m. the community and the environment are not unreasonably disrupted or impacted by works, construction or demolition activities; and
- n. building plant, services and storage areas are designed and located to avoid nuisance to adjoining premises and to avoid an unattractive appearance when viewed from the street.

9.4.2.3 Specific Benchmarks for Assessment

Table 9.4.2.3.1 — Benchmarks for Accepted Development Subject to Requirements

Benchmarks for Accepted Development Subject to Requirements		Comments
1 Driveways and Vehicular Crossings	RO1.1 Vehicular crossings are designed and constructed in accordance with relevant Council standard drawings. Note: Part 7, Division 3 of the General Works and Infrastructure Planning Scheme Policy provides references to standard drawings for vehicular crossings. RO1.2	RO1.1-RO1.5 Complies. All driveways and accesses will be constructed to comply with ICC's standards.

	The maximum number of vehicular crossings per site is: a. for a dwelling house, 1 crossing, or 2 crossings where the road frontage at the property boundary is greater than 40m; b. for a dual occupancy or multiple dwelling, 1 crossing, or 2 crossings where the road frontage at the property boundary is greater than 20m; and c. for a non-residential use, 2 crossings.	
	RO1.3 Vehicular crossings are located to achieve a separation of: a. 3m from other vehicular crossings; b. 1.5m from a side property boundary in a residential development of 2 dwellings or less; and c. 2m from a side property boundary for all other development.	
	RO1.4 The construction of the driveway or vehicular crossing does not cause damage to existing trees located within the verge.	
	RO1.5 Corner lots are accessed from the lower order street (secondary frontage), and as far as is possible from the intersection.	

Table 9.4.2.3.2 — Benchmarks for Assessable Development

1 General		Comments
PO1.1 Works are designed and constructed in accordance with the relevant standards.	AO1.1 Works are designed and constructed in accordance with the standards and requirements outlined in the General Works and Infrastructure Planning Scheme Policy.	PO1.1-AO1.1 Complies as required. All works will be designed in accordance with Department of Education Design Guidelines. Any areas not covered by DoE will be designed to ICC standards.
PO1.2	AO1.2	PO1.2-AO1.2 Will comply

Development provides the necessary infrastructure to service the development. Note: The delivery of any part of a network identified in the approved plans as being for trunk infrastructure is determined by Part 6 Local Government Infrastructure Plan.	No accepted outcome provided.	The site will be serviced accordingly.
PO1.3 Development preserves amenity and health and safety, and the integrity of surrounding premises. Note: A construction works management plan outlining the management of the site during construction is the preferred method for addressing this performance outcome.	AO1.3 No accepted outcome provided.	PO1.3-AO1.3 Will comply
PO1.4 Hours of construction are limited to minimise adverse impacts to surrounding premises during construction.	AO1.4 Construction only occurs between 6:30am and 6:30pm Monday to Saturday excluding public holidays, unless varied by a development approval.	PO1.4-AO1.4 Will comply
2 Roadworks — Construction and Maintenance		
PO2.1 Roads are provided with the characteristics required by their determined road type in the road hierarchy, and in accordance with the design and construction standards outlined in SC6.2 General Works and Infrastructure Planning Scheme Policy, and in all cases: a. roads are designed and constructed to be fit for purpose to provide access, servicing of development and to deliver a low-maintenance asset with a minimal whole of life cost; b. design and construction achieves a minimum design life of 20 years;	AO2.1 No accepted outcome provided.	PO2.1-AO2.1 Will comply All works will be designed in accordance with Department of Education Design Guidelines. Any areas not covered by DoE will be designed to ICC standards.

c. pavements are durable, ensure safe passage, and provide adequate stormwater discharge, all-weather access and reasonable travel comfort; d. the road edge is designed and constructed to delineate the carriageway and to provide for people with disabilities; e. verges provide safe access for pedestrians and vehicles onto properties, and sufficient area for public utility services in accordance with the General Works and Infrastructure Planning Scheme Policy; and f. laneways and pathways are designed to be functional and safe and achieve good connectivity with the surrounding road network. Note: Road, laneway and pathway design standards are provided in Part 1 — Standard for Design of Roadworks and Part 7 — Standards for Construction of Roadworks of the General Works and Infrastructure Planning Scheme Policy SC6.2.		
3 Roadworks — Associated Structures		
PO3.1 Structures associated with the provision of roads, pathways and laneways are provided using proven methods and in accordance with the relevant standards.	AO3.1 Structures associated with the provision of roads, pathways and laneways are provided in accordance with the relevant standards outlined in the General Works and Infrastructure Planning Scheme Policy. Note: Sections within the General Works and Infrastructure Planning Scheme outlining requirements for associated structures include: Signs and Road Markings (1.1.13), Road Edge Guide Posts and Safety Barriers (1.1.14), Bus Stops (1.1.15), and Gullies and Access Chambers (2.1.2)	PO3.1-AO3.1 Will comply All works will be designed in accordance with Department of Education Design Guidelines. Any areas not covered by DoE will be designed to ICC standards.

4 Roadworks — Street Design		
PO4.1 Streets are provided in accordance with their determined road type in the road hierarchy and in accordance with the appropriate design and construction standards, and ensure: a. safe and secure travel for pedestrians, bicycles, rideables and vehicles; b. access to properties for all transport modes; c. accessibility for people with special ambulatory needs; d. sufficient area for the provision of all utilities; e. desirable aesthetics and amenity, and the opportunity for growth; and f. the practical amelioration of noise and other pollution.	AO4.1 Streets are designed and constructed in accordance with the standards and requirements outlined in the General Works and Infrastructure Planning Scheme Policy. Note: Part 1 — Standards for Design of Roadworks and Part 7 — Standards for Construction of Roadworks of the General Works and Infrastructure Planning Scheme Policy include specific provisions for street design and construction.	PO4.1-AO4.1 Will comply as required The external roadworks will be designed in accordance with ICC standards.
5 Driveways and Vehicular Crossings		
PO5.1 Driveways and vehicular crossings are designed and constructed in accordance with proven methods and the relevant standards.	AO5.1 Driveways and vehicular crossings are designed and constructed in accordance with the standards and requirements outlined in the General Works and Infrastructure Planning Scheme Policy. Note: Part 7 — Standards for Construction of Roadworks, Division 3 Urban Roadworks and Access, 7.3.1 Vehicular Crossings of the General Works and Infrastructure Planning Scheme Policy provides references to standard drawings for vehicular crossings.	PO5.1-AO5.1 Will comply All works will be designed in accordance with Department of Education Design Guidelines. Any areas not covered by DoE will be designed to ICC standards.
PO5.2	AO5.2	PO5.2-AO5.2 Will comply

The location of vehicular crossings provides maximum visibility and does not compromise the safety, capacity and effective operation of streets.	No accepted outcome provided.	Final design of the external roadworks will achieve compliance. Refer to Traffic Consultant.
PO5.3 The location of vehicular crossings considers the value of street trees in the urban landscape and maintains trees within the road reserve wherever possible.	AO5.3 The construction of the driveway or vehicular crossing does not cause damage to existing trees located within the verge.	PO5.3-AO5.3 Will comply Refer to Landscape Architect Consultant Drawings.
PO5.4 Driveways and private roads allow for safe evacuation and access for fire trucks and other emergency vehicles.	AO5.4 Driveways and private roads are designed in accordance with the requirements of Queensland Fire and Emergency Services ' <i>Fire Hydrant and Vehicle Access Guidelines for residential, commercial and industrial lots 2019</i> ' to provide safe evacuation and access for fire trucks.	PO5.4-AO5.4 Will comply Final design of the external roadworks will achieve compliance. Refer to Traffic Consultant.
PO5.5 Where refuse collection is required, driveways and private roads are designed to provide access and manoeuvring so that refuse vehicles can enter and exit the site in a forward gear.	AO5.5 No accepted outcome provided.	PO5.5-AO5.5 Will comply Final design of the external roadworks will achieve compliance. Refer to Traffic Consultant.
6 Stormwater and Water Sensitive Urban Design — General		
PO6.1 Development does not cause adverse stormwater drainage, water quality or water quantity impacts on or off the site, meeting the required stormwater quality and quantity objectives including protecting the quality of surface waters, ground waters and the existing natural flow of waterways.	AO6.1 Stormwater quantity is managed in accordance with the minimum standards outlined in: a. Part 2 — Standards for Design of Stormwater Drainage Works; b. Part 3 — Stormwater Quantity, Quality and Floodplain Management; and c. Part 8 — Standards for Construction of	PO6.1-AO6.1 Complies The development will introduce two bio detention basins to manage the stormwater runoff from the site.

	Stormwater Drainage Works of the General works and infrastructure planning scheme policy.	
PO6.2 The impacts of construction and operational activities on stormwater quantity and quality are minimised both on and off the site. Note: A Stormwater quantity and quality management plan prepared in accordance with the requirements of Part 3 Stormwater Quality, Quantity and Floodplain Management of the General Works and Infrastructure Planning Scheme Policy is the preferred method for addressing this performance outcome.	AO6.2 No accepted outcome provided.	PO6.2-AO6.2 Will comply. The development will introduce two bio detention basins to manage the stormwater runoff from the site. Stormwater construction management will be managed by the Construction management Plan.
7 Stormwater and Water Sensitive Urban Design — Stormwater Infrastructure Design		
PO7.1 Stormwater infrastructure is designed and constructed to meet peak flow requirements using proven methods and in accordance with the relevant standards including the Queensland Urban Drainage Manual (QUDM). Note: Stormwater infrastructure is designed and constructed in accordance with the standards and requirements outlined in Part 2 — Standards for Design of Stormwater Drainage Works, Part 3 — Stormwater Quantity, Quality and Floodplain Management and Part 8 — Standards for Construction of Stormwater Drainage Works of the General Works and Infrastructure Planning Scheme Policy.	AO7.1 No accepted outcome provided.	PO7.1-AO7.1 Complies The development will introduce two bio detention basins to manage the stormwater runoff from the site.
PO7.2 Development provides the necessary stormwater infrastructure to service the development and integrates that infrastructure with the existing stormwater management network.	AO7.2 No accepted outcome provided.	PO7.2-AO7.2 Complies The site layout has taken into account internal stormwater network to achieve safe and compliant conveyance through the site.

PO7.3 Stormwater infrastructure has sufficient capacity to manage all designed-for run-off and peak flows and: a. large areas of impervious material are minimised; b. opportunities for capture and reuse are maximised; c. sufficient area is provided within the site to accommodate an effective stormwater management system; and d. the design of the stormwater infrastructure manages all upstream water inputs (including surface water) and fully considers and minimises the downstream implications of the development.	AO7.3 No accepted outcome provided.	PO7.3-AO7.3 Complies
PO7.4 a. All development discharges to a lawful point of discharge in accordance with the Queensland Urban Drainage Manual. b. Where the lawful point of discharge is to a park, the receiving waterway shall be designed, 'naturalised' and constructed within an existing channel or waterway. Any works undertaken within the park ensure that the park function is not degraded and the written permission of the asset owner is obtained and submitted in support of the proposed discharge. c. A lawful point of discharge is established for infill (brown field) development where the site slopes away from the road reserve, and no inter-allotment drainage system	AO7.4 No accepted outcome provided.	PO7.4-AO7.4 Complies The development will discharge to two separate LPODs as per the existing scenario.

exists. If the drainage system passes through a private property, consent must be provided by the owners, with approval of the design and permission for the establishment of a drainage easement. Note: Discharge to the road reserve provides a lawful point of discharge. Where discharge to the road reserve is not possible, a lawful point of discharge may also include discharge to reserve land or to a stormwater easement, or by direct input into the stormwater management system (see the criteria for lawful point of discharge in the <i>Queensland Urban Drainage Manual (Part 3.9.1 Lawful point of discharge test)</i>. Note: For large scale development or development adjacent to waterways or wetlands, it may be preferable to reduce discharge to negligible levels by including detention or retention in the stormwater design, and by the re-use of water on site for irrigation or other purposes (see requirements of the Part 4 — Stormwater and water sensitive design of the General Works and Infrastructure Planning Scheme Policy).		
PO7.5 Stormwater infrastructure does not have an adverse effect on floodplain management, and is designed to: - minimise the impact of flooding within and external to the site; - ensure access to the site is maintained as much as is practically possible during flood events; - resist damage from flood waters; - provide effective management of upstream floodwater inputs and downstream floodwater dispersal, and - maintain its designed functionality during a flood event. Note: Where within or adjacent to a floodplain, stormwater infrastructure is designed and constructed in accordance with	AO7.5 No accepted outcome provided.	PO7.5-AO7.5 Complies A future flood impact statement will be required to confirm the updated flooding arrangement taking into account Ripley Road Widening. The small portion of the northern basin will be located within the flood overlay. A FIA will confirm the impact of flooding within the externals of the site.

the requirements of the SC6.2 General Works and Infrastructure Planning Scheme Policy.		
PO7.6 Alterations to the established patterns of the overland flow of water are avoided to: a. reduce runoff, peak flows, intensity and velocity; and b. minimise ponding and its corresponding risks to health and safety.	AO7.6 No accepted outcome provided.	PO7.6-AO7.6 Complies The site proposes to manage developed site flows by end of line bio/detention basins.
PO7.7 Stormwater infrastructure is generally designed and constructed to minimise risks to health and safety, preserve the integrity of buildings and structures, be safely accessible and efficiently maintained and to integrate with the existing stormwater infrastructure.	AO7.7 No accepted outcome provided.	PO7.7-AO7.7 Complies
8 Stormwater and Water Sensitive Urban Design — Water Quality		
PO8.1 The quality of surface waters and ground waters, and the existing natural flow of waterways, is protected.	AO8.1 Water quality is managed in accordance with the standards outlined in Part 2 — Standards for Design of Stormwater Drainage Works, Part 3 — Stormwater Quantity, Quality and Floodplain Management and Part 8 — Standards for Construction of Stormwater Drainage Works of the General works and infrastructure planning scheme policy. Note: The Waterway Corridors and Wetlands Overlay Code provides further guidance on the protection of natural waterways, and applies to development in areas where Waterway Corridors and Wetlands are mapped (in the Waterway Corridors and Wetlands Overlay mapping).	PO8.1-AO8.1 Complies Water quality is managed through two bioretention basins located within the detention basin.

PO8.2 During construction, erosion is minimised and sediments do not leave the site.	AO8.2 An assessment of the potential for erosion during construction is undertaken in accordance with the requirements of the General Works and Infrastructure Planning Scheme Policy in order to identify the potential for increased suspended solids, turbidity and sedimentation during construction, and the results of this assessment are used to inform an erosion and sediment control plan, ensuring that stormwater quality is maintained at acceptable levels during construction. Note: The Erosion and Sediment Control Plan addresses the requirements of Part 5 — Standards for Provision of Earthworks (5.1.6 Erosion and Sedimentation Control) and forms part of a Stormwater Management Plan required in Part 3 — Stormwater Quantity, Quality and Floodplain Management (3.5.3 Design).	PO8.2-AO8.2 Complies Refer to construction management plan
PO8.3 Stormwater management systems are designed and constructed in accordance with water sensitive urban design principles - a. using natural channel design; b. harvesting water where possible for use in landscaping (or other uses); c. protecting the existing natural features and ecological processes; and d. protecting the existing hydrologic behaviour of related catchments. Note: The design of the stormwater management system should align with the goals of the <i>Natural Resources Management Plan 2009 — 2031 (Healthy land and water)</i>. Note: Part 2 — Standards for Design of Stormwater Drainage Works, Part 3 — Stormwater Quality Management and Part 8	AO8.3 No accepted outcome provided.	PO8.3-AO8.3 Complies The proposed development will manage stormwater accordingly.

— Standards for Construction of Stormwater Drainage Works of the General Works and Infrastructure provide information that assists with meeting these requirements.		
9 Lighting		NA, Please refer to Relevant Consultant
PO9.1 Public lighting is designed and constructed in accordance with proven methods and the relevant standards.	AO9.1 Public lighting is designed and constructed in accordance with the standards outlined in Part 1 — Standards for Design of Roadworks, Part 4 — Standards for Design and Construction of Parks and Streetscapes and Part 6 — General Construction Issues Procedures and Standards of the General works and infrastructure planning scheme policy.	
PO9.2 Lighting provision does not result in adverse amenity outcomes for sensitive uses or fauna and is generally designed to prevent light spillage outside the boundaries of the site.	AO9.2 No accepted outcome provided.	
PO9.3 Installation of lighting minimises earthworks, and avoids crossing waterways, corridors and wetlands, and where crossing is unavoidable, tunnel-boring techniques are used to minimise disturbance to the environment and any disturbed areas are fully reinstated after lighting works are completed.	AO9.3 No accepted outcome provided.	
PO9.4 Lighting design facilitates casual surveillance and promotes safety and security in public places. Note: Lighting design should meet the principles of <i>Crime</i>	AO9.4 No accepted outcome provided.	

<i>Prevention Through Environmental Design (CPTED).</i>		
10 Utilities		
PO10.1 Development provides the necessary utilities to service the development in accordance with the requirements of the relevant regulatory authority and distributor.	AO10.1 No accepted outcome provided.	NA, Please refer to Relevant Consultant
PO10.2 A water supply is provided: a. to the standards of the relevant authority where reticulated water is available; and b. in accordance with proven methods and relevant standards outside the reticulated water service area. Note: Water supply must meet the requirements of Queensland Fire and Emergency Services for water supply. Note: Where in a designated bushfire prone area and a reticulated water supply is not available, additional requirements for the supply of water for firefighting are outlined in the Bushfire Risk Areas Overlay Code.	AO10.2 A water supply is provided: a. as reticulated water, meeting the standards of the relevant authority and fully operational before the commencement of any use; or b. where not in a reticulated water service area, as tank water, meeting the requirements of the Queensland Plumbing and Wastewater Code and Part 8 Utilities of the General Works and Infrastructure Planning Scheme Policy; and c. a sufficient provision of water is made for firefighting purposes in addition to the requirements for normal use.	Complies with PO10.2 / AO10.2 Water infrastructure has been located within the vicinity of the site. The site proposes to alternate connection locations to service the site.
PO10.3 In 'common private title' arrangements, and in other circumstances where private roads are used as the primary access, fire hydrants are identified appropriately and are accessible to fire trucks in accordance with the <i>Queensland Fire and Emergency Services publication Fire Hydrant and Vehicle Access Guidelines for Residential</i> ,	AO10.3 No accepted outcome provided.	Will comply as required, Please refer to Relevant Consultant

<i>Commercial and Industrial Lots (March 2019).</i>		
PO10.4 Sewerage is provided: a. to the standards of the relevant authority where a sewerage service is available, and b. in accordance with proven methods and relevant standards outside the reticulated sewerage service area.	AO10.4.1 A sewerage supply is provided: a. as reticulated sewerage, meeting the standards of the relevant authority and fully operational before the commencement of any use; and b. where not in a reticulated sewerage service area, as an on-site treatment system meeting the requirements of the <i>Queensland Plumbing and Wastewater Code</i> and Part 8 of the General Works and Infrastructure Planning Scheme Policy. AO10.4.2 Disposal of trade waste into the reticulated sewerage system meets the requirements of the <i>Environmental Protection Act 1994</i> .	NA – Site is not proposed as a commercial/industrial lot
PO10.5 An electricity supply is provided, meeting the standards of the relevant authority, and is fully operational before the commencement of any use, and where a reticulated gas service is supplied, it meets the standards of the relevant authority.	AO10.5 No accepted outcome provided.	NA – Site is not proposed as a commercial/industrial lot
PO10.6 A telecommunications service is provided meeting the standards of the relevant authority.	AO10.6 No accepted outcome provided.	NA – Site is not proposed as a commercial/industrial lot
11 Construction		All construction items will comply and be covered by the future construction management plan.
PO11.1	AO11.1	

Adverse impacts from noise and dust are fully contained, or at minimum, reduced to acceptable levels during demolition and construction (including dust from vehicles entering and leaving the site). Note: Where it is expected that noise during construction will have significant impact, a noise impact assessment addressing the requirements of the SC6.9 Noise Impact Assessment is the preferred method for addressing the noise impact requirements of this performance outcome.	No accepted outcome provided.	
PO11.2 Development involving filling or excavation does not cause ground-borne vibration beyond the boundary of the site.	AO11.2 No accepted outcome provided.	
PO11.3 Works ensure the protection of existing utilities infrastructure.	AO11.3 Works are designed and constructed in accordance with the requirements of the General works and infrastructure planning scheme policy, the <i>Queensland Development Code</i> MP1.4 — building over on or near relevant infrastructure, and the standard design specifications of the relevant service authority.	
PO11.4 Where future infrastructure has been planned and identified by the relevant authority, works are implemented to adequately accommodate this future infrastructure.	AO11.4 No accepted outcome provided.	
PO11.5 Acceptance of assets is undertaken in accordance with Part 9 — Compliance with Standards for Reconfigurations and Site Development Works and Part 10 — Maintenance of the General Works	AO11.5 No accepted outcome provided.	

and Infrastructure Planning Scheme Policy.		
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9.4.3 Earthworks Code

9.4.3.1 Application

- (1) This code applies to accepted development subject to requirements and assessable development for which the Earthworks Code is identified in the Category of Development and Assessment Benchmarks and Required Outcomes column in Table 5.7.2 - Categories of Development and Level of Assessment — Operational Works.
- (2) When using this code, reference should be made to Part 5.2 Reading the Tables and Part 5.3 Categories of Development and Assessment to determine the requirements for assessment of particular development.

9.4.3.2 Purpose and Overall Outcomes

- (1) The purpose of the Earthworks Code is to ensure that earthworks:
 - a. result in finished works that are designed and constructed to an appropriate standard;
 - b. do not adversely impact existing or planned future infrastructure;
 - c. are confined to the site and do not materially impact other properties;
 - d. do not unreasonably impact visual amenity; and
 - e. protect and preserve the natural environment beyond the site.
- (2) The purpose of this code will be achieved through the following overall outcomes:
 - a. earthworks are carried out to provide a change in level of the site from an existing ground (substrate) that:
 - i. is suitable for filling, by using only solid clean fill;
 - ii. if filled, is stable and provides a modified surface suitable for its intended purposes; and
 - iii. does not impact adjoining property, unless consent from the owner of that property is sought and obtained;
 - b. works ensure the protection of existing and future planned infrastructure;
 - c. stormwater flows resulting from the work do not increase or concentrate from the pre-development flows;
 - d. existing natural flow paths are considered in the design of earthworks;
 - e. water leaving the site does not cause erosion or allow sediments to leave the site;
 - f. earthworks do not have an adverse impact on a floodplain and its management;

- g. the use of retaining walls and batters is minimised, and where retaining walls or batters are used, the resulting impact on adjoining properties, streets and surrounding areas is minimised; and
- h. disruption to surrounding premises and the environment are minimised, and air and acoustic amenity is maintained during construction.

9.4.3.3 Specific Benchmarks for Assessment

Table 9.4.3.3.1 — Benchmarks for Accepted Development Subject to Requirements

Benchmarks for Accepted Development Subject to Requirements		Comments
Minor Earth Works	RO1.1 Do not exceed any of the following: a. 1000m² in area or 20m³ in volume; b. average depth of 500mm or a maximum depth of 800mm; c. batters with a slope greater than 1 in 8; d. a retaining wall height of 1m at any point; and / or e. a continuous retaining wall length of 20m.	The site will exceed RO1.1 earthwork volumes but all works will be located within the site boundary and account for future road widening. The site proposes to convey existing overland flow paths via the external road reserve.
	RO2.1 Are not located or undertaken: a. across property boundaries; b. do not interfere with, concentrate or redirect the natural flow of stormwater; c. in a natural gully or overland flow path or below the adopted flood level; d. within a public utilities easement; e. within 3m of a boundary with an adjoining property; f. within 3m of or on top of local government or public utility infrastructure; and / or g. within a road reserve, or drainage reserve (other than for government purposes)	
	RO3.1 Are not located in a 'high' or 'extreme' risk mapped area on the Flood Risk and Overland Flow Overlay.	

Table 9.4.3.3.2 — Benchmarks for Assessable Development

1 General Provisions		Comments
PO1.1 Earthworks are designed and constructed in accordance with relevant standards.	AO1.1 Development for earthworks is designed and constructed in accordance with the standards in the SC6.2 General Works and Infrastructure Planning Scheme Policy.	Complies PO1.1 / AO1.1 All Bulk Earthworks will be designed and completed in accordance with ICC SC6.2
PO1.2 The development and maintenance of earthworks ensures the preservation of health and safety, and maintains the integrity of adjacent premises, infrastructure and the natural environment. Note: A construction works management plan addressing the requirements of Part 5 — Standards for the Provisions of Earthworks of the General Works and Infrastructure Planning Scheme Policy (SC6.2) will assist in addressing this performance outcome.	AO1.2 No accepted outcome provided.	Complies PO1.2 / AO1.2
PO1.3 Hours of construction are limited to minimise adverse impacts during earthworks.	AO1.3 Earthworks only occurs between 6:30am and 6:30pm Monday to Saturday, excluding public holidays, unless varied by a development approval.	Will comply with PO1.3 / AO1.3 Refer to future construction management plan
PO1.4 All earthworks and retaining structures, and all activity related to the development of earthworks are contained within the site.	AO1.4 No accepted outcome provided.	Complies with PO1.4 / AO1.4 All retaining structures are located within the site boundary.
PO1.5 Earthworks are designed to minimise adverse	AO1.5 No accepted outcome provided.	Complies with PO1.5 / AO1.5 All earthworks are designed and will be

impacts in natural hazard areas, avoid waterway corridors and wetlands and ensure the preservation of biodiversity. Note: Where earthworks are intended adjacent to these areas, an analysis in the form of a plan identifying the location of the hazard, waterway or biodiversity area will assist in addressing this performance outcome. Where earthworks are planned within these areas, the relevant overlay code will apply.		constructed in accordance.
2 Geotechnical		
PO2.1 Where earthworks are proposed, the existing ground (substrate) is stable and suitable for fill.	AO2.1 The site: a. does not have compressible soils (e.g. soft clays) or reactive soils (soils with high elasticity or that are prone to cracking, shrinking and expansion, including but not limited to black soils) underneath the site; or b. where the site is underlain by compressible or reactive soils, a site specific geotechnical assessment is provided demonstrating the proposed treatment of compressible soils so they are able to provide sufficient support for future structures. Note: A geotechnical assessment report addressing the requirements of Part 5 — Standards for the Provisions of Earthworks of the General Works and Infrastructure Policy, prepared in the last five years and certified by an RPEQ* qualified engineer experienced in civil works, is the preferred method for addressing this performance outcome. * Engineer registered by the Board of Professional Engineers Queensland.	Will comply with PO2.1 / AO2.1 Geotechnical advice and testing will be sought prior to final design design/For Construction drawings are issued.

PO2.2 Appropriate material is used for fill, and is sufficiently compacted to support future development.	AO2.2 Only clean, geotechnically suitable fill is used, and it is compacted and shaped in accordance with the standards outlined in Part 5 — Standards for the Provisions of Earthworks of the General Works and Infrastructure Planning Scheme Policy. Note: Section 5.1.2 Materials for Filling of the General Works and Infrastructure Policy outlines the requirements for suitable fill and its uses.	Complies with PO2.2 / AO2.2 Geotechnical testing will be completed to ensure compliance.
PO2.3 Fill is free from contaminants.	AO2.3 Fill consists of soil, rock or other material excavated from the natural ground and is free from construction or other waste, chemical or liquid waste contamination, and weeds and their seeds. Note: Appendix 2 — Declared Plants of SC6.7 Landscape Works Planning Scheme Policy provides further information and references for weed species.	Complies with PO2.3 / AO2.3 Geotechnical testing will be completed to ensure compliance.
PO2.4 Topsoil that is stockpiled for reuse at the site is contained within the site, and removed vegetation is disposed of.	AO2.4 Topsoil and spoil: a. is stockpiled in accordance with an approved erosion and sediment control plan; and b. removed vegetation is either removed, transported off site or mulched for reuse on site, but is not burned off. Note: Details of the requirements for an Erosion and Sediment Control Plan are outlined in Part 5 — Standards for the Provision of Earthworks of the General Works and Infrastructure Planning Scheme Policy.	Will comply with PO2.4 / AO2.4 Refer to future construction management plan
PO2.5 Temporary or permanent retention structures used in association with earthworks are designed and constructed to be fit for purpose, and where	AO2.5 No accepted outcome provided.	Will comply with PO2.5 / AO2.5 Refer to future construction management plan

applied outside the boundary of the property are supported by consent from the affected landowner.		
3 Stormwater and Water Sensitive Urban Design		
PO3.1 Development does not cause adverse stormwater drainage or water quality impacts on or off the site, meeting the required stormwater quality and quantity objectives including protecting the quality of surface waters, ground waters and the existing natural flow of waterways. Note: Requirements for stormwater quality and quantity are outlined in SC6.2 General Works and Infrastructure Planning Scheme Policy (Part 2 — Standard for Design of Stormwater Drainage Works, Part 3 — Stormwater Quantity, Quality and Floodplain Management and Part 8 — Standards for Construction of Stormwater Drainage Works)	AO3.1 No accepted outcome provided.	Complies with PO3.1 / AO3.1 Site grading has been designed to manage site flows safely to the downstream stormwater management infrastructure.
PO3.2 During construction, development ensures that erosion is minimised and that sediments do not leave the site.	AO3.2 An assessment of the potential for erosion during construction is undertaken in accordance with the requirements of the General Works and Infrastructure Planning Scheme Policy to identify the potential for increased suspended solids, turbidity and sedimentation during construction, and the results of this assessment are used to inform an Erosion and Sediment Control Plan ensuring that stormwater quality is maintained at acceptable levels during construction. Note: The Erosion and Sediment Control Plan should address the requirements of Part 5 — Standards for Provision of Earthworks (5.1.6 Erosion and Sedimentation Control) and forms part of a Stormwater Management Plan required in Part	Will comply with PO3.2 / AO3.2 Refer to future construction management plan which will include a detailed Erosion and Sediment Control Plan.

	3 — Stormwater Quantity, Quality and Floodplain Management (3.5.3 Design).	
PO3.3 At all times, there is no ponding at the site.	AO3.3 No accepted outcome provided.	Complies PO3.3 / AO3.3 Site grading has been designed to avoid any trapped sags for stormwater to pond. Stormwater infrastructure will be designed in accordance with compliant ponding as per QUDM.
PO3.4 During earthworks, and maintained after the completion of earthworks, stormwater leaves the site at a lawful point of discharge. Note: Discharge to the road reserve provides a lawful point of discharge. Where discharge to the road reserve is not possible, a lawful point of discharge may also include discharge to land reserved for stormwater purposes or via a stormwater easement, or by direct input into the stormwater management system (see requirements of Part 2 — Standards for Design of Stormwater Drainage Works, Part 3 — Stormwater Quantity, Quality and Floodplain Management and Part 8 - Standards for Construction of Stormwater Drainage Works of SC6.2 General Works and Infrastructure Planning Scheme Policy). Note: For large scale development or development adjacent to waterways or wetlands, it may be preferable to reduce discharge to negligible levels by including detention or retention in the stormwater design, and by the re-use of water on site for irrigation or other purposes (see requirements of the Part 4 Stormwater and water sensitive design of SC6.2 General Works and Infrastructure Planning Scheme Policy).	AO3.4 No accepted outcome provided.	Complies with PO3.4 / AO3.4 All stormwater flows are managed through the site and discharge via the lawful point of discharge.
PO3.5 Earthworks do not have an adverse effect on floodplain management, and are designed to: - minimise the impact of flooding; - consider residual flood risks beyond the defined flood event;	AO3.5 No accepted outcome provided.	Will comply with PO3.5 / AO3.5 A Flood Impact Assessment will be required to confirm the updated flood impacts to the site taking into the account the Ripley Road widening. This will also cover the current extent

c. ensure access is maintained during flood events; d. resist damage from flood waters; e. provide effective management of upstream floodwater inputs and downstream floodwater dispersal; and f. retain full functionality during a flood event. Note: Where within or adjacent to a floodplain, earthworks are designed and constructed in accordance with the requirements of SC6.3 Flooding and Overland Flow Planning Scheme Policy.		of Bulk Earthworks.
4 Retaining Walls and Batters		
PO4.1 Permanent or temporary retaining walls and batters are designed and constructed using proven methods, materials and technology. Note: See Part 5.1.8 — Standards for the Provision of Earthworks (5.1.8 Batters and Earth Retaining Structures) in SC6.2 General Works and Infrastructure Planning Scheme Policy for additional requirements for the placing and construction of retaining walls.	AO4.1 No accepted outcome provided.	Complies with PO4.1 / AO4.1 All retaining walls will be design in accordance with best practice and signed by RPEQ.
PO4.2 Retaining walls and batters are visually attractive and do not impose a negative visual impact upon neighbouring properties, the street or public spaces, and the impact of retaining walls and batters is softened by terracing and landscaping.	AO4.2 Development provides retaining walls and batters which are designed and constructed using proven methods, materials and technology. Where residential and commercial: a. unless designed as integral to an overall building design, the maximum height for a single vertical retaining wall is: i. 1m for the front boundary; ii. 1.5m for the side boundary with a minimum 1m setback to the	Will comply with PO4.2 / AO4.2 To be coordinated with future design.

	building; and iii. 2.5m for the rear boundary with a minimum 3m setback to the building. b. for the side boundary, where a vertical separation (total height) of greater than 1.5m is required, retaining walls are staggered with a minimum horizontal separation of 1m between the staggered walls to allow for an intermediate landscaped area with a minimum 1m setback from the lower retaining wall to the building; c. the bottom tier of a staggered retaining wall is a maximum of 1m in height, to facilitate the use of the intermediate landscaped area; d. to reduce the impact of overshadowing in residential applications, the combined retaining wall height and fencing (maximum vertical separation) is no greater than 3.3m with a single retaining wall or 4.3m with a tiered retaining wall for the side boundary, and 4.3m for the rear boundary; e. all retaining walls must be designed for a minimum design life of 60 years; and f. vegetated batters have a maximum gradient of 1:3 and are appropriately stabilised. Turf batters have a maximum gradient of 1:6. Where industrial: a. unless designed as integral to an overall building design, the maximum height for a	
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	single vertical retaining wall is: i. 2m for the front boundary, where above and fronting a road; b. where a vertical separation (total height) of greater than 2m is required on the front, road facing boundary, retaining walls are staggered with a minimum horizontal separation of 1m between the staggered walls to allow for an intermediate landscaped area; c. all retaining walls must be designed for a minimum design life of 60 years; and d. vegetated batters have a maximum gradient of 1:3 and are appropriately stabilised. Turf batters have a maximum gradient of 1:6.	
PO4.3 Fencing along the top of retaining walls is minimised to reduce visual and security impacts on surrounding properties and public spaces.	AO4.3.1 Where a boundary fence is provided adjacent to or at the top of the retaining wall, the maximum height of the fence is 1.8m to reduce the bulk of the entire structure. AO4.3.2 Where between a building and a public space (i.e. street, open space or pathway) and along front boundaries, retaining walls are no more than 1m in height, and where public space is below the building or lot, the maximum height of a fence is a maximum of 1.2m to provide for passive surveillance of the public space.	Will comply with PO4.3 / AO4.3 Will be coordinated with final design.
PO4.4 Retaining walls (with a vertical clearance of greater than 1m) are constructed wholly within the	AO4.4 Retaining walls do not encroach onto adjoining properties, and where adjoining —	Complies with PO4.4 / AO4.4 All retaining walls are located wholly within the site boundary.

property boundary for ease of access and maintenance.	a. residential uses, parks, open space or road reserve are a minimum distance of 300mm from the property boundary; and b. industrial or business activities, are wholly within the property boundary.	
5 Infrastructure and Easements		
PO5.1 Where in potential conflict with services, within a public utilities easement or other easement in favour of Council, or within 1.5m of existing local government infrastructure works earthworks do not: a. damage the infrastructure; b. impede access to the infrastructure for maintenance purposes; or c. prejudice the functioning of the easement for its intended purpose.	AO5.1 Earthworks are designed and constructed in accordance with: a. the requirements of SC6.2 General Works and Infrastructure Planning Scheme Policy; b. the Queensland Development Code MP1.4 — Building over on or near relevant infrastructure; and c. the standard design specifications of the relevant service authority.	Complies with PO5.1 / AO5.1 All existing infrastructure will be managed.
PO5.2 Where future infrastructure has been planned and identified, works are designed and implemented to adequately respond to and accommodate the future infrastructure.	AO5.2 No accepted outcome provided.	Complies with PO5.2 / AO5.2 The proposed site layout caters for the external road widening extents along Ripley Road.
6 Maintaining Amenity		
PO6.1 Road infrastructure is not adversely affected by haulage, and the impact of haulage activity is minimised along transport routes and at neighbouring properties.	AO6.1 All transport routes are approved: a. for State controlled roads, by the Department of Transport and Main Roads; b. for all other roads, by Council; and	Will comply with PO6.1 / AO6.1 All existing infrastructure located within the site will be managed accordingly.

	c. hours of haulage are between 6:30am to 6:30pm Monday to Saturday excepting public holidays, or as otherwise varied in a development approval.	
PO6.2 Development involving filling or excavation does not cause ground-borne vibration beyond the boundary of the site.	AO6.2 No accepted outcome provided.	Will comply with PO6.2 / AO6.2 Refer to the future construction management plan.
PO6.3 The spread of dust to adjacent properties and public places is minimised.	AO6.3 Dust emissions resulting from works, including vehicles entering and exiting the site, do not extend beyond the site.	Will comply with PO6.3 / AO6.3 Refer to the future construction management plan.
PO6.4 Noise emissions are minimised. Note: Where there is an expectation that noise levels may be excessive, or where sensitive uses may be affected by the level of noise expected during the proposed earthworks, a noise impact assessment prepared in accordance with the requirements of SC6.9 Noise Impact Assessment Planning Scheme Policy is the preferred method of addressing this Performance Outcome.	AO6.4 Works are carried out during approved hours.	Will comply with PO6.4 / AO6.4 Refer to the future construction management plan.
7 Landscaping		
PO7.1 Upon completion of earthworks, surface landscape treatments are used to stabilise soils and prevent erosion.	AO7.1 Upon completion of the works, the site is planted with approved establishment species to stabilise topsoils and reduce erosion and sedimentation to acceptable levels. Note: See Part 3 — Stormwater Quantity, Quality and Floodplain Management in SC6.2 General Works and Infrastructure Planning Scheme Policy for acceptable levels for sedimentation.	Will comply with PO6.4 / AO6.4 Refer to landscape consultant information

8 Existing Vegetation		
PO8.1 Where it is possible to preserve existing vegetation such as mature native trees to contribute to future landscaping works, the required existing vegetation is protected during earthworks.	AO8.1 Earthworks are not carried out within the tree protection zone (TPZ) of trees retained for use in future landscaping works. Note: Where work is proposed within a tree protection zone, an arborist report with recommendations for the protection and preservation of the tree during and after excavation may satisfy the requirements of this outcome. Note: this provision does not apply to significant vegetation mapped within areas identified in the Biodiversity overlay. Where vegetation is within these areas, the Biodiversity Overlay Code applies.	Will comply with PO8.1 / AO8.1 Refer to landscape/Arborist consultant information
9 Dams		
PO9.1 The construction or filling of a dam does not adversely affect natural physical processes or ecosystems and creates a safe and stable dam wall surface.	AO9.1 The dam is constructed in a rural zone and: - the land has a slope of less than 25% (1:4); - all earthworks for the dam are set back a minimum of 50m from the property boundary; and - the size of the lot on which the dam is located is greater than 5 hectares. Note: Dams and levees may be assessable development under the <i>Water Supply (Safety and Reliability) Act 2008</i> . Where more than two people may be at risk from the failure of the dam, the dam is considered a referable dam. For information on referable dams contact damsafety@rdmw.qld.gov.au . Note: Construction works for dams must be in accordance with Part 5 — Standards for the Provision of Earthworks of the SC6.2 General Works and Infrastructure Planning Scheme Policy. Also see 'Small Dam Safety'.	NA – no dams present on site.

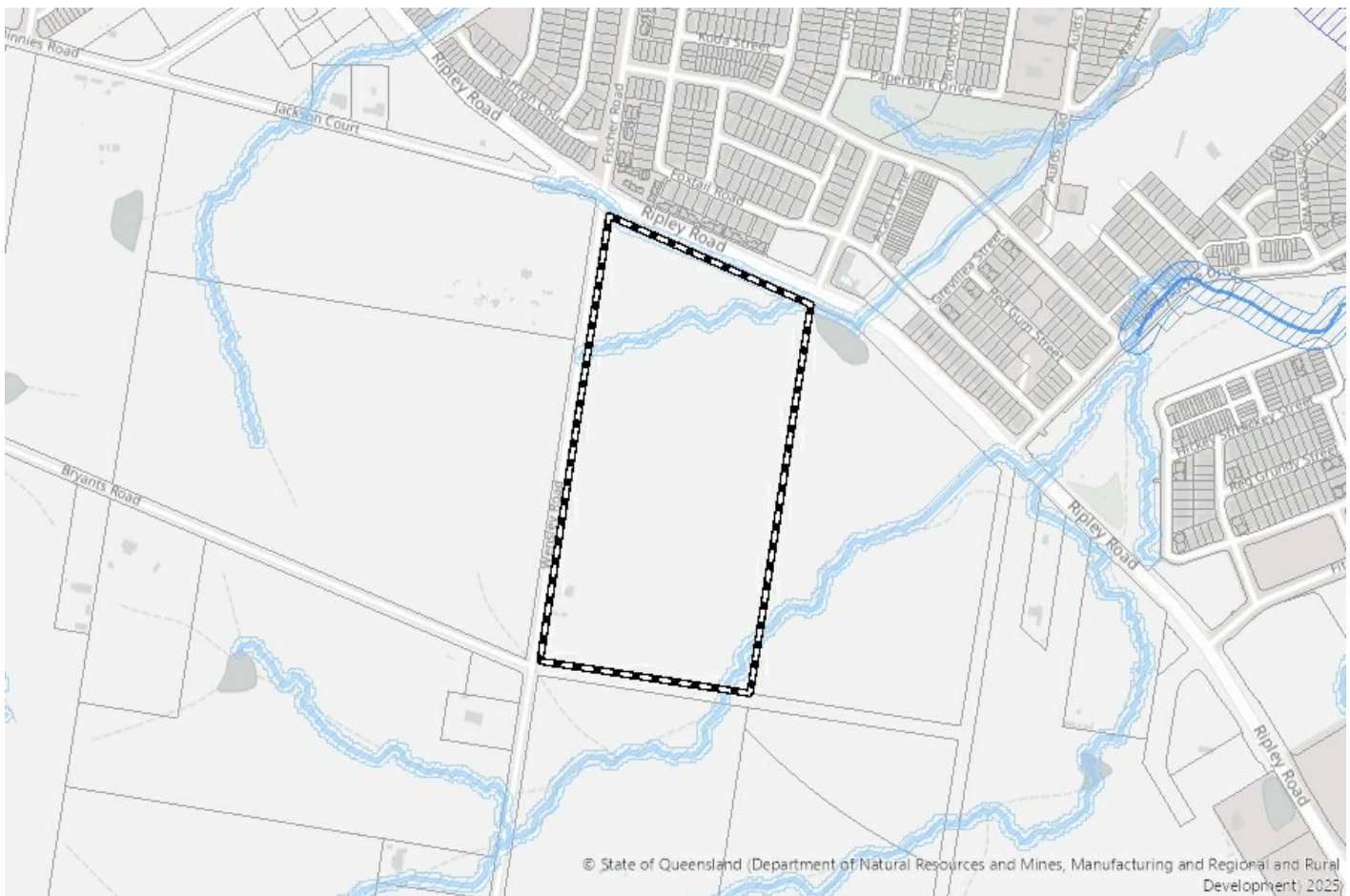
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Appendix F – Council Overlay Maps



Property Details

Address	54 WENSLEY ROAD RIPLEY QLD 4306
Plan Area	180,240 m ²
Lot / Plan	191SL18

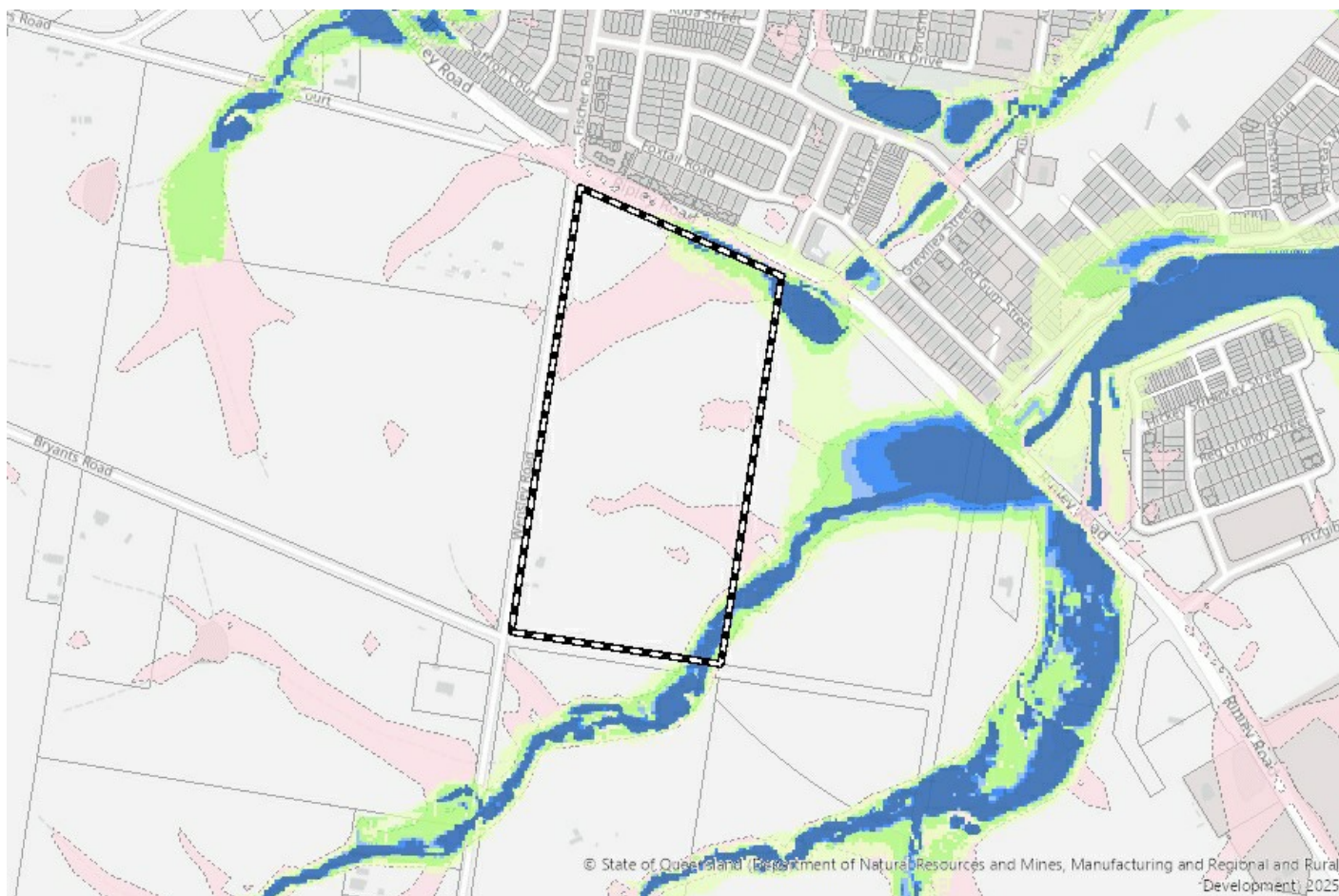


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Property Details

Address 54 WENSLEY ROAD RIPLEY QLD 4306
Plan Area 180,240 m²
Lot / Plan 191SL18



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Zones and Precincts

Zone - Note: Refer to Ripley Valley Urban Development Area Development Scheme

Local Area Framework - 18; Ripley Valley



Overlays, OV1 Biodiversity

OV1 MSES QLD Waterways for Waterway Barrier Works

OV1 MSES Regulated Vegetation Intersecting a Watercourse

Overlays, OV2 Waterway Corridors and Wetlands

OV2 Minor Waterway

OV2 Minor Waterway Buffer



Overlays, OV7A Operational Airspace Height Restriction Zone and Obstruction Clearance Surface

OV7A RAAF Height Restriction Zone 90m

OV7A RAAF Obstruction Clearance Surface - Obstruction Clearance Surface - Outer Horizontal Surface RL 176.5



Overlays, OV7B Wildlife Attraction and Lighting Issues

OV7B RAAF Wildlife Hazard Buffer Zone - Wildlife Hazard Buffer Zone 13km

OV7B RAAF Wildlife Hazard Buffer Zone - Wildlife Hazard Buffer Zone 8km



Overlays, OV7D Explosive Storage Public Safety Restricted Areas Purga Rifle Range

OV7D RAAF BRA AOI 90m AHD



Overlays, OV10 Bushfire Prone Areas

OV10 Bushfire Prone Areas - High Potential Bushfire Intensity

OV10 Bushfire Prone Areas - Medium Potential Bushfire Intensity

OV10 Bushfire Prone Areas - Potential Impact Buffer



Overlays, OV11 Difficult Topography and Landslide

OV11 Slope 15% to 25%



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Overlays,OV12 Flood Risk and Overland Flow

OV12 Overland Flow Path	
OV12 Flood Risk Category Very Low Risk	
OV12 Flood Risk Category Low Risk	
OV12 Flood Risk Category Medium Risk	
OV12 Flood Risk Category High Risk	
OV12 Flood Risk Category Extreme Risk	

Overlays,OV13 Regional Infrastructure

OV13 Future Railway Corridor	
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Overlays,OV15 Water Resource Catchments

OV15 Minor Waterway	
OV15 Minor Waterway Buffer	

Local Government Infrastructure Plan (LGIP)

LGIP AICR Charge Area References	
LGIP Districts	

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Further information on these layers can be found in the FACTSHEETS on shapeyouripswich.com.au/new-ipswich-planning-scheme

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Appendix G – Water By Design Maintenance

THREE **UNDERTAKING MAINTENANCE**



Maintenance activities for swales, bioretention systems, constructed wetlands, and sediment basins include:

- repairing erosion (Section 3.1)
- unblocking inlets and outlets (Section 3.2)
- removing sediment (Section 3.3)
- removing litter and debris (Section 3.4)
- managing mosquitoes (Section 3.5)
- managing birds (Section 3.6)
- managing high or low water levels in a wetland (Section 3.7)
- responding to a paint or fuel-spill (Section 3.8)
- replanting (Section 3.9)
- controlling weeds (Section 3.10)
- managing excessive algae in sediment basins and constructed wetlands (Section 3.11)
- managing algal or moss growth on bioretention systems (Section 3.12)

The need for maintenance can be identified by comparing the state of the asset against the performance indicators in the checklists in Section 4.

3.1 Repairing erosion

ISSUE

Erosion in and around vegetated stormwater assets is generally because of fast flows, poor soil placement or compaction, inadequate vegetation cover, or dispersive soils. The most common areas for erosion are:

- at the base of a swale or on the surface of a bioretention system
- on the batter slopes, usually due to lateral inflows to the asset or where there is poor vegetation
- around inlet structures, due to high velocities
- at the interface of concrete and soil surfaces, due to water preferentially flowing along the concrete surface

Figure 14 and Figure 15 show examples of erosion in vegetated stormwater assets.

Minor erosion can extend and turn into a larger problem, including undermining structures, channelling of flows, and affecting vegetation health.

Figure 14 Erosion at the transition between a swale and bioretention system causing ripping of the jute mat



Photo: Paul Dubowski, Healthy Waterways

Figure 15 Erosion at the transition between wetland cells



Photos: Jason Sonneman, DesignFlow

ACTIONS

If the erosion poses a risk to public safety or the structural integrity of the asset, or is likely to worsen if left unattended, undertake repairs immediately.

If the erosion is minor, re-profile using hand tools or light machinery to limit damage to adjacent vegetation. Re-plant using replacements from other parts of the asset or bring in new stock.

Larger washouts may require large machinery and new fill material and plant stock to be imported. When using large machinery, take care not to compact the filter media of a bioretention system. If imported fill is used, it must meet the design specifications (particularly for bioretention systems). If the design specifications are not known, consult the *Technical Design Guidelines*. Re-plant once the earthworks are finished.

If an investigation into the source of the erosion is needed (e.g. the erosion is severe or recurring), refer to *Rectifying Vegetated Stormwater Assets*.

3.2 Unblocking inlets and outlets

ISSUE

The inlets and outlets are the main hydraulic controls. If they are blocked or not flowing freely:

- the asset may pose a risk to flooding, particularly if there is no alternative high-flow path
- the vegetation will be at risk (the plants may drown eventually)
- the volume of water that can be treated will be restricted as inflow will not enter the asset when it is full, causing flows to overflow or to pass downstream untreated

Figure 16 Litter blocking outlet pits



Photos: Paul Dubowski, Healthy Waterways and Robin Allison, DesignFlow

Figure 16 shows examples of blocked outlet pits that are restricting flows.

ACTIONS

Remove litter and debris by hand or with hand tools, such as shovels, forks, and tongs. Special opening tools (e.g. grate/gatic openers) are required for some outlets.

For sediment basins and wetlands, waders or a boat may be required to access the water body.

In extreme cases, machinery may be required.

If blocking persists, refer to *Rectifying Vegetated Stormwater Assets*. An alternative grate may be required or upstream measures may need to be investigated e.g. checking or installing gross pollutant traps.

3.3 Removing sediment

ISSUE

Sediment build-up in swales, bioretention systems (Figure 17), constructed wetlands, and sediment basins can:

- smother vegetation
- change the surface profile of the asset, which influences flow patterns
- form an impermeable layer on the surface of bioretention systems and prevent infiltration

If infiltration in a bioretention system is reduced or not occurring (see Figure 18), stormwater will bypass untreated into the overflow and the media may become boggy. A lack of water will affect the health of the vegetation and boggy conditions can attract mosquitoes, as well as generate unpleasant odours.

Figure 17 Sediment accumulated at an inlet



Photo: Paul Dubowski, Healthy Waterways

Figure 18 Examples of a bioretention surface that has been blinded with clay-like sediment deposition



Photos: Alan Hoban, Healthy Waterways and Andrew O'Neill, DesignFlow

ACTIONS

If an asset requires cleaning out at an unacceptable or unsustainable frequency, refer to *Rectifying Vegetated Stormwater Assets*.

Bioretention systems – coarse sediment forebay

Coarse sediment forebays are placed at the inflow location to bioretention systems to capture very coarse sediment (>1 mm). The forebays will typically be constructed of rock or concrete and should be designed to be cleaned out once a year¹. When the sediment forebay is 75% full or greater, remove the sediment.

Removing sediment should be a straightforward task that can be done by hand or mechanically. Because the forebay captures coarse sediment only, it should not be contaminated, and because the forebay is shallow and mostly dry, dewatering should not be needed.

Bioretention systems – surface

Remove sediment in dry weather and ideally at the end of the dry season.

To maintain the integrity of the vegetation and prevent compaction of the filter media, remove sediment by hand (if possible) using flat shovels.

If machinery is used, remove sediment via an excavator located on the edge of the bioretention system or via a pozitrack bobcat to avoid compaction of the filter media. Minimise the number of times the bobcat passes over the bioretention surface. Reprofile and replant the area as required.

The equipment required for cleaning the coarse sediment forebay and the surface of the bioretention system includes:

- shovel and wheelbarrow for small assets
- bobcat or small excavator for large assets
- tipper truck if sediment disposal cannot occur locally

Sediment basins

Sediment basins are normally designed to be cleaned out at least once every five years¹. Clean out a sediment basin when there is less than 1 m of water above the accumulated sediment. Complete the works in dry weather, ideally at the end of the dry season.

When removing sediment:

- Complete a sediment contamination and disposal assessment as outlined in Appendix A. In most cases, sediment contamination should not be a concern. If the sediment is contaminated, engage a licensed waste removal contractor as transporting and disposing of the sediment is subject to local and state regulations.
- Get necessary approvals for the works, including permission to de-water if necessary. Approval to drain the asset may be required for sediment basins and wetlands.
- Lower the water level with a maintenance valve or de-water the asset with a pump in accordance with the procedures of the relevant authority. Divert inflows away from the asset. In some cases, install a plug in the inlet pipe, pump the water, and clean the asset while holding the water upstream. Dewatering can take 1–2 days depending on the size of the asset and the capacity of the drain or pump. Ensure the dewatering has no adverse environmental affects.
- Remove and store plants that will be disturbed, in order to replant them after removing the sediment.
- Remove the sediment using appropriate machinery (see below).
- Remove sediment from the bottom of the asset. Sediment basins may have a hard base (such as concrete, rocks, or gravel), which indicates the bottom. The design drawings should identify this.
- If a drying (de-watering) area is available, place the sediment in this area to dry, ensuring it has silt control, and leave it until it is dry enough to remove. Clean sediment (no pollutants, needles etc.) may be re-used in earthworks or landscaping activities subject to relevant testing. Otherwise, place the sediment in a

truck and transport to an approved recycling or disposal facility.

- If a drying area is not available, place the sediment in a sealed truck for transport to an approved waste disposal facility. It is worth investigating if a drying area can be created nearby to reduce transport and disposal costs.
- Clean the sediment basin and reinstate the dewatering area and sediment pond edges as required, including replanting.

The equipment required to maintain sediment basins includes:

- pump to dewater the basin if maintenance valves do not completely drain it
- method of stopping inflows to the basin e.g. sand bags for small inflows
- if sediment needs to be collected from the edge of the basin, an excavator (possibly with a long-reach) or a heavy vacuum loader unit with a 6 inch hose
- if there are reinforced access tracks, a backhoe or excavator can enter the asset
- drying pad or a sealed truck to transport the saturated sediment
- if the dry sediment if it cannot be reused on site, a truck
- hand tools or small machinery to reinstate the disturbed area

Constructed wetlands

Removing sediment from wetlands is similar to removing it from sediment basins, with the following additional tasks:

- Ensure the wetland is off-line, diverting flows around the wetland if possible. Always have sediment controls in place in case of flows into the wetland.
- Access the wetland from the edge to avoid damaging vegetation.
- Replant all disturbed areas after removing the sediment.

¹ This clean out frequency is after construction activity in the catchment has finished.

3.4 Removing litter and debris

ISSUE

While litter and debris are mainly an aesthetic issue, they can smother vegetation, provide habitat for mosquito breeding, be a source of pollutants, block inlet and outlet structures, and pose a risk to public safety. If litter is able to enter downstream waterways it can cause environmental harm.

ACTIONS

Remove litter and excessive debris, by hand or with hand tools such as shovels, forks, and tongs.

For sediment basins and wetlands, waders or a boat may be required to access the water body.

In extreme cases, small machinery such as bobcats may be required.

3.5 Managing mosquitoes

ISSUE

Shallow, isolated pools of water that exist for several days in constructed wetlands, sediment basins, or water-logged areas of swales and bioretention systems can provide habitat for mosquitoes. Permanent water bodies are less likely to cause mosquito issues because they support predator species that can keep mosquito populations under control.

ACTIONS

Fill and reprofile isolated pools of water and re-plant if necessary.

If there are excessive numbers of mosquitoes or the problem is recurring, refer to *Rectifying Vegetated Stormwater Assets*.

3.6 Managing birds

ISSUE

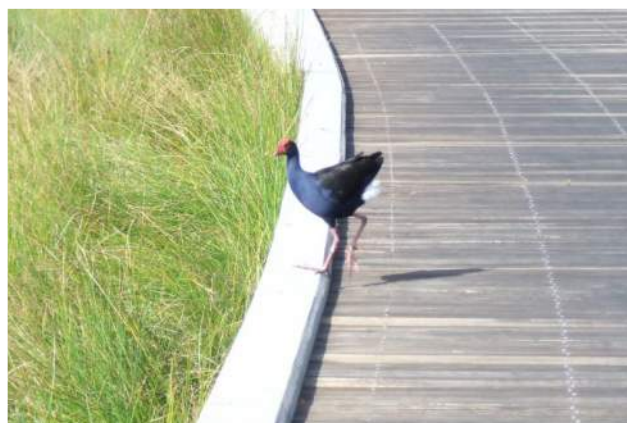
While fauna is generally welcomed in vegetated stormwater assets, large populations of some fauna can be a nuisance and can affect how an asset functions. In particular, birds can be a problem in and around constructed wetlands because they can eat or trample vegetation. For example, plant death can result from swamp hens trampling vegetation (see Figure 20). Faeces of other birds that gather in high numbers can affect water quality. Common problem species are ibises and ducks.

ACTIONS

Manage the preferred habitat. For example, remove islands or provide a predator bridge. Wetlands should not have islands as these encourage birds to nest and roost safe from predators. Other options are using signs to encourage visitors not to feed the birds or dropping the water level before and during breeding time to encourage the birds to leave the area, particularly for swamp hens. If the wetland does not have an outlet control pit (refer to *Technical Design Guidelines*), it is recommended that one is installed. If the wetland cannot be drained under gravity, pumping will be required.

If excessive numbers of birds are causing significant or repeated damage to an asset, refer to *Rectifying Vegetated Stormwater Assets*.

Figure 19 Swamp hen and associated damage



Photos: Andrew O'Neill, DesignFlow

3.7 Managing high or low water levels in a wetland

ISSUE

The water level in a constructed wetland will vary according to climatic conditions. During rainfall it will rise up to 0.5 m above the normal water level and during drought conditions it may lower by up to 0.3 m. The wetland plants will tolerate this variation and most will thrive. However, persistently high or low water levels (Figure 20) will have a negative impact on the plants and will need to be fixed.

Figure 20 Example of a wetland with persistently low water levels



Photo: Robin Allison, DesignFlow

ACTIONS

If it has not rained for three days and water levels remain high, the outlet may be blocked or there may be high water downstream that is preventing the wetland from drawing down. If an outlet or riser orifice is blocked, see Section 3.2. If there are no blockages, consult *Rectifying Vegetated Stormwater Assets*.

If the water level is much lower than the normal water level, inflows may have reduced or there may be a leak in the wetland. Consult *Rectifying Vegetated Stormwater Assets*.

3.8 Responding to paint or fuel spills

ISSUE

Pollutants from paint or fuel spills can get into stormwater and into a vegetated stormwater asset. Action is required to reduce the impacts, particularly on wetlands.

ACTIONS

Ensure designated staff and equipment are available in the case of a pollution-related incident.

Stop polluted material from moving through a wetland and reaching downstream environments using floating booms and by shutting off the outlet area (if possible).

Record all incidents on the inspection and maintenance checklist.

3.9 Replanting

ISSUE

Vegetated stormwater assets should have dense, evenly distributed vegetation across all planted areas.

Maintaining vegetation is crucial to the performance of vegetated stormwater assets because it:

- assists to spread and slow water, which maximises the amount of vegetation in contact with the stormwater
- helps to reduce erosion
- minimises the establishment of weeds by shading and competing for nutrients
- preserves hydraulic conductivity in bioretention systems
- traps coarse litter
- acts as a deterrent to public access

Some water plant species will dieback (senesce) each winter: this does not equate to dead vegetation.

Figure 21 shows an example of uneven vegetation in a wetland. It is important to quickly re-establish vegetation in bare areas before weeds establish.

Figure 21 Uneven vegetation cover in a wetland and after transplanting



Photos: Robin Allison, DesignFlow

ACTIONS

If the asset does not meet the performance indicators for vegetation, re-establish the vegetation using new stock or (for constructed wetlands) using stock transplanted from elsewhere within the asset.

If replanting with new stock, use the plant species that are growing well in other parts of the asset. (For wetlands, look for plants growing in similar depths of water.) Otherwise, refer to the *Technical Design Guidelines* or a person with a good understanding of aquatic vegetation. Plant at a density of between 6–10 plants per m² and use a minimum of two species.

In constructed wetlands, dividing and relocating existing vegetation is a simple and cost-effective way of replacing vegetation. Mature water plants from a similar depth zone can be removed and the plant divided by splitting it through the base. Directly plant the new sections into the re-establishment area, taking care of the root system. Water plants with rhizomatous root systems (underground stems with multiple shoots off them) are ideal candidates for division and relocation, as each rhizome can be cut into multiple sections.

In wetlands with grazing waterbirds (particularly Purple Swamp Hens) or where the water level cannot be maintained at a constant low level (10 cm), replant using larger seedlings or plants. This is because swamp hens tend to pull seedlings out and high water levels often drown the seedlings. In areas with few birds and good water level control, use seedlings to revegetate as they are usually more cost-effective.

Use specialist aquatic plant contractors when large areas need replanting. A small boat may be required.

Refer to the *Construction and Establishment Guidelines* for detailed advice on planting procedures for vegetated stormwater assets.

If the lack of vegetation cover is severe or recurring or the replanted vegetation fails to establish, consult *Rectifying Vegetated Stormwater Assets*.

3.10 Controlling weeds

A weed is a plant that is growing where it is not wanted. Plants are considered weeds because they: compete with or displace native plant species; reduce biodiversity; impact ecosystem function; alter natural habitats; restrict natural processes; reduce amenity; and cause blockages to hydraulic structures. While this definition is generally applied to introduced plant species, some native plant species are also classified as weeds when they grow out of their natural range. Appendix B contains detailed information on common weeds encountered in vegetated stormwater assets.

ISSUE

Identifying and controlling weeds is important to preserve the function of a vegetated stormwater asset.

Assets are particularly vulnerable to weed invasions when the desirable plants are stressed, such as during the dry season or at the end of the wet season.

Swales and bioretention systems

Common terrestrial weeds readily grow within bioretention systems and swales (Table B-1). The growth of weeds within bioretention systems can reduce vegetation health, cover, and diversity, and result in an excessive organic layer accumulating on the surface of the filter material. Dense weeds within swales can reduce the flow capacity of the asset and increase the risk of flooding.

Sediment basins and wetlands

Enriched nutrient conditions and open water provides ideal habitat for aquatic weeds within sediment basins and constructed wetlands. Emergent aquatic plants (i.e. Cumbungi) and semi-aquatic weeds (i.e. para grass) colonise and grow well within the planted marsh zones and ephemeral margins (Table B-1). Common terrestrial weeds readily grow on the batters (Table B-1).

ACTIONS

Ideally, remove or control all weed species within an asset as part of a regular maintenance program. This is mandatory for declared weeds. A low level of undeclared weed cover may be okay if it does not hinder the functioning of an asset. However, early detection and action should cost less and result in higher success rates for managing weeds.

The main aspects of controlling weeds in vegetated stormwater assets are:

- recognise that some weed growth is inevitable because stormwater conveys weed seeds from the catchment
- know which weeds cause problems
- regularly inspect for weeds

Persistent weed ingress or excessive weed cover may mean that maintenance activities are not sufficient to manage the weeds. In this case, increase the maintenance frequency for a growing season (6–12 months). If this does not satisfactorily manage weeds, refer to *Rectifying Vegetated Stormwater Assets*.

When managing weeds, consider the following factors:

- the cause of the weed infestation
- the biology and ecology of the weed species
- methods to remove weeds, including their costs and benefits

Determining the source or cause of weeds will help to determine the most appropriate weed control strategy.

Understanding a weed's biology or ecology may influence the timing of the control method. For example, it may be beneficial to control a particular weed before it seeds to prevent further spread of the infestation.

There is a range of methods commonly used to control weeds within vegetated stormwater assets (see below). An integrated approach, where a number of control methods are used in a co-ordinated manner, is often the most effective long-term strategy. For example, a weed may initially be removed by hand, with any remaining weeds controlled using chemicals.

Many aquatic weed species are able to re-grow from small plant fragments and seeds. Take extreme care when physically removing and disposing of the plant material. Thoroughly clean all equipment used with or near aquatic weeds before moving the equipment to another waterway. This includes hand equipment, boats, booms, excavators, harvesters, and transport vehicles.

Control methods

PHYSICAL REMOVAL OF WEEDS

Hand pulling: A labour-intensive method that is extremely effective for controlling isolated weed infestations. This method is particularly useful for removing shallow-rooted weed species. Take care to remove all root material, particularly when removing deep-rooted perennial weed species.

Hand raking: A labour-intensive method used to remove small aquatic weed infestations. This method involves using a long-handled rake to remove floating or submerged aquatic weeds from sediment basins and constructed wetlands.

Grubbing: This method uses tools such as shovels and mattocks to remove weeds. Grubbing is a useful method for removing deep-rooted, woody weed species.

Mechanical removal: Use this method to remove large infestations of floating or submerged aquatic weeds from sediment basins and constructed wetlands.

Specialised floating harvesters can remove floating aquatic weeds or cut and remove weed biomass at a fixed depth below the water surface. Floating harvesters can manage weed biomass. Weed harvesting needs to be regularly repeated.

An excavator can remove floating and submerged aquatic weeds from open water areas. This normally involves scooping plants from the water with a bucket. If using excavators, use floating booms to concentrate floating aquatic weeds.

Long-reach draglines, such as chains or nets, can remove floating or submerged aquatic weeds. This involves pulling the chain or net through the water using a tractor. Only use this method when other methods of weed control are unfeasible as draglines can damage desirable macrophytes.

While using floating harvesters, excavators, or draglines to remove aquatic weeds is unlikely to eradicate them, this may provide an effective strategy for short-term control.

Floating booms: Floating booms are an effective method to control the spread of free-floating aquatic weeds within sediment basins and constructed wetlands. Floating booms are particularly useful for confining small, isolated weed infestations to particular areas of the asset, at which point plants may be physically removed or other control methods used, such as herbicides.

SLASHING

Slashing is an effective strategy to prevent weeds from flowering and seeding. Slashing is particularly useful for controlling isolated weed infestations but is not an effective method for eradicating weeds. Slashing can be undertaken using either a hand-held brush-cutting machine or a tractor equipped with a slashing implement.

BIOLOGICAL

Biological control uses insects and disease to control the spread of particular weed species. Biological control does not eradicate weeds. Biological control is a long-term strategy that reduces the health of a weed population, in order to control it easily with other methods. Biological control can be a cost-effective and environmentally sensitive method of weed control. A number of aquatic weed species within Australia have been successfully targeted using this method.

WATER LEVEL MANAGEMENT

Lowering the water level in sediment basins and wetlands can help to control floating and submerged aquatic weeds. The draw-down of water levels will dry out the vegetative material. Drying out sediment basins and wetlands is most effective during the dry season, when there is little or no stormwater runoff.

HERBICIDES

Herbicides are a common method used to control weeds growing in vegetated stormwater assets. Chemical weed control is often more cost-effective than mechanical methods and is particularly effective at controlling large weed infestations.

Major risks associated with using herbicides include the potential impacts on desirable plants and the environmental effects due to chemical residues accumulating within sediments and soils.

When treating aquatic weeds within sediment basins and constructed wetlands, take care to ensure that herbicides are registered or permitted for use around aquatic areas. Use herbicides in accordance with the registered labels and the relevant legislation (e.g. *Chemical Usage (Agricultural and Veterinary) Control*

Act 1988 in Queensland). Seek advice from the relevant government department if considering uses other than prescribed on labels. Note that all staff using herbicides should have completed Chemcert Training or its equivalent. Special licences may be required to use herbicides within a water body.

Herbicides are commonly applied to weeds using either foliar spray or rope-wick applicator methods. Cut stump and stem injection (drill and fill) are suitable methods for applying herbicides to woody weeds.

Foliar spray: Apply foliar herbicides using spot spraying techniques with hand-held sprayers. Spot spraying reduces the amount of herbicide used, which minimises the cost of application and damage to non-target plants. Take care to minimise the amount of herbicide that makes contact with the water. Using booms to confine isolated aquatic weeds may help to minimise non-target application of the herbicide.

Rope-wick applicators: Consists of a handle with a wick or rope attached to the end that is soaked with herbicide. Use the wetted wick or rope to brush herbicide over the surface of the weed. Rope-wick applicators are suitable for herbaceous weeds and young regrowth. This method ensures minimal damage to non-target plants.

Cut stump: This method involves cutting the stump of the weed approximately 15 cm from the ground using a cane knife or secateurs and applying herbicide immediately to the cut surface of the stump using a paintbrush or spray bottle.

Stem injection: This method involves making a 45-degree incision in the bark of the weed's stem using a small axe or machete and filling the pocket with a herbicide mixture. The incision must penetrate through the sapwood. Incisions are required every 7.5 cm around the circumference of the trunk.

All herbicides are potentially hazardous to humans. Protective clothing is essential when handling or spraying most herbicides. The minimum personal protection required is: rubber boots; long pants or overalls; rubber or plastic apron or coat covering the tops of the boots; rubber or plastic gloves; face shield; and waterproof hat or hood.

STEAMING

The direct application of heated steam can control weeds. Applying steam removes the plant's outer, waxy coating and breaks cellular structures, resulting in discoloration and death within a few days. While

steaming is an effective method for controlling annual weeds, regrowth of perennial weeds often occurs unless repeated treatments are undertaken.

3.11 Managing excessive algae in sediment basins and constructed wetlands

ISSUE

Algae occurs naturally in sediment basins and constructed wetlands due to the nutrient concentrations in stormwater inflows and the nutrients released from sediment and decomposing organic matter.

Generally, algal growth is either planktonic or filamentous.

Planktonic algae comprise individual, free floating cells that often turn the water green, which is also known as an 'algal bloom'. Planktonic algae include many blue-green algal species that produce toxins and pose a potential public health risk.

Planktonic algae typically grow in open water areas, particularly in sediment basins characterised by highly enriched conditions. Algal blooms will not affect the functional performance of either sediment basins or constructed wetlands.

Filamentous algae comprise single algal cells that form visible chains and often appear as floating or submerged algal mats that are bright green. Filamentous algae feel slimy when handled and individual filaments can often be recognised.

Filamentous algae grow in shallow vegetated zones and open water areas. A combination of high nutrient concentrations, light, and warm shallow water often results in excessive filamentous algal biomass.

Excessive filamentous algal biomass may severely affect the functional performance of sediment basins and constructed wetlands. Filamentous algae can block hydraulic structures, resulting in altered water regimes, and can potentially damage vegetation health, cover, and diversity. Filamentous algal biomass in constructed wetlands can smother the vegetation and be displaced by stormwater inflow. This can severely reduce plant health and the overall vegetation cover within the wetland. The death and decay of filamentous algal biomass can lead to oxygen depletion and result in poor water quality and fish kills.

ACTIONS

Planktonic algae

If access to sediment basins and constructed wetlands is restricted and there are minimal public health risks, it is not necessary to take any further action regarding planktonic algae.

Where sediment basins or constructed wetlands are accessible to the public or located within prominent public locations, the presence of blue-green algae requires further investigation. Refer to *Rectifying Vegetated Stormwater Assets*.

Filamentous algae

If filamentous algal biomass is observed within a sediment basin or wetland, it is generally not necessary to take any further action. However, in high amenity areas it may be desirable to remove filamentous algal biomass from areas of open water. Filamentous algal biomass can be physically removed using rakes, or through mechanical removal with specialist machinery (e.g. that used for removing wet sediment).

If the filamentous algal mat covers more than 10% of the sediment basin or constructed wetland area on two consecutive inspections, refer to *Rectifying Vegetated Stormwater Assets*.

3.12 Managing algal or moss growth on bioretention systems

ISSUE

Constant wetting of the filter surface of a bioretention system may result in the growth of algal or moss. Algae can be identified as a green/brown coloured coating or biofilm on the surface of the filter media, as shown in Figure 22. Filamentous algae may also appear on the surface of the filter media and often appears as a dense mat of fine green filaments (see Section 3.11). Moss is easy to identify because it looks like a thick green carpet as shown in Figure 23.

In most circumstances, minor algal and moss growth on the surface of a bioretention system will not be detrimental to infiltration rates. However, excessive algal growth or moss can clog the filter surface and prevent infiltration, and indicate that either base flows are entering the asset or there are problems with the infiltration rate. If infiltration in a bioretention system is reduced or not occurring (see Figure 18), stormwater will bypass untreated into the overflow and the media may become boggy. A lack of water will affect the health of

the vegetation and boggy conditions can attract mosquitoes, as well as generate unpleasant odours.

ACTIONS

If the cover of algal and moss growth is more than 10% of the filter media surface, refer to *Rectifying Vegetated Stormwater Assets*.

Figure 22 Algae growing on the filter media surface



Photo: Leon Rowlands, Sunshine Coast Council

Figure 23 Moss growing on the filter bed surface



Photo: Paul Dubowski, Healthy Waterways

FOUR **RECORDING INSPECTIONS AND MAINTENANCE**



4.1 Overview

Use the checklists in this section when undertaking inspections and maintenance in order to record the condition of assets (i.e. by comparing the state of the asset against the performance indicators), the maintenance undertaken, and any additional maintenance or rectification that may be required. The checklists are structured in the order that the inspection is likely to be undertaken i.e. inspect the surrounds and then move on to inspect specific elements of the asset e.g. the inlet, banks etc.

Identify the need for maintenance by comparing the state of the asset against the performance indicators. The performance indicators are quantitative measures that inspectors and maintenance crews can visually assess to determine if vegetated stormwater assets are likely to be functioning properly. Maintenance is required when one or more performance indicators are not met. Refer to Section 3 for guidance on how to undertake maintenance activities and when to refer to *Rectifying Vegetated Stormwater Assets*.

Determining vegetation cover can be difficult in large bioretention systems and wetlands, particularly where it is difficult to see the inner areas of the asset due to dense vegetation along the margins. In these cases, it may be necessary to survey the asset from various points.

Water quality monitoring is not recommended to determine the performance of every vegetated stormwater asset, as it is a specialised field that is complex and costly. If asset owners want to perform more water quality monitoring of their assets, monitor a discrete number of assets in a particular area and seek specialist advice about sampling location, type, and frequency to ensure the results can be extrapolated to other assets that have a similar design.

4.2 Inspection and maintenance checklist for swales

For bioretention swales, use the checklist for bioretention systems (Section 4.3).

ASSET TYPE	Swale	ASSET ID
Location		
Date		
Date of last rainfall		Weather
Officer's name		

Swale plan

Insert diagram or plan of the asset showing key features e.g. locations of inlet, outlet, overflow

Additional information

Time taken to complete inspection or maintenance

Photos of site (explanatory notes)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

General comments and sketches

Officer's signature

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
SURROUNDS				
Damaged or removed structures e.g. traffic bollards	No damage that poses a risk to public safety or structural integrity			
INLET				
Erosion	Inlet is structurally sound and there is no evidence of erosion or subsidence/settlement			
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity			
Sediment, litter, or debris	No blockage			
BATTER SLOPES AND BASE INVERT				
Erosion	Minor erosion only that does not pose a risk to public safety or structural integrity and would not worsen if left unattended			
Sediment	Minor amount of sediment accumulated			
Surface ponding or boggy conditions	No surface ponding or boggy areas			

* 1 – PI met; 2 – PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
Litter	Maximum 1 piece litter per 4 m ²			
Unusual odours, colours, or substances (e.g. oil and grease)	None detected			
Vegetation	Minimum 80% vegetation cover (minimal bare batches); 100% cover if turfed			
	Plants healthy and free from disease			
Weeds	No declared weeds (or declared weeds are controlled)			
	Maximum 10% cover of weeds			
Erosion	Outlet is structurally sound and there is no evidence of erosion or subsidence/settlement			
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity			
Sediment, litter, or debris	No blockage			

* 1 – PI met; 2 – PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

4.3 Inspection and maintenance checklist for bioretention systems

ASSET TYPE	Bioretention	ASSET ID
Location		
Date		
Date of last rainfall		Weather
Officer's name		

Bioretention plan

Insert diagram or plan of the asset showing key features e.g. locations of inlet, outlet, and overflow

Additional information

Time taken to complete inspection or maintenance

Photos of site (explanatory notes)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

General comments and sketches

Officer's signature

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
SURROUNDS				
Damaged or removed structures e.g. traffic bollards	No damage that poses a risk to public safety or structural integrity			
INLET				
Erosion	Inlet is structurally sound and there is no evidence of erosion or subsidence/settlement			
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity			
Sediment, litter, or debris	No blockage			
COARSE SEDIMENT FOREBAY (IF PRESENT)				
Erosion	Minor erosion only that does not pose a risk to public safety or structural integrity and would not worsen if left unattended			
Sediment	Coarse sediment forebay <75% full and no litter			

*1 – PI met; 2–PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
BATTER SLOPES AND BASE INVERT				
Erosion	Minor erosion only that does not pose a risk to public safety or structural integrity and would not worsen if left unattended			
Crust of fine sediment	No surface crusting			
Depressions or mounds	No surface depressions or mounds > 100 mm			
Hydraulic conductivity or permeability	Filter media is draining freely, whereby water is not ponded on the surface for more than 12 hours after rainfall and there is no obvious impermeable or clay-like surface on the filter media**			
Underdrains/clean out points	Clean out points not damaged and end caps securely in place			
Litter	Maximum 1 piece litter per 4 m ²			
Unusual odours, colours, or substances (e.g. oil and grease)	None detected			
Vegetation	Minimum 95% vegetation cover (minimal bare batches)			
	Plants healthy and free from disease			
	Average plant height > 500 mm			

* 1 – PI met; 2 – PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
Algal or moss growth	Maximum 10% of surface covered in algae			
	No moss growth			
OUTLET (OVERFLOW WEIR, PIPE, OR OUTFALL)				
Erosion	Outlet is structurally sound and there is no evidence of erosion or subsidence/settlement, including around edges of rock protection or toe of weir for large systems			
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity			
Sediment, litter or debris	No blockage			
Outlet freely draining to receiving drainage or waterway	No downstream impediments to the release of water, no erosion or damage to the outfall structure, and no evidence of malfunction (e.g. excessive sediment accumulated)			

* 1 – PI met; 2 – PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

*** Presence of *Typha* is an indicator of poorly draining filter media

4.4 Inspection and maintenance checklist for constructed wetlands

Use the sediment basin checklist for inspecting and maintaining the inlet zone of a wetland.

ASSET TYPE	Constructed wetland	ASSET ID
Date		
Date of last rainfall		Weather
Officer's name		

Wetland plan

Insert diagram or plan of the asset showing key features e.g. locations of inlet, outlet, overflow, and normal water level

Additional information

Time taken to complete inspection or maintenance

Photos of site

(explanatory notes)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

General comments
and sketches

Officer's signature

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
SURROUNDS				
Damaged or removed structures e.g. traffic bollards	No damage that poses a risk to public safety or structural integrity			
INLET				
Erosion	Inlet is structurally sound and there is no evidence of erosion or subsidence/settlement			
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity			
Sediment, litter, or debris	No blockage			
BATTER SLOPES AND BASE INVERT				
Erosion	Minor erosion only that does not pose a risk to public safety or structural integrity and would not worsen if left unattended			
Depressions or mounds	No surface depressions or mounds > 100mm			
Isolated pools of water	No isolated pools/depressions that could provide mosquito habitat			
Litter	Maximum 1 piece litter per 4 m2			

* 1 – PI met; 2 – PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
Unusual odours, colours, or substances (e.g. oil and grease)	None detected			
Accumulated sediment**	No visible coarse sediment accumulated			
Water levels	During dry conditions, the water level is not more than 0.3m below the normal level			
Vegetation	Minimum 80% vegetation cover on batters and in water up to 300mm deep (higher if the vegetation provides a public-safety exclusion role)			
	Average plant height > 500 mm above normal water level			
	Plants healthy and free from disease			
Weeds (emergent, floating, or submerged)	No declared weeds (or declared weeds are controlled)			
	Maximum 10% cover of weeds			
Algal mats	Maximum 10% cover of algal mats on two consecutive inspections			

*1 – PI met; 2–PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

What to look for	Performance Indicator (PI)	Condition rating *	Maintenance undertaken**	Additional work needed
OUTLET (RISER OVERFLOW WEIR, PIPE OR OUTFALL)				
Erosion	Outlet is structurally sound and there is no evidence of erosion or subsidence/settlement			
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity			
Sediment, litter, or debris	No blockage			
Downstream outfall	No downstream impediments to the release of water, no erosion or damage to the outfall structure, and no evidence of malfunction (e.g. excessive sediment accumulated)			

*1 – PI met; 2-PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

*** Monitor the rate of accumulation by checking sediment levels at least once per year. This may involve establishing one or more reference points within different zones of the wetland. Where sediment depths are greater than 150 mm, a bathymetric survey of the wetland may be required to determine the full extent of accumulation.

4.5 Inspection and maintenance checklist for sediment basins

This checklist is for permanent sediment basins, which are typically used upstream of wetlands or large bioretention systems as inlet ponds. It does not apply to temporary sediment basins associated with sediment control activities during construction activities.

ASSET TYPE	Sediment basin	ASSET ID
Date		
Date of last rainfall		Weather
Officer's name		

Wetland plan

Insert diagram or plan of the asset showing key features e.g. locations of inlet, outlet and overflow and normal water level

Additional information

Time taken to complete inspection or maintenance

- Photos of site (explanatory notes)
- 1.
 - 2.
 - 3.
 - 4.
 - 5.
 - 6.

General comments and sketches

Officer's signature

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
SURROUNDS				
Damaged or removed structures e.g. fences	No damage that poses a risk to public safety			
INLET				
Erosion	Inlet is structurally sound and there is no evidence of erosion or settlement			
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity			
Sediment, litter, or debris	No blockage			
BATTER SLOPES				
Erosion	Minor erosion only that does not pose a risk to public safety or structural integrity and would not worsen if left unattended			
Depressions or mounds	No surface depressions or mounds > 100mm			
Isolated pools of water	No isolated pools/depressions that could provide mosquito habitat			
Litter	No litter			
Vegetation	Minimum 80% vegetation cover across full batter slope (minimal bare batches)			

* 1 – PI met; 2 – PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
	Average plant height > 500 mm Plants healthy and free from disease			
Weeds (emergent, floating or submerged)	No declared weeds (or declared weeds are controlled)			
	Maximum 10% cover of weeds			
OPEN WATER				
Sediment	Minimum 1 m of water above accumulated sediment			
Litter	No floating litter			
Unusual odours, colours, or substances (e.g. oil and grease)	None detected			
Weeds (emergent, floating, or submerged)	Maximum 10% cover of weeds			
Algal mats	Maximum 10% cover of algal mats on two consecutive inspections			
OUTLET (OVERFLOW WEIR, PIPE OR OUTFALL)				
Erosion	Outlet is structurally sound and there is no evidence of erosion or settlement			

* 1 – PI met; 2 – PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety risk or structural integrity			
Sediment, litter, or debris	No blockage			
Downstream outfall	No downstream impediments to the release of water, no erosion or damage to the outfall structure, and no evidence of malfunction (e.g. excessive sediment accumulated)			

*1 – PI met; 2–PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed