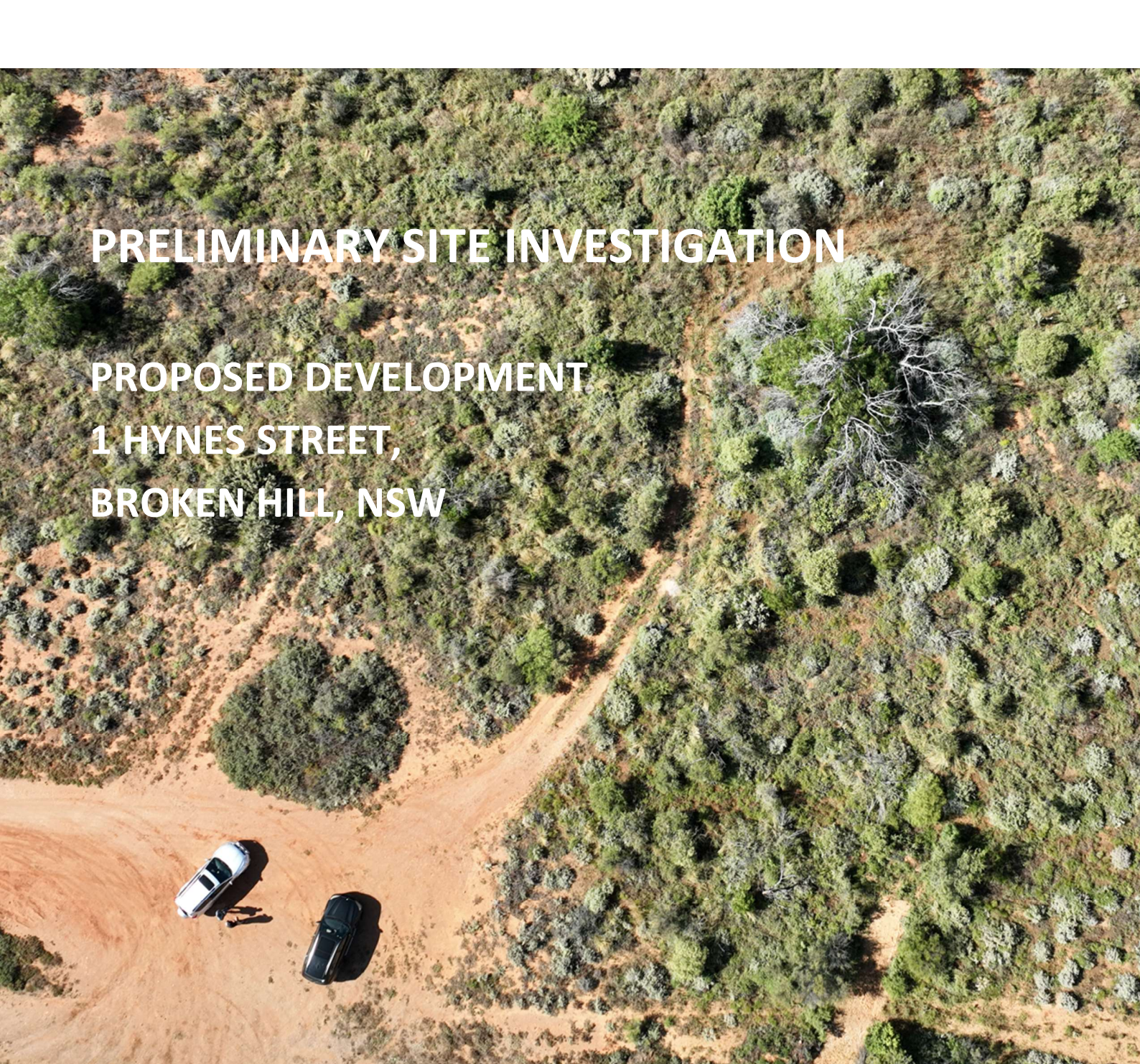




PRELIMINARY SITE INVESTIGATION

PROPOSED DEVELOPMENT

1 HYNES STREET,
BROKEN HILL, NSW

January 30th - 2023

Metaline Engineering Group Pty Ltd.

www.metaline-engineering.com

Authored by: Anthony Misagh



This report has been requested by:

Name: Mr Douglas Henderson

Contact: bhillaircon@gmail.com | 0410 267 326

Dear Douglas,

Thank you for using Metaline Engineering Group Pty Ltd for providing the following scope of works for you:

- Site Classification and Report
- Preliminary Site Contamination Investigation (PSI)

Below I have attached a copy of the report, should you require further assistance or need clarification on anything that is contained within the report then please do not hesitate to contact me directly.

The attached report includes the following:

- Part 1 Introduction,
- Part 2 Site Description,
- Part 3 Site Contamination Assessment,
- Part 4 Site Classification,
- Part 5 Conclusion,
- Part 6 Recommendations,
- Limitations Statement.

Attachments:

- Appendix A: Aerial Photography/Map
- Appendix B: Laboratory Results
 - o Soil sampling Borehole logs,
 - o MEG chain-of-custody (COC) sheets,
 - o Soil Contamination Lab Results.
- Appendix C: Site Classification Report
- Appendix D: Proposed Development Plans – TBC
- Appendix E: Dial Before You Dig Search findings
- Appendix F: Site walkover photos

Yours Sincerely

Metaline Engineering Group Pty Ltd



Anthony Misagh
Director



Part 1: Introduction

This report documents a Preliminary Site Investigation (PSI) for potentially contaminating activities, or contaminated soils together with a geotechnical study to support design requirements as per AS2870-2011 Residential Slabs and Footings. This report is to support a development application (DA) to Broken Hill City Council for proposed future subdivisions for the development of two residential buildings, located at 1 Hynes Street, Broken Hill, NSW, 2880.

The investigation area for this PSI comprises only part of the site, as shown in Appendix A.

PROJECT DETAILS

Client Name: Douglas Henderson
Subject Property: 1 Hynes Street Broken Hill, NSW, 2880

INSPECTION & REPORT DETAILS

Inspection Date: Wednesday 2nd December 2022
Inspection Time: 10 am
Stage of Works: Preliminary Studies
Date of this Report: 30th January 2023

INSPECTION NOTES

At the time of this inspection, we note the following:

- Site is clear of any buildings, or other obstructions.
- The day was windy, warm and sunny.
- Access to site was uninterrupted.

REPORT PURPOSE

MEG was commissioned by Mr. Douglas Henderson, to carry out the following scope of works:

- **Preliminary Site Contamination Investigation (PSI):**
 - Review of available past development consents for the site.
 - Review of historical aerial photographs of the site to assess past site use patterns.
 - Review of other government databases relating to potentially contaminating land uses.
 - Perform Soil Contamination testing for Zinc, Lead, Cadmium, Arsenic and Asbestos.
 - Preparation of a PSI report in accordance with ASC NEPM (2013), NSW EPA (2020) and Council guidelines.
- **Preliminary Geotechnical Investigation and Site Classification**
 - Dial before you dig (DBYD) search to assess if service locating is required.

-
- Site investigation to include 3 - 4 boreholes. Boreholes are to be completed via drilling machine with boreholes taken to 1.5 – 2.0m below ground level or prior refusal. Boreholes shall be supplemented with penetration testing using a Dynamic Cone Penetrometer (DCP) at each location to similar depths (or prior refusal on rock).
 - Report has been prepared in accordance with relevant national guidelines and provide preliminary advice in relation to depth to bedrock; general geotechnical recommendations; and preliminary site classification (AS 2870).

References:

- NEPC (1999, amended 2013) National Environmental Protection (Assessment of Site Contamination) Measure. Referred to as ASC NEPM (2013).
- NSW EPA (2017) 3rd Ed. Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme.
- NSW EPA (2020) Contaminated Land Guidelines: Consultants Reporting on Contaminated Land.
- AS2870 – Residential slabs and footings

Proposed Development and Objective:

The proposed site development involves the construction of two residential homes as per approximate location, site A and Site B with associated outdoor areas.

Proposed development plans are provided in Attachment D.

The Objective of the Investigation include:

- Identification of historic and current potentially contaminating site activities.
- Identification and evaluation of areas of environmental concern and associated contaminants of potential concern within the investigation area.
- Provision of comment on the suitability of the investigation area for the future use, and where required, provide recommendations for additional investigations.
- Provide a soil contamination study on the existence of metals such as Lead, Arsenic, Zinc and Cadmium. Other hazardous materials such Asbestos will also be investigated.
- Provide Site Classification for consideration in footing/slab design.

Project Scope:

The scope of works include:

- Walkover inspection to review current land use, potential contaminating activities and neighboring land use.
- Review of site history using aerial photographs and available historic records.
- Review of NSW EPA notices under the Contaminated Land Management Act (1997).
- Preparation of a report in general accordance with the relevant sections of NSW OEH (2011) and ASC NEPM (2013) and EPA (2017).

Part 2: Site Description

Site Details:

Site information has been summarized in Table 1 below, and site location, aerial photography and general surrounds shown in Appendix A.

Table 1: Site Background Information

ITEM	DESCRIPTION
Site address	1 Hynes Street, Broken Hill, NSW, 2880
Legal Identifier	○ Lot: 12 ○ Section: – ○ Plan No.: DP1174503
Surveyed area (Approximate only)	Approximately 65,000m ²
Local Government Area	Broken Hill City Council
Current Zoning and Land Use	Zone R1
Proposed Land Use	General Residential – Currently Vacant
Site Description	The vacant allotment is approx. 6.48 Ha in size or 16 acres in metric equivalent. The zoning is E4 Environmental living. The property subject to a DA application has an assortment of approved usages, subdivision potential and the likes. Power and water are not connected. <i>TBC by BHCC</i>
Surrounding Land Uses	Low-density residential dwellings in all directions, with mining activity 3-4km to the East, fuel stations 2km to the East and local cemetery in the neighbouring block.
Topography	The site is relatively flat. A sudden increase of elevation (approximately 1m) to the back of the block is present due to a possible formed river. The local railway, decommissioned 1970, has a footprint of where the railway used to be on the block. With the rail and all jewellery removed, some ballast and mounds of the old rail only remains.
Expected Geology	Sandy/Rocky substrate.
Surface Hydrology	No natural underground water systems.

Hydrogeology:

Review of WaterNSW Real-time Water Database indicated no groundwater bores within 1km of the site. Temporary or stagnant groundwater may be encountered within the soil profile at times of and following heavy or extended rainfall. No springs were listed within 1km of the site in the NSW Government Hydrography Spatial Data (SEED, 2019).

From the Site Classification/Geotechnical Investigation, underlying substrate is rock, and therefore it is highly unlikely for significant ground water activity. Should further information on permanent site groundwater conditions be required, an additional assessment would need to be carried out (i.e. installation of groundwater monitoring bores / ongoing groundwater monitoring).

Part 3: Site Contamination Assessment

Council Historical Site Records:

An online review of the available records on the Broken Hill City Council website was undertaken on 5th January 2023 and there were no records of concern with regards to contamination on site. No Historical information was also found regarding activities relating to development.

NSW EPA Records:

No sites within 500m of the inspection area were identified on the list of NSW contaminated sites notified to the EPA as required by the Contaminated Land Management Act (1997) and the Environmentally Hazardous Chemicals Act (1985).

No sites within 500 m of the inspection area were listed on the EPA public register required under section 308 of the Protection of the Environment Operations Act 1997 (the POEO Act), which lists licenses, notices penalty notices and convictions.

External Potentially Contaminating Activities:

Although no neighboring service stations, mechanics, mining or drycleaners are in operation within 500 m of the inspection area, the following operations are active within 2-5km of the inspection area.

Table 2: Potentially Contaminating activities

ITEM	TYPE OF ACTIVITY	APPROXIMATE DISTANCE TO SITE BOUNDARY	DIRECTION FROM SITE	ADDRESS	GRADIENT FROM SITE
1	Woolworth Mechanic/Fuel Station	2000m	East	5 Galena Street, Broken Hill	Undulating/down gradient
2	Shell Fuel Station	2500m	East	164 Williams Street, Broken Hill	Undulating/down gradient
3	CBH Resources Broken Hill Operation – RASP Mine - Broken Hill	3000-5000m	East	-	Undulating/down gradient

Due to distance and hydraulic gradient from the site, items 1 and 2 above is not expected to have an impact on the site. However, dust particle movement through the air, and Broken Hill's Dust storm climate and events pose a risk for dust particles to move over Kms, this in particular has an impact on the site.

Although lead in Broken Hill's air and soil is common, it is mostly derived from historical and current mining operations. Studies such as those published in the journal Atmospheric Environment has confirmed that some of that lead is emitted as dust every day by the city's mines. The Broken Hill

Environmental Lead Program is funded by the EPA to raise awareness and carry out remediation works, which actively test and promote lead safe living in the city.

Site walkover and findings:

Potential exists for contaminating activities to have been undertaken on site which may impact on the suitability for the proposed land-use which include dumping of waste and mining activities. The historic mining activities have most likely resulted in contaminants such as heavy metals, which are common in broken hill and include Lead, Zinc, Cadmium and Arsenic. See soil sampling procedures below for result summary. Placement of imported fill, illegal dumping and construction waste may have also resulted in contamination, more concerningly asbestos, batteries and plastics would be typical in the Broken Hill region. However, dumping of waste was minimal during the time of the investigation. See soil sampling procedures below.

No historical aerial photographs were found of the site in order to review and investigate historic site activity and surrounding land use. Aerials found indicated that the land was used for potential residential purposes, plantation of pistachio trees and recreational purposes.

Observations of the site and surrounding areas, with respect to the potential for contamination, are summarized below with photographs provided in Appendix F.

Photo 1: Contaminants found Site A:

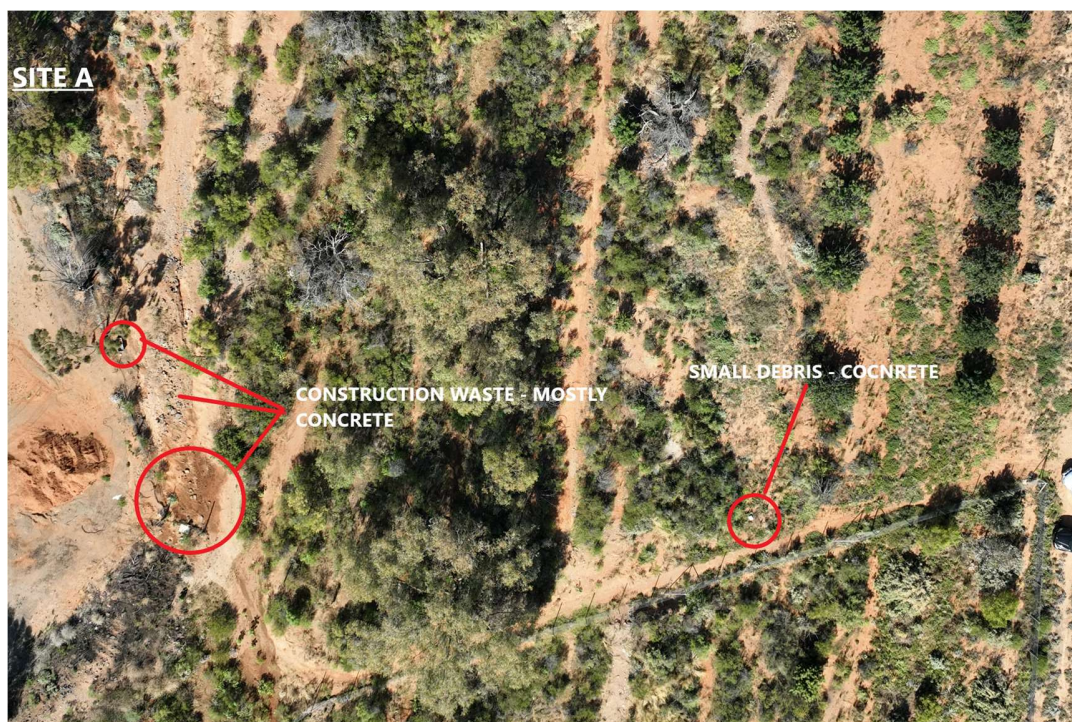
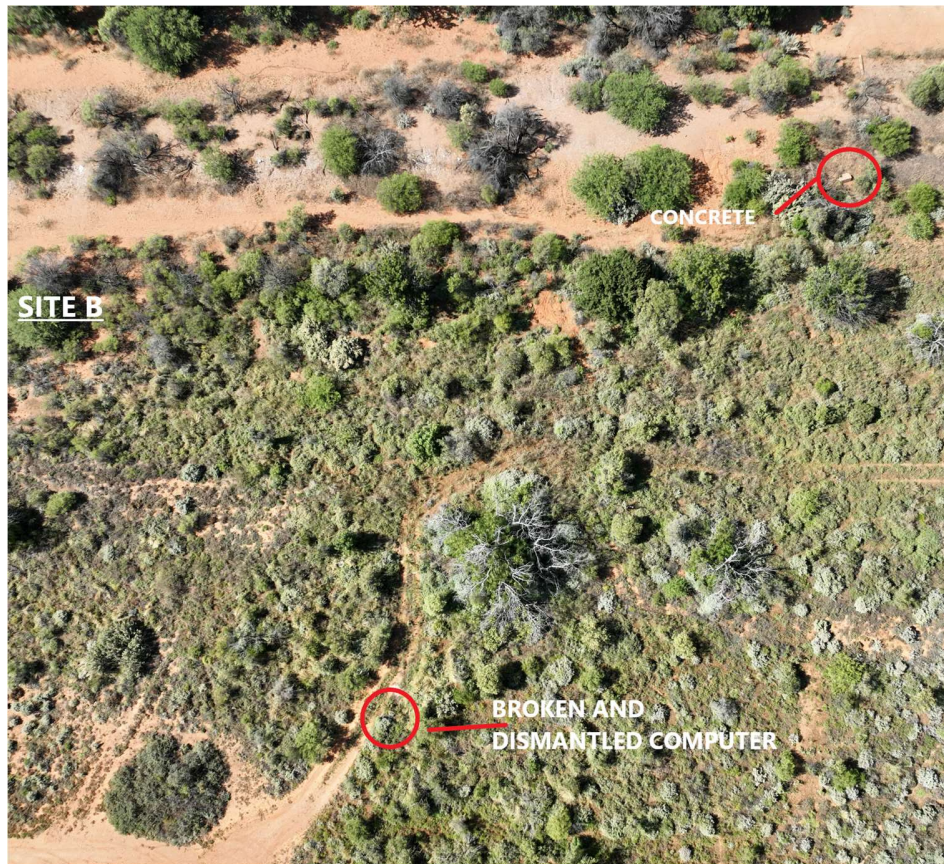


Photo 2: Contaminants found Site B:



Observations during the site walkover inspection 5th December 2022 is as follows:

The site layout appears to have remained relatively unchanged, confirmation with some of the neighbors (via door knocking), confirmed that the site has been left unmaintained and abandoned. The general site topography was consistent except for the rear of the block were an a drop of approximately 1m difference in elevation at the rear of the property.

- The block/s is bound by residential properties in all other directions. There are two other vacant similar sized blocks within 100m of the site. The rear of the block is the local cemetery.
- Multiple fragments of concrete were found, ranging from 20mm to 300mm. These fragments were scattered mostly on the Easter side of the block.
- A computer was found broken and dismantled.
- Construction waste, namely concrete

Soil Sampling Procedures:

All sampling data was recorded on borehole logs, see Appendix B, and samples selected for laboratory analysis were recorded on chain-of-custody (COC) sheets, see Appendix B. The general soil sampling procedure comprised:

- Soil samples were recovered directly from augers.
- Some samples specifically from waste dump areas were taken also.
- Use of disposable sampling equipment including disposal nitrile gloves.
- Transfer of samples into laboratory-prepared ziplock bags, as per the lab's recommendations.
- Placement of sample containers and bags into a cooled, insulated, and sealed container for transport to the laboratory; and
- COC was always maintained and countersigned by the receiving laboratory on transfer of the samples.

EnviroLab Services Pty Ltd (EnviroLab), is accredited by NATA for the analysis undertaken, and was employed to conduct the sample analysis. The laboratory is required to carry out in-house QC procedures.

The analytical laboratory, EnviroLab Services Pty Ltd (ELS), accredited by NATA, is required to conduct in-house QA/QC procedures. These are normally incorporated into every analytical run and include reagent blanks, spike recovery, surrogate recovery and duplicate samples. These results are included in the laboratory certificates in Appendix B.

Potential Contamination and levels – Metals

Table 3: Soil Assessment Criteria – Metals mg/kg

ITEM	HIL A* – Residential	HIL B* – Recreational	Lab Results - Highest recorded samples (see Appendix B for full Lab results) [mg/kg]
Arsenic	100	500	11
Cadmium	20	140	6.2
Lead [^]	300	1200	950
Zinc	8000	60000	2000
TRAIN LINE RESULTS			
Arsenic	100	500	78
Cadmium	20	140	28
Lead [^]	300	1200	6600
Zinc	8000	60000	10000

* www.NEPC.gov.au

- **HIL A** – Standard residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake, (no poultry), includes children's day care centres, preschools and primary schools.
- **HIL B** – Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats.

- ^HIL for lead based on blood lead models (IEUBK for HILs A, B and C and adult lead model for HIL D where 50% oral bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate.

The above results indicate that the metals found in the train line hold above the maximum limits.

Potential Contamination and levels – Asbestos

Chrysotile Asbestos & Amosite Asbestos have been detected in the soil samples sent through with >7mm sizing found, totaling approximately 2.6g of actual Asbestos or 3.7g/kg of sample, see table 4 below. This maybe generally arising from:

- Inadequate removal and disposal practices during demolition of buildings containing asbestos products.
- Widespread dumping of asbestos products and asbestos containing fill on vacant land and development sites (illegal dumping); and
- Commonly occurring in historical fill containing unsorted demolition materials.
- Mining, manufacturing or distribution of asbestos products may result in sites being contaminated by friable asbestos including free fibers. Severe weathering or damage to bonded ACM may also result in the formation of friable asbestos comprising fibrous asbestos and/or asbestos fines.

Table 4: Health Screening levels for asbestos contamination in soils

ITEM	HIL A* – Residential	HIL B* – Recreational	Lab Results - Highest recorded samples (see Appendix B for full Lab results)
Asbestos	0.01%	0.04%	ACM - 0
TRAIN LINE RESULTS			
Asbestos	0.01%	0.04%	-

* www.NEPC.gov.au

Asbestos only poses a risk to human health when asbestos fibers are made airborne and inhaled. If asbestos is bound in a matrix such as cement or resin, it is not readily made airborne except through substantial physical damage. Bonded ACM in sound condition represents a low human health risk, whilst both Fibrous Asbestos and Asbestos Fines materials have the potential to generate, or be associated with, free asbestos fibers. Consequently, Fibrous Asbestos and Asbestos Fines must be carefully managed to prevent the release of asbestos fibers into the air.

A detailed asbestos assessment was not undertaken as part of this investigation. The presence or absence of asbestos as well as a visual assessment for the presence or absence of ACM at the test locations have been adopted for this assessment as an initial screen.

Part 4: Site Classification

An investigation was conducted by Metaline Engineering Group on the 3rd of December 2022 to provide a site classification and identify parameters for the footing system design. Based on the results of the investigation the site has been classified as Class “M-D” - site in accordance with AS 2870-2011 Residential Slabs and Footings.

Two boreholes were completed per site to assess the subsurface conditions. The materials encountered during the field investigation are presented in Appendix C borehole logs and in general consist of granular sandy reddish soil with little to no clays. Soil moisture conditions are considered consistent with the seasonal variation of the area and time of testing.

Groundwater was not encountered during the investigation. A classification explanation sheet is attached in Appendix C, outlining the terms and symbols used in the preparation of the report.

Part 5: Conclusion

The review of the site history indicated that the site appears to have remained relatively unchanged, confirmation with some of the neighbors (via door knocking), confirmed that the site has been left relatively untouched, however mostly utilized mostly for recreational purposes with pistachio trees planted. A quick check with Broken Hill City Council has also indicated that no significant activity has taken place. Potential contamination sources which have been identified during this PSI are summarized as:

- The site has attracted some illegal dumping for construction waste such as cement, concrete, old computer/s and some concrete blocks.
- Broken Hill is also home to one of the worlds largest lead-zinc-silver deposits, as a result, the effects of mining has taken a toll on high lead and levels, specifically for sites in close proximity to the mines. Lead toxicity in children has emerged as a major public health issue over the past decade. In 1991 the first comprehensive testing undertaken on children under five years of age revealed that more than 80 per cent had blood lead levels over the current guideline level of 10 pg/dL. Current environmental exposure to lead appears to be related more to historical mining and mine management practice than current activities. Lead contamination of the broader community arises from sources including:
 - Naturally occurring surface ores;
 - Past smelting and mine waste management practices;
 - Entrapment of dust in linings of domestic buildings and the re-entrainment over time of this dust back into the living spaces - (Post construction)
 - Open-cut mining activities (undertaken in the center of the city until the early 1990s);
 - The handling and transportation of ore concentrates;

-
- Dust from tailings dams and the contamination of open spaces.
 - Off-site use of mining by-products for private use, such as landfill etc.

From the Laboratory results, the non-railway line sites indicate fairly common results for Broken Hill. With the relatively dense vegetation on site these levels of contaminants are considered to have minimal environmental impact as levels of dust are reduced. However, the railway line site does indicate high levels in lead and zinc, and it is reasonable to conclude that overall, the site is considered to generally have a high risk of contamination should the dirt be disturb.

To determine potential risk of harm to human health and environment under proposed development conditions, assessment of the identified area of environmental concern should be undertaken prior to any future development.

Part 6: Recommendation

Based on the findings of this report together with laboratory results, levels of potential contaminants of concern were above the health investigation and health screening levels for soil samples collected across the railway site, namely Lead and Zinc.

Levels of Lead and Zinc exceeded the adopted health investigation levels for soil contaminants samples collected from the railway site.

Excavation of the contaminated fill material would be required for offsite disposal. This option removes the contaminated materials through bulk excavation into trucks that then transfer the contaminated materials to a waste facility with appropriate licenses to receive the waste. This approach has the advantage of removing the contaminated soils from the site and potentially reducing development restrictions associated with contaminated soils. It also has the advantage of being relatively fast with minimal impact on the neighboring properties. The main disadvantage of excavation and disposal is the expense associated with offsite disposal to an appropriately licensed landfill.

Therefore, as part of the remediation program, it is the recommendation of this report that the site shall be stabilized with a 50 mm cover of clean material. New vegetation such as grass, small to medium sized trees and other native vegetation are a good capping source to stabilize the soil. Further capping of the site is also possible by the introduction of a concrete slab in the form of driveways, paths and the footing system of the house.

However, disturbing the railway line is not recommended due to the high levels of Lead and Zinc. An appropriate landscaping plan should be prearranged, in which all dirt areas, as a minimum should be sealed and covered with grass. No veggie gardens or fruit trees are to be established into the ground. It is also a recommendation to maintain year-round cover of lawn or mulch to minimize dust generation, this should be considered across the site.

Other matters to consider, establishment of a periodic cleaning program must be in place that include the provision regular dusting, washing of AC filters, cleaning and pressure washing of paved areas. Other measures such as proper door and window seals must be incorporated into the designs.

An Unexpected Finds Protocol is recommended to be implemented during site development works to manage possible identification of potential hazards during development.

It is the conclusion of MEG that the implementation of the above recommendation will achieve the objectives of the project and render the site suitable for the intended development.

- ^{1.} <https://www.scu.edu.au/media/scueduau/eal/documents/NEPM-guideline-on-investigation-levels-for-soils-and-groundwater046a.pdf>

LIMITATIONS - TERMS & CONDITIONS FOR THE PROVISION OF THIS REPORT

1. Metaline Engineering Group (MEG) has prepared this report (or services) for this project at 331 Cummins Street Broken Hill, NSW, 2880, in accordance with MEG's proposal dated 5 December 2022 and acceptance received from Douglas Henderson.
2. The work was carried out under an agreed contract between MEG and Douglas Henderson. This report is provided for the exclusive use of the client for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as
3. stated above, and without the express written consent of MEG, does so entirely at its own risk and without recourse to MEG for any loss or damage. In preparing this report MEG has necessarily relied upon information provided by the client and/or their agents.
4. The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after MEG's field testing has been completed.
5. MEG's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by MEG in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.
6. This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. MEG cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.
7. This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by MEG. This is because this report has been written as advice and opinion rather than instructions for construction.
8. Asbestos has been detected by laboratory analysis, either on the surface of the site, or in filling materials at the test locations sampled and analysed. Building demolition materials, such as plastic fragments were, however, located in previous below-ground filling and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.
9. Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints, or to parts of the site being inaccessible and not available for inspection/sampling

(due to buildings present onsite), or to vegetation preventing visual inspection and reasonable access (in garden beds).

10. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.
11. The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life.
12. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of MEG. MEG may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to MEG. Any such risk assessment would, however, be necessarily restricted to the (geotechnical /environmental) components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.
13. The Report is expressly produced for the sole use of the Client. Legal liability is limited to the Client.
14. Advice from the inspector has only been around meeting the principal engineers' specifications.
15. Any dimensions given are approximate only. Should any dimensions be considered critical or important, they should be accurately measured.
16. This report, its layout and contents are the copyright of Metaline Engineering Group. Any person, party or entity, other than the party named as the client on this report hereof that uses or relies upon this report without our expressed written permission is in breach of this copyright.
17. All advice given by the Inspector and not included in the Report is given in good faith. However, no responsibility is accepted for any losses, either direct or consequential, resulting from the advice.
18. The Report is confirmation of a visual inspection of the site/inspection area carried out by the Inspector on the day of the inspection and only covers those items that could reasonably be detected by such visual inspection at the time of such inspection.
19. If the Report fails to conform in any material respect to the terms and conditions set out herein, then the Inspector is not liable unless the Client notifies the Inspector of the failure within 28 days after the date of delivery of the Report, and the liability of the Inspector is, in any case, limited to the cost of providing this inspection, and the Inspector is not liable for any consequential damage.

Appendix A

Aerial Photography



Site A







Site B







Appendix B

Laboratory Results



SITE B (2)

SAMPLE 1

SAMPLE 2





OLD RAILWAY LINE

SAMPLE

CERTIFICATE OF ANALYSIS 312365

Client Details

Client	Metaline Engineering Group T/L
Attention	Anthony Misagh
Address	331 Cummins St, Broken Hill, NSW, 2880

Sample Details

Your Reference	<u>Metaline Engineering - Douglas Henderson</u>
Number of Samples	5 Soil
Date samples received	06/12/2022
Date completed instructions received	06/12/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
 Samples were analysed as received from the client. Results relate specifically to the samples as received.
 Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	13/12/2022
Date of Issue	13/12/2022
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Asbestos Approved By

Analysed by Asbestos Approved Analyst: Stuart Chen
 Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By

Giovanni Agosti, Group Technical Manager
 Greta Petzold, Assistant Operation Manager
 Lucy Zhu, Asbestos Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

Acid Extractable metals in soil				
Our Reference		312365-1	312365-2	312365-3
Your Reference	UNITS	Site 1 Sample 1	Site 1 Sample 2	Site 2 Sample 1
Depth		150	150	150
Date Sampled		2/12/2022	2/12/2022	2/12/2022
Type of sample		Soil	Soil	Soil
Date prepared	-	07/12/2022	07/12/2022	07/12/2022
Date analysed	-	09/12/2022	09/12/2022	09/12/2022
Arsenic	mg/kg	11	6	4
Cadmium	mg/kg	6.2	5.2	4
Lead	mg/kg	950	610	240
Zinc	mg/kg	2,000	1,500	1,100

Moisture				
Our Reference		312365-1	312365-2	312365-3
Your Reference	UNITS	Site 1 Sample 1	Site 1 Sample 2	Site 2 Sample 1
Depth		150	150	150
Date Sampled		2/12/2022	2/12/2022	2/12/2022
Type of sample		Soil	Soil	Soil
Date prepared	-	07/12/2022	07/12/2022	07/12/2022
Date analysed	-	08/12/2022	08/12/2022	08/12/2022
Moisture	%	14	8.3	2.7

Asbestos ID - soils NEPM - ASB-001		
Our Reference		312365-4
Your Reference	UNITS	Site 2 Sample 2
Depth		150
Date Sampled		2/12/2022
Type of sample		Soil
Date analysed	-	08/12/2022
Sample mass tested	g	662.43
Sample Description	-	Brown fine-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected
Total Asbestos ^{#1}	g/kg	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected
ACM >7mm Estimation*	g	—
FA and AF Estimation*	g	—
ACM >7mm Estimation*	%(w/w)	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. NOTE ^{#1} Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) NOTE ^{#2} The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.

Client Reference: Metaline Engineering - Douglas Hendereson

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date prepared	-			07/12/2022	[NT]	[NT]	[NT]	[NT]	07/12/2022	[NT]
Date analysed	-			09/12/2022	[NT]	[NT]	[NT]	[NT]	09/12/2022	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	101	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	96	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Asbestos-ID in soil: NEPM

This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

CERTIFICATE OF ANALYSIS 312365-A

Client Details

Client	Metaline Engineering Group T/L
Attention	Anthony Misagh
Address	331 Cummins St, Broken Hill, NSW, 2880

Sample Details

Your Reference	<u>Metaline Engineering - Douglas Henderson</u>
Number of Samples	5 Soil
Date samples received	06/12/2022
Date completed instructions received	06/12/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	13/12/2022
Date of Issue	23/01/2023
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Giovanni Agosti, Group Technical Manager
Greta Petzold, Assistant Operation Manager

Authorised By



Nancy Zhang, Laboratory Manager

Acid Extractable metals in soil		
Our Reference		312365-A-5
Your Reference	UNITS	Train line sample
Depth		150
Date Sampled		2/12/2022
Type of sample		Soil
Date prepared	-	13/12/2022
Date analysed	-	13/12/2022
Arsenic	mg/kg	78
Cadmium	mg/kg	28
Lead	mg/kg	6,600
Zinc	mg/kg	10,000

Moisture		
Our Reference		312365-A-5
Your Reference	UNITS	Train line sample
Depth		150
Date Sampled		2/12/2022
Type of sample		Soil
Date prepared	-	07/12/2022
Date analysed	-	08/12/2022
Moisture	%	8.8

Client Reference: Metaline Engineering - Douglas Hendereson

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.

Client Reference: Metaline Engineering - Douglas Hendereson

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-11	[NT]
Date prepared	-			13/12/2022	[NT]	[NT]	[NT]	[NT]	13/12/2022	[NT]
Date analysed	-			13/12/2022	[NT]	[NT]	[NT]	[NT]	13/12/2022	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	105	[NT]
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Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
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Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Appendix C

Site Classification Report

Project:	Proposed new development	Layers Removed:	0 (BH1)
Chainage:	N/A	Prior to test:	N/A
Test No.:	1 & 2 per site 1 and 2	Easting:	N/A
Location:	1 Hynes Street - vacant block	Northing:	N/A
Direction:	West Broken Hill	Existing Level:	N/A
Final Depth (mm BGL):	Site 1 - 550mm Site 2 - 1500mm	Test Level:	N/A
Date Tested:	6-Dec-22		

Conditions of Use:

This report is not intended for use by any other person or third party other than the named client. This report is not to be used or quoted except as a complete document including all appendices and subject to the report limitations as stipulated in Section 5 of this document.

Conditions of Use:

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This document has been produced expressly for the client. The 'client' is defined as the person or persons named in this report/proposal or the purchaser of the services. No part of this report/proposal including the whole or same shall be used for any other purpose nor by any third party without the prior written consent of Metaline Engineering Group Pty Ltd.

Direct Contact:

Any questions or queries regarding this report should be directed to Metaline Engineering Group on email at megprojects@metaline-engineering.com

Document Revision History:

Date	Rev	Engineer	Comments
30/01/2023	A	A. Misagh	Revision A

1. INTRODUCTION

Metaline Engineering Group Pty Ltd (MEG) have been engaged by the client to conduct an investigation of the surface and subsurface conditions at 1 Hynes Street, Broken Hill, NSW, 2880 as depicted on the cover page with a view to reporting on the Site Classification for a **proposed new residential subdivisions**.

2. SITE CLASSIFICATION

2.1. SITE GEOLOGY

The available Geological Survey Maps showed the site to be underlain by a triangular block of metamorphic and deformed sedimentary rocks forming a series of northeast and northwest trending ridges. Bedrock includes schist and gneiss, intrusive granites, amphibolites and very coarse pegmatites.

Some of these rocks contain inherited minerals forming basement rocks which are partly overlain by Cambrian and Devonian conglomerates, quartz sandstones, shales and thin beds of limestone. Scopes, Mootwingee and Wonnaminta Ranges are mainly Ordovician to Devonian conglomerates – sandstones and shales that have been only gently folded. On the eastern margin of the Mootwingee and Wonnaminta Ranges, horizontally bedded sandstones of Cretaceous age form flat-topped mesas and tablelands that extend northeast into the Mulga Lands Bioregion. The geomorphology of the ranges is controlled by the different rock types and their structure. Faults up to 60 km long form prominent scarps between hill country and plains. Hard rocks outcrop as strike ridges and remnant pinnacles standing above long shallow slopes, with thin soils developed on the softer rocks. These rock cut slopes pass to wide footslopes and alluvial plains. Hills on granite are more rounded and subdued. Limestone and dolomites occur in limited areas as linear outcrops.

Beyond the footslopes the streams expand as alluvial fans, distributing sediment into sandy floodouts and clay playas. Much of the drainage from the Barrier, Mootwingee and Wonnaminta ranges ends in the Bancannia trough, where shallow lakes and swamps have formed and alluvial sand has been blown into sandplains and dune fields..

The Subsurface profile encountered in the boreholes is considered to be consistent with the geological map indications.

2.2. FIELD INVESTIGATION

TWO (2) boreholes were advanced for each site using a **Mechanical Auger** to the depths indicated on the borehole logs (refer to Appendix B). These boreholes were positioned as indicated on the site plan (refer to Appendix A) along with details of the existing surface conditions such as slope, trees, and existing buildings. Disturbed materials obtained from auguring boreholes were logged in accordance with AS1726-2017 and then classified in accordance with AS2870-2011.

A guide to the existing/natural soil profile consisted of: **SANDY and CLAY**

Full details of the observed subsurface material and conditions have been recorded on the borehole logs and presented in Appendix B.

2.3 SITE CLASSIFICATION IN ACCORDANCE TO AS2870 - 2011

In accordance with AS2870-2011 "Residential Slabs and Footings Construction" a site classification of Class "**M-D**" is applicable to this site due to moisture conditions at depth – potential recently demolished building on site and trees, recently removed trees on adjacent sites.

This site is subject to abnormal moisture conditions which must be alleviated or allowed for in the design of the footing system. In the absence of these abnormal moisture conditions, the designing engineer should recognise that the natural soils encountered on this site result in a "**Class M-D**" site classification applying to this site.

On the basis of the findings in this investigation, including visual-tactile identification of the soil profile combined with this writer's local knowledge and experience, the characteristic surface movement (V_s) on this site, under normal conditions, has been estimated to be in the range of 20mm to 40mm

experience, the characteristic surface movement (ϵ_s) on this site – under normal conditions – has been estimated to be in the range of 20mm to 40mm.

It should be noted that this site is in an area with deep-seated movements and this should be taken into account by the designing engineer. Should a more detailed investigation (by others) with relevance to the reactivity of the soils in the local area be available, MEG should be provided with this documentation. It is a condition of this report that any information the client may have with regards to the site and its history be provided to MEG. This may lead to MEG reviewing the above classification and conducting a more detailed geotechnical investigation with regards to the additional information. This report is not a detailed geotechnical investigation. It complies with the requirements of AS2870-2011 and is limited to the items required under Clause 2.2.2(a). Should a more rigorous assessment be required, MEG can provide a Geotechnical Investigation of the site upon request.

In assessing the classification for this site, and unless specifically noted, this report has not considered any future tree(s) to be planted as part of either site or roadside landscaping. If additional information is known by the owner, future owner, any stakeholder, or any consultant, this information must be provided to the design engineer to ensure that the footing system is adequate for the conditions which are expected.

2.3.1 ADDITIONAL NOTES RELATING TO THIS SITE CLASSIFICATION

This investigation is based on a limited geotechnical assessment. Should the subsurface conditions encountered during construction vary from those described above, MEG must be advised of these variations to provide comment or inspect the site where necessary. The use of standard footings as presented in AS2870-2011 is only applicable to building with a loading and a construction style similar that of a residential dwelling as described in section 3.1 of AS2870-2011.

In accordance with Clause 2.5.2 of AS2870 where the site cut exceeds 500mm a second site investigation is recommended. As such;

- Where the cut depth is >500mm and < 1000mm the relevant design engineer may choose to design for a reduced crack zone from first principles
- Where the cut depth is in excess of 1000mm a second soil must be carried out to confirm the effects of the cut on the site classification"

3. FOUNDING RECOMMENDATIONS

Based on the site classification an engineer designed foundation systems is required at this site. The foundation systems must be designed to cater for the potential movements associated with the drying effects of trees, removal of small bush, removal of small to medium trees or a group of trees. **This site is heavily vegetated.** The designer may adopt the classification of the site "**Class M-D**" for the purposes of determining the total Y_t . The designer should also pay close attention to any adverse scenario where the tree/structure are removed and the subsequent heave that could be expected under this scenario. Hence site conditions may alter to a classification "**P**"

Alternatively, deeper foundations can be adopted as follows:

To prevent differential settlement of the structure consideration should be given to the use of bored piers/screw piles or driven piles where these are founded within the natural occurring undisturbed **SANDY/CLAY**.

Bored Piers should be founded into the **SANDY/CLAY** which has an allowable end bearing pressure as indicated on Table 1. As a guide any bored piers founded deeper than 1800mm from the existing surface the extent of the bored pier founded greater than this depth may adopt a skin friction of **15kPa** for any clay soils.

The pile design should be conducted by engineering principles, adopting the principle of effective stress. Negative skin friction should be adopted for the upper filling material.

The exact depth required to achieve the capacity will need to be analysed by the piling contractor and the current piling codes. **However, for the**

3.1 MAINTENANCE RECOMMENDATIONS

In line with AS 2870-2011 Appendices A and B, the owner, future owner, any stakeholder, and any consultant, have a duty of care to ensure that future landscaping will not contribute to an adverse impact on the footing system. MEG recommends reference to the following resources when planning landscaping works for the site:

- HEDRA – How to protect your house (<https://bit.ly/3opoBQf>)
- CSIRO – Foundation Maintenance and Footing Performance: A Homeowner's Guide [2003] (<https://bit.ly/3qe0yGb>)

3.2 ALLOWABLE BEARING PRESSURES

The following allowable bearing pressures can be adopted for the soils listed in the table below. These bearing pressures apply where typically the embedment is a minimum of 100mm into the specified material.

Table 1: Allowable Bearing Pressures

Soil Type	Indicative founding depth (mm)	Maximum Allowable Bearing Capacity (kPa)
Natural Sandy/Clay*	100mm into layer	80
Natural Sandy/Clay*	100mm into layer	120
Natural Sandy/Clay*	300mm into layer	150
Natural Sandy/Clay*	600mm into layer	250
Natural Sandy/Clay*	900mm into layer	250

*Bearing pressures reported above are only applicable to raft slab and or waffle slab foundations. Where strip, pad, and bored piers are adopted bearing pressures reported for the deeper, clay and or rock units are to be adopted. The minimum founding depths as required by AS2870 can be adopted unless specific founding depths have been provided in Section 3. Further investigation may be required for such footing types.

*Natural Material – All-natural material given allowable bearing capacities denotes strength at optimum moisture conditions. The potential presence of perched groundwater in soils may lead to construction difficulties during wet weather. Please refer to **Section 4.2** for site specific difficulties.

4. CONSTRUCTION TECHNIQUES AND DIFFICULTIES

4.1 GENERAL

1. All loose surface fill, all roots and all organic material are to be removed from the building platform.

2. Notwithstanding the recommendations made in this report, wherever footings are close to any excavations or easements, that part of the footing must be deepened so that the projection from the underside of the footing to the bottom of the excavations makes an angle not exceeding 30 degrees in sandy soils and 45 degrees in clayey soils (This angle is measured from the horizontal). Steeper angles are not recommended unless sufficient testing and investigation has been carried out to indicate otherwise or the foundations are founded in competent rock.

3. It is recommended a second soil test be undertaken if the site is cut more than 400mm for CLAY sites. Where it is proposed to FILL the site a second soil test will be required should > 400mm of CLAY FILL be proposed or >800mm SAND FILL be proposed. It is recommended that any FILLING placed meet the requirements of CONTROLLED FILL as this will minimise the impact of the FILLING on the current classification of the site.

4. The Plumber shall lay waste pipes below ground surface at minimum grade. Risers are to be staked firmly.

5. Care shall be taken with surface drainage of the allotment from the start of construction and must be well drained so that water cannot pond beside or adjacent to footings. The drainage system shall be completed by the finish of construction of the house in accordance with AS2870-2011 Clause 5.5.3 (a).

6. Proper site drainage is very important in reactive sites such as this site. It is therefore recommended that the ground surface immediately next to the perimeter footings be graded away or site drainage issues be addressed. Should you the client require detailed design for specific site drainage plans please do not hesitate to contact MEG Consulting Engineers.

7. Any filling placed across the site to assist in levelling prior to slab construction should conform with the requirement for either Controlled fill (Clause 2.5.3) or Rolled fill (Clause 6.4.2) AS 2870-2011. These clauses are as follows. If it cannot be confirmed that the fill is Controlled Fill or Rolled Fill then the reader should refer to item (c).

A. Controlled Fill - Fill that will be required to support structures or associated pavements, or for which engineering properties are to be controlled AS2870-2011. Refer Clause 2.5.3, Clause 2.5.3(a)(c) - (I.e.: where a specification has been provided on the type, quality and compaction requirements for filling at a site and the earthworks have been deemed compliant with the specification)

B. MEG has the express right to deem FILL uncontrolled where it cannot be clearly demonstrated that fill has been placed under the above conditions. That is to say that it is a requirement of the developer/builder to demonstrate fill placement has been placed in the appropriate layer thicknesses.

C. Rolled Fill - Rolled Fill consists of material compacted in layers by repeated rolling with an excavator or similar equipment. The depth of rolled fill shall not exceed 0.6metres compacted in layers not more than 0.3m thick for sand material or 0.3m compacted in layers not more than 0.15m thick for other material AS2870-2011 Cl6.4.2(b)

D. Where the nature of the fill cannot be confirmed, this office must undertake an assessment of the fill or be supplied with a suitable compaction report or geotechnical assessment of the fill to undertake an appropriate design for the site if the fill is to be utilised as a foundation.

8. We advise that it is possible that some sites may still have the presence of isolated areas of original organic material that may not have been fully removed during the sub division earthworks development stage. MEG will make every effort to identify organic material within the soil profile, however due to the limitation on the number of boreholes for each site investigation, it is possible that some of these pockets may escape identification. MEG does not take responsibility for isolated organic material that lies in areas outside our borehole locations, to the extent that these pockets could affect the design or construction of the footing system.

4.2 SITE SPECIFIC

- The soils encountered on-site could develop a localised perched groundwater during periods of high rainfall which may lead to construction difficulties associated with excavations on this site.

- This site may have contained significant trees that have been recently removed. The builder is to ensure all tree roots/material over the proposed building area has been removed. Any soft or loose material that does not respond to compaction should be excavated to achieve a firm working base. Fill holes with suitable fill compacted in 150mm (maximum) layers.

- An engineer designed footing system in accordance with AS2870 2011 is recommended for this site taking into consideration the effect of the trees in relation to the final house siting.

- Demolition previously of the existing structure is likely to leave isolated pockets of fill and or disturbed ground conditions. Where there is local disturbance the proposed foundations must extend a minimum of 100mm below the level of disturbance into either of the naturally occurring materials as identified in Section 2 of this report. Note alternatively the disturbed material may be controlled and subsequently adopted as a founding material (refer definitions on controlled FILL).

5. CONDITIONS OF USE OF THIS REPORT

5.1 REPORT LIMITATIONS

1. The recommendations in this report are based on the following:

- a) Information about the site & its history, proposed site treatment and building type conveyed to us by the client and or their agent
- b) Professional judgments and opinions using the most recent information in soil testing practice that is available to us.
- c) The location of our test sites and the information gained from this and other investigations.

2. Should the client or their agent neglect to supply us with correct or relevant information, including information about previous buildings, trees or past activities on the site, or should changes be made to the building type, size and or/position, this report may be made obsolete, irrelevant or unsuitable. In such cases, MEG will not accept any liability for the consequences and MEG reserves the right to make an additional charge if more testing or a change to the report is necessary.

3. The recommendations made in this report may need to be reviewed should any site works disturb any soil 200mm below the proposed founding depth.

4. The descriptions of the soils encountered in the boreholes follow those outlined in AS1726-2017; Geotechnical Site Investigations. Colour

descriptions can vary with soil moisture content and individual interpretation.

5. If the site conditions at the time of construction differ from those described in this report then MEG must be contacted so a site inspection can be carried out prior to any footing being poured. The owner/builder will be responsible for any fees associated with this additional work.

6. This report assumes that the soil profiles observed in the boreholes are representative of the entire site. If the soil profile and site conditions appear to differ substantially from those reported herein, then MEG should be contacted immediately and this report may need to be reviewed and amended where appropriate. The owner/builder will be responsible for any fees associated with this additional work.

7. The user of this report must take into account the following limitations. Soil and drilling depths are given to a tolerance of +/- 200mm. Where spot levels or a feature survey have been undertaken, levels are given a tolerance of +/-200mm.

8. It must be understood and a condition of acceptance of this report is that whilst every effort is made to identify fill material across the site, difficulties exist in determining fill material, in particular, for example, well compacted site or area derived fill, when utilising a small diameter auger. Consequently, MEG emphasises that we will not be responsible for any financial losses, consequential or otherwise, that may occur as a result of not accurately determining the fill profile across the site.

9. The owner(s) and/or future owner(s) shall be cognisant of their responsibilities as outlined in AS2870-2011 Appendices A and B.

10. MEG's assessment of flooding is based on Government/Council planning and GIS data available at the time of this investigation. MEG has not made a site specific assessment based on height or hydrological data with reference to the future flood risk at the property. MEG does not guarantee that this site is free from flooding as further detailed investigation may be required.

a) This report does not assess the potential for landslide, undermining or aggressive soils.

11. Unless specifically mentioned, this report has not considered the risk of subsidence caused by historical, current or future mining activities.

5.2 VARIATIONS TO THIS REPORT

It is neither economically feasible nor practical to determine every subsurface feature on the site. Studies have shown that a large number of boreholes leads to only a slight increase in probability of detecting hidden site features (such as a filled well or cellar) in the foundation soils. As such, any variations, or discrepancies in soil type, colour, or horizon depth must be reported to the Engineer immediately so that their potential influence on the footings may be assessed.

5.3 LOSS OR DAMAGES

Subject to the limitations of this report as expressed in **Section 5.1**, MEG Consulting Engineers Pty Ltd will not accept liability for loss or damage, consequential or otherwise, based on the recommendations of this report, other than for the cost of re-assessment. This site classification assessment should not be considered a comprehensive analysis of the subject site. Should a more detailed geotechnical assessment be required MEG Consulting Engineers Pty Ltd can provide such a report. Please contact MEG Consulting Engineers Pty Ltd to discuss this further.

Should you have any questions regarding this report please do not hesitate to contact the MEG Site Classification Division on 0484 770 935

For and on behalf of MEG Consulting Engineers Pty Ltd

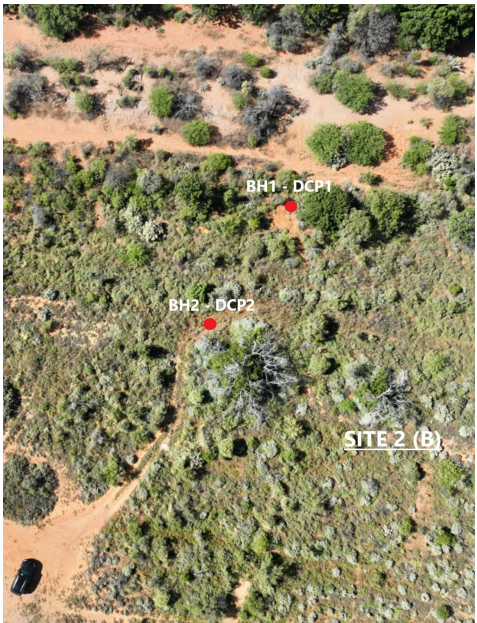
Metaline Engineering Group Pty Ltd



Anthony Misagh



APPENDIX A
Site Plan



APPENDIX B

Borehole Logs and DCP Test Results

BOREHOLE LOGS - Site A (1)

Site Address - 1 Hynes Street, Broken Hill NSW, 2880							Mechanical Augure	Mechanical Augure
Location	USC	Soil Type	Moisture	Density/Consistency/Strength	Plasticity	Description	BH 1	BH2
EXISTING SURFACE LEVEL							0	0
Site A (1)	OL	Sandy/minor traces of Clay	Dry	Loose	Low	Redish Brown	0-400	0-400
Site A (1)	OL	Sandy/minor traces of Clay	Dry	Loose	Low	Redish Brown	450	550
NOTES							Bearing Cap >200kPa	Bearing Cap >200kPa
							Ground Water Not Encountered	Ground Water Not Encountered

BOREHOLE LOGS - Site B (2)

Site Address - 1 Hynes Street, Broken Hill NSW, 2880							Mechanical Augure	Mechanical Augure
Location	USC	Soil Type	Moisture	Density/Consistency/Strength	Plasticity	Description	BH 1	BH2
EXISTING SURFACE LEVEL							0	0
Site B (2)	OL	Sandy/minor traces of Clay	Dry	Loose	Low	Redish Brown	0-500	0-400
Site B (2)	OL	Sandy/minor traces of Clay	Dry	Loose	Low	Redish Brown	500-800	500-800
Site B (2)	OL	Sandy/minor traces of Clay	minor	Loose	Low	Redish Brown	800-1000	800-1000
Site B (2)	OL	Sandy/minor traces of Clay	minor	Loose	Low	Redish Brown	1000-1500	1000-1500
NOTES							Bearing Cap >200kPa	Bearing Cap >200kPa
							Ground Water Not Encountered	Ground Water Not Encountered

Site A (1)

DYNAMIC CONE PENETROMETER (DCP) TEST RESULTS

Test number	DCP-1	DCP-2
Ground Water	Nil	Nil
Depth (mm)	Number of blows/100 mm	
0-100	3	3
100-200	3	3
200-300	3	3
300-400	5	5
400-500	10	10
500-600	Terminate	Terminate

Site B (2)

DYNAMIC CONE PENETROMETER (DCP) TEST RESULTS

Test number	DCP-1	DCP-2
Ground Water	Nil	Nil
Depth (mm)	Number of blows/100 mm	
0-100	5	5
100-200	2	2
200-300	2	2
300-400	2	2
400-500	2	2
500-600	1	1
600-700	1	1
700-800	1	1
800-900	4	4
900-1000	4	4
1000-1500	10	10
	Terminate	Terminate

*Refusal - more tan 20 blows/0.1m

SITE CLASSIFICATION EXPLANATIONS:

Class	Expected Surface Movement (Ys)	Explanation
A	0mm	Includes many sand, gravel and rock sites with little/no clays. These sites have little/no expected movement and as a result zero moisture variation.
S	0 - 20mm	Slightly reactive sites which exhibit only small movements with moisture variation.
M	20 - 40mm	Moderately reactive sites exhibit moderate amounts of movement with moisture variation. These sites commonly include red/brown silty soils, some sandy clays and loamy soils.
H1	40 - 60mm	Highly reactive sites exhibit high amounts of movement with moisture variation.
H2	60 - 75mm	Highly reactive sites exhibit high amounts of movement with moisture variation.
E	>75mm	Extremely reactive sites which exhibit greater than 75mm of surface movement. Typically, these sites include deep reactive clays, such as black and dark brown soils. These sites typically demand quite expensive footing systems.

In areas of deep seated moisture changes, the site classification shall be modified by the addition of a "-D".

As indicated previously, the Site Classification must consider many aspects of the site, not just the reactivity of the soil. P sites are those that include other factors that need to be brought to the attention of the owner, builder and footing designer. A "P" classification does not indicate a specific Ys value and is described as a "Problem" site.

The reasons for a P classification include:

- | | |
|----------|--|
| P | <ul style="list-style-type: none"> • Clay fill greater <400mm Sand fill <800 • Growth &/or Removal of Trees will cause Abnormal moisture conditions in the subsurface soils; • Unusually high moisture conditions caused by water flow, ponds, dams etc; • Sites with Loose fill which can be either "controlled" or "uncontrolled". The P Classification depends upon the depth and type of fill; • Sites with poor bearing capacity, soft soils, or soils which are prone to collapse; • Sites prone to mine subsidence, land slip, piping or coastal erosion; • Sites which for one reason or another cannot be classified as normal sites |
|----------|--|

APPENDIX C

Site Photos

Site A (1)



Site B (2)



Appendix D

Proposed Draft Development Plans

Appendix E

Dial Before You Dig Search Findings



CABLE/PIPE LOCATION
Assets were found in the search area

COMPANY NAME:	Metaline Engineering Group Pty Ltd
ATTENTION:	Abtin Misagh
SEARCH LOCATION:	1 Hynes Street Broken Hill NSW 2880
SEQUENCE NO:	220541119
DATE:	Monday, 30 January 2023

Provision of Plans:

Please find enclosed plans depicting approximate locations of **Essential Energy** assets in the search location. **The excavator must not assume that there may not be assets owned by other network operators in the search location.**

Underground assets searched for	Underground assets found
Essential Energy Electrical	☒
Essential Energy Water & Sewerage	☒

Plans are updated from time to time to record changes to underground assets and may be updated by Essential Energy without notice. In the event that excavation does not commence within 28 days of receipt of a plan, a new plan should be obtained.

The excavator must retain the plans on site for the duration of the works.

The excavator shall report all damage made to Essential Energy assets immediately. Note that damage includes gouges, dents, holes and gas escapes.

IN CASE OF EMERGENCY OR TO REPORT DAMAGE:
PHONE 13 20 80

DISCLAIMER

Please be aware that plans may **not** reflect alterations to surface levels or the position of roads, buildings, fences etc. **Cable and pipe locations are approximate** and the plans are **not** suitable for scaling purposes. *Essential Energy does not retain plans for privately-owned underground electrical or water & sewerage assets located on private property. Privately-owned underground electrical assets located on private property are the responsibility of the owner.*

The plans have been prepared for Essential Energy's sole use and benefit. **Essential Energy cannot and does not warrant the accuracy or completeness of the plans.** Essential Energy supplies them at no cost with the object of reducing the serious risk of unintentional damage being caused to its cables and pipes. **Essential Energy does not accept any responsibility for any omissions, inaccuracies or errors in the plans, or any reliance place on the material. Any reliance placed on any plan provided in response to your request is at your own risk.**



Essential Energy retains all intellectual and industrial property rights which exists or may exist in or with respect to the plan(s). The material provided is not to be copied or distributed beyond you.

You release Essential Energy from and against all claims, demands, actions and proceedings arising out of or in any way related to the use of the provided material.

Location of Assets on Site:

The plans indicate only that cables and pipes may exist in the general vicinity – they do not pinpoint the exact location of the cables and pipes.

If it is found that the location of cables or pipes on the plans can be improved, please notify Essential Energy on 13 23 91 (or fax 1800 354 636).

All individuals have a duty of care they must observe when working in the vicinity of underground cables and pipes. It is the **excavator's responsibility to visually expose the underground cables and pipes manually, ie. by using hand-held tools and non-destructive pot-holing techniques prior to any mechanical excavation**. The excavator will be held responsible for all damage caused to the Essential Energy network or cables and pipes, and for the costs associated with the repair of any such damage. The excavator will also be held responsible for all damage caused to any persons.

When digging in the vicinity of underground assets, persons should observe the requirements of the applicable Codes of Practice published by the NSW Work Cover Authority or Safe Work Australia, and any amendments from time to time by the Authorities, including although not limited to:

- Excavation Work
- Managing Electrical Risks in the workplace
- How to manage and control asbestos in the workplace

(Please refer to <https://www.workcover.nsw.gov.au/law-and-policy/legislation-and-codes/codes-of-practice>).

When digging in the vicinity of **electrical assets** persons should observe the requirements of the **Electricity Supply Act 1995**.

Persons excavating near live underground electrical reticulation and/or earthing cables **must exercise extreme caution at all times and adhere to the requirements of Essential Energy's Electrical Safety Rules**. (These are available on our website: <http://www.essentialenergy.com.au/content/safety-community> and include

- **Work near Essential Energy's Underground Assets:**
<http://www.essentialenergy.com.au/asset/cms/pdf/contestableWorks/CEOP8041.pdf> , and
- **Asbestos Fact Sheet:**
<http://www.essentialenergy.com.au/asset/cms/pdf/safety/AsbestosFactSheet.pdf>

In some situations these procedures call for work to be performed by authorised staff.

Should there be any doubt as to the exact location of any underground electrical assets, and the potential for conflict with live underground cables caused by excavation at your work site, you should contact

13 23 91 to arrange for an on-site visit by an Essential Energy representative. No construction or mechanical excavation work is to commence prior to this on-site visit and approval being obtained.

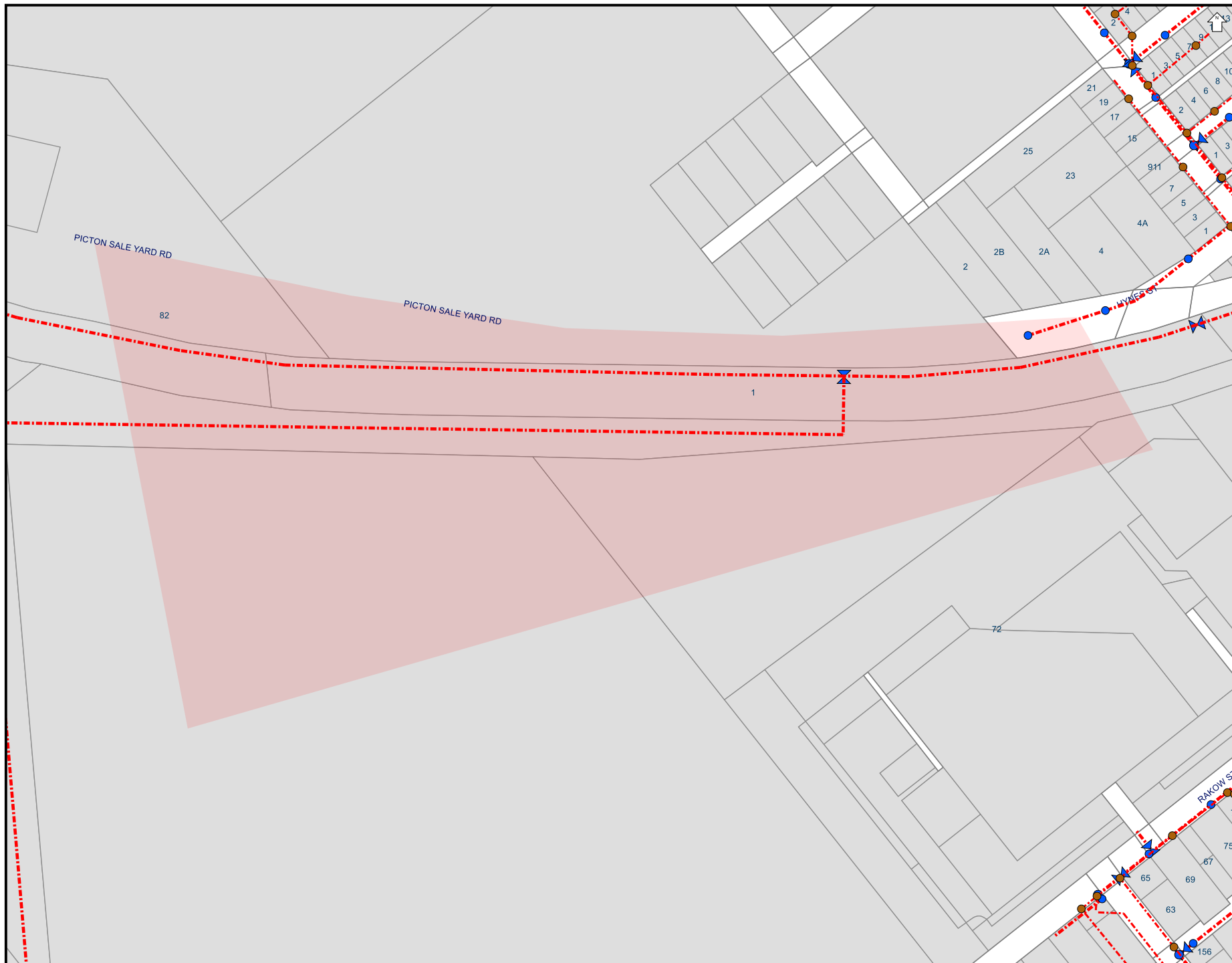
When digging in the vicinity of **water or sewer assets** persons should observe the requirements of the **Water Management Act 2000**.

Should there be any doubt as to the exact location of any underground water and sewer assets, and the potential for conflict with underground water and sewer pipes caused by excavation at your work site, you should contact **13 23 91** to arrange for an on-site visit. No construction or excavation work is to commence prior to this on-site visit and approval being obtained.

Prior Notification:

Please note that for excavation depths greater than 250mm near power poles and stays you should allow for **advance notice** in your construction program to permit Essential Energy time to allocate the necessary field resources to carry out the inspection at the site a **minimum of fourteen (14) working days prior to work commencing**. This service may incur a fee and this can be negotiated with the local Area Coordinator at the time of making the appointment. Failure to give reasonable notice to the local Area Coordinator may result in disruption to Essential Energy's planned works program in the district and could incur an extra charge over and above the normal rate for this service.

For further information please call 13 23 91.



Overhead wires not shown
LOOK UP & LIVE!
Water/Sewer infrastructure
ONLY shown

LEGEND

- Critical* asset
- Water Hydrant
- Water Valve
- Water Isolation Valve
- Water Service Connection
- Above Ground Water Device
- Above Ground Sewer Device
- Area of Interest

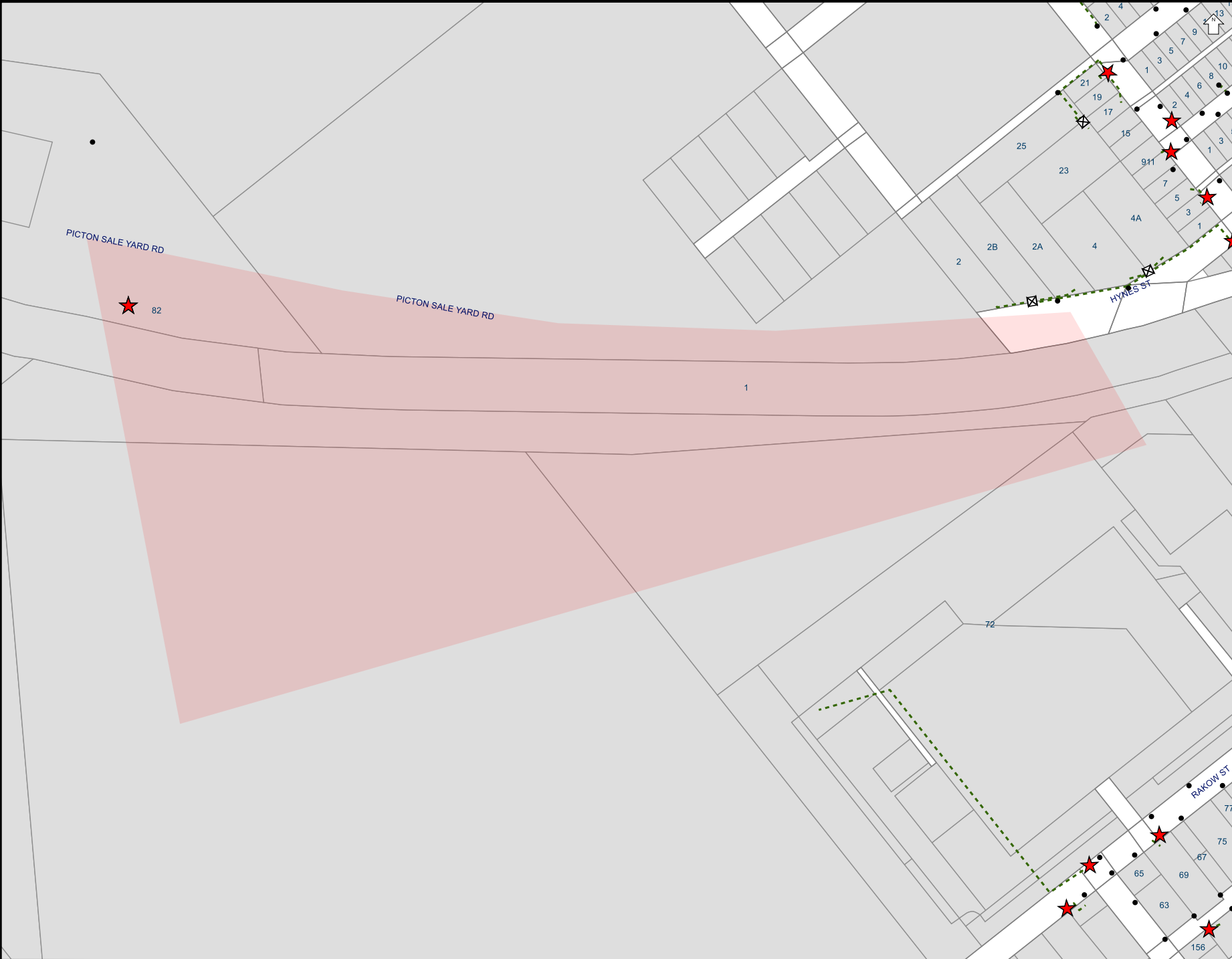
* Critical Assets: Contact Essential Energy on 13 23 91

THE INFORMATION ON THIS MAP MAY NOT BE ACCURATE. If details are incorrect, please notify Essential Energy on 13 23 91 (or fax 1800 354 636)

ISSUE DATE: 30/01/2023
You must resubmit your request if you have not started work within 4 weeks of the 'Issue Date' above

A4 SCALE 1:5739





Overhead wires not shown
LOOK UP & LIVE!

LEGEND

LV Underground Cable

HV Underground Cable

Underground Pipe

Underground Earth or Wires

Ground Substation

Pole

Cubicle

Pit

Area of Interest

Critical Assets

Contact Essential Energy on 13 23 91

Zone Substation

Underground Cable

Underground Fibre

Proposed Works

Area of proposed works

Proposed assets are shown as orange symbols

THE INFORMATION ON THIS MAP MAY NOT BE ACCURATE.
If details are incorrect, please notify
Essential Energy on 13 23 91
(or fax 1800 354 636)

ISSUE DATE: 30/01/2023

You must resubmit your request if you have not started work within 4 weeks of the 'Issue Date' above

A4 SCALE: 1:5736





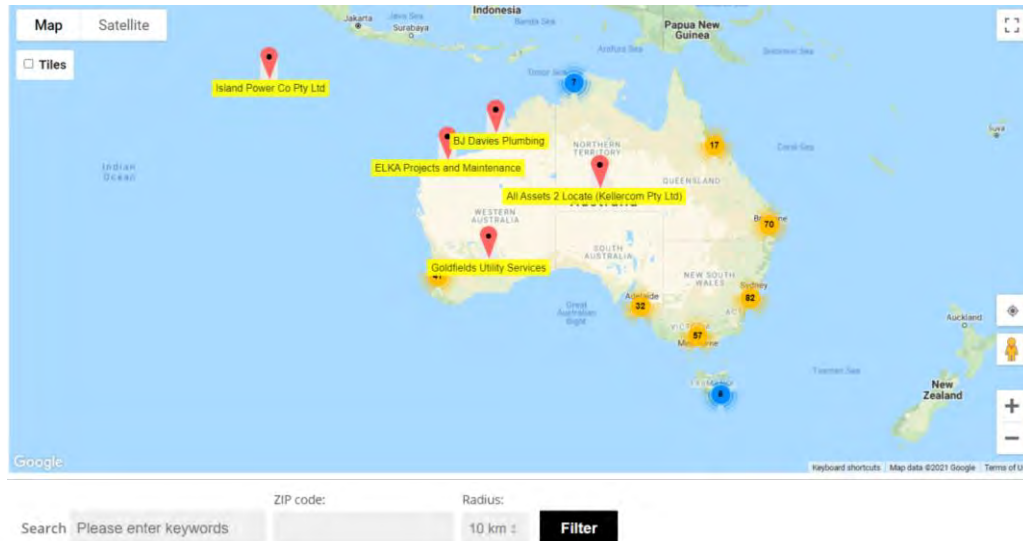
Certified Locating Organisations (CLO)

Find the closest CLO to your worksite on: <https://dbydlocator.com/certified-locating-organisation/>

Read the disclaimer and click:

Accept and Search Now

A national map and an A-Z list of Certified Locating Organisations is displayed.



Use the map to zoom to your work area and choose the closest  Locator indicated.

OR search by entering the **postcode** of your work area.

1. Enter the post/zip code
2. Choose your search radius
3. Click filter (If there is no result, you may have to increase the search radius)
4. Click on the closest  for CLO details or view the results displayed below the map



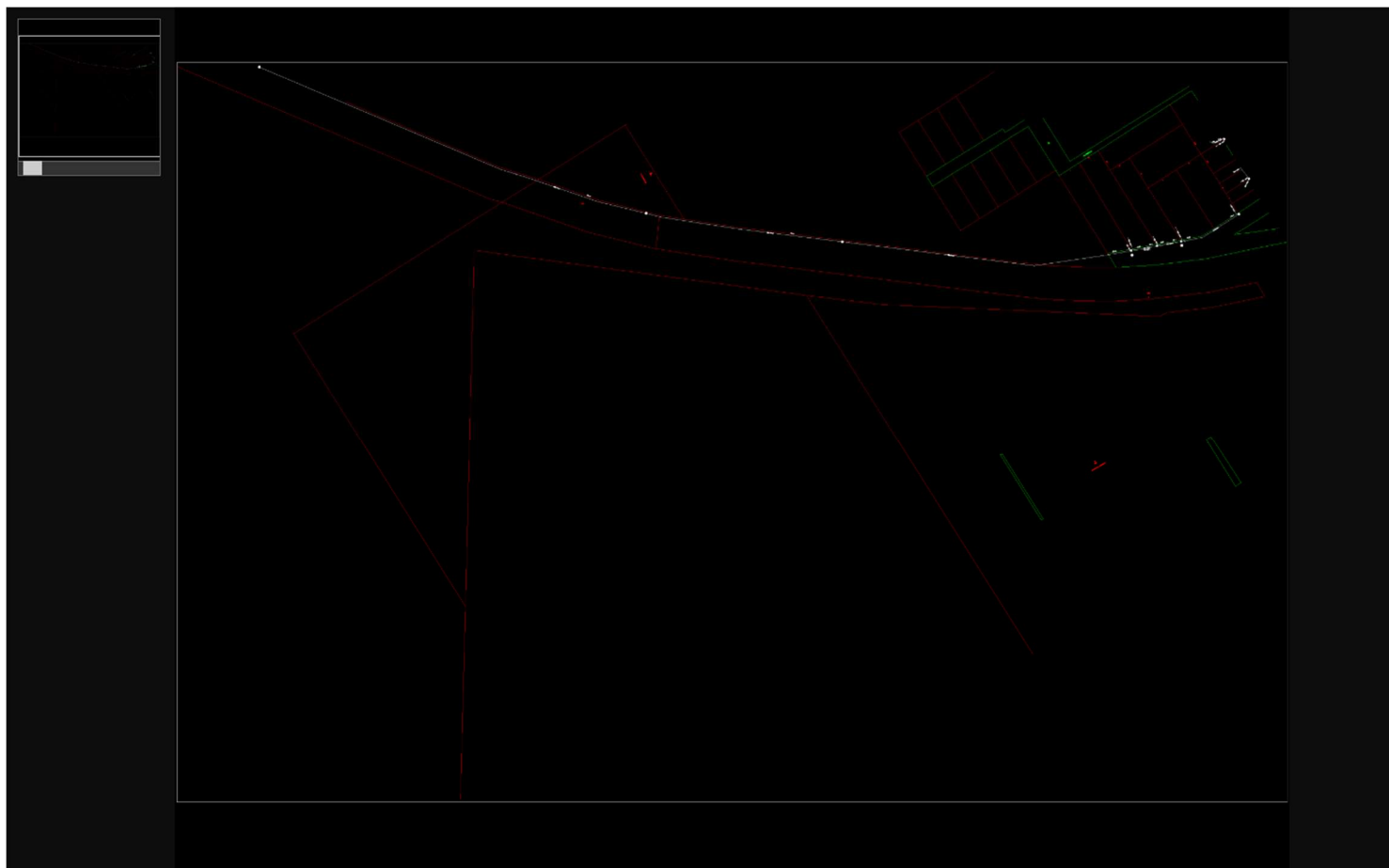
Locator skills have been tested, and the Organisation has calibrated location and safety equipment.

Telstra is aware of each Certified Locating Organisation and their employee locators.

Only a DBYD Certified Locator registered with a Certified Locating Organisation is authorised to access Telstra network for locating purposes.

Each Certified Locator working for a CLO is issued with a photo ID Card, authorising them to access Telstra pits and manholes for the purpose of cable and plant locations.

Please ask to see your Locators' CLO ID Card.



TELSTRA



Working near **nbn**TM cables

nbn has partnered with Dial Before You Dig to give you a single point of contact to get information about **nbn** underground services owned by **nbn** and other utility/service providers in your area including communications, electricity, gas and other services. Contact with underground power cables and gas services can result in serious injury to the worker, and damage and costly repairs. You must familiarise yourself with all of the Referral Conditions (meaning the referral conditions referred to in the DBYD Notice provided by **nbn**).

Practice safe work habits

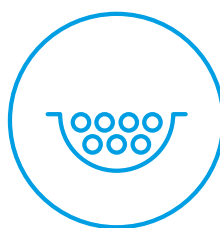
Once the DBYD plans are reviewed, the Five P's of Excavation should be adopted in conjunction with your safe work practices (which must be compliant with the relevant state Electrical Safety Act and Safe Work Australia "Excavation Work Code of Practice", as a minimum) to ensure the risk of any contact with underground **nbn** assets are minimised.



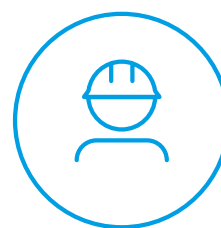
Plan: Plan your job by ensuring the plans received are current and apply to the work to be performed. Also check for any visual cues that may indicate the presence of services not covered in the DBYD plans.



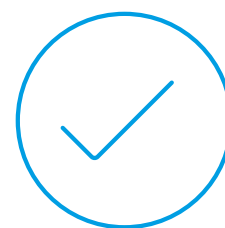
Prepare: Prepare for your job by engaging a DBYD Certified Plant Locator to help interpret plans and identify on-site assets. Contact **nbn** should you require further assistance.



Pothole: Non-destructive potholing (i.e. hand digging or hydro excavation) should be used to positively locate **nbn** underground assets with minimal risk of contact and service damage.

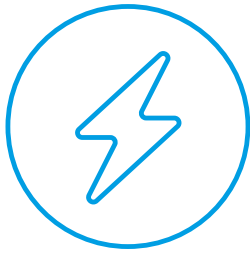


Protect: Protecting and supporting the exposed **nbn** underground asset is the responsibility of the worker. Exclusion zones for **nbn** assets are clearly stated in the plan and appropriate controls must be implemented to ensure that encroachment into the exclusion zone by machinery or activities with the potential to damage the asset is prevented.

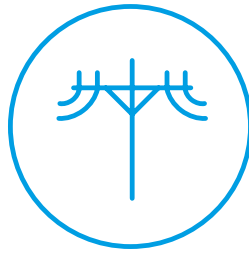


Proceed: Proceed only when the appropriate planning, preparation, potholing and protective measures are in place.

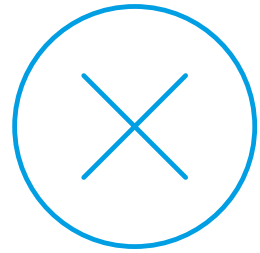
Working near **nbn**[™] cables



Identify all electrical hazards, assess the risks and establish control measures.



When using excavators and other machinery, also check the location of overhead power lines.



Workers and equipment must maintain safety exclusion zones around power lines.

Once all work is completed, the excavation should be re-instated with the same type of excavated material unless specified by **nbn**. Please note:

- Construction Partners of **nbn** may require additional controls to be in place when performing excavation activities.
- The information contained within this pamphlet must be used in conjunction with other material supplied as part of this request for information to adequately control the risk of potential asset damage.

Contact

All **nbn**[™] network facility damages must be reported online [here](#).
For enquiries related to your DBYD request please call 1800 626 329.

Disclaimer

This brochure is a guide only. It does not address all the matters you need to consider when working near our cables. You must familiarise yourself with other material provided (including the Referral Conditions) and make your own inquiries as appropriate.

nbn will not be liable or responsible for any loss, damage or costs incurred as a result of reliance on this brochure.

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To: Abtin Misagh
Phone: Not Supplied
Fax: Not Supplied
Email: Megprojects@metaline-engineering.com

Dial before you dig Job #:	33506731	
Sequence #	220541118	
Issue Date:	30/01/2023	
Location:	1 Hynes Street , Broken Hill , NSW , 2880	

Indicative Plans

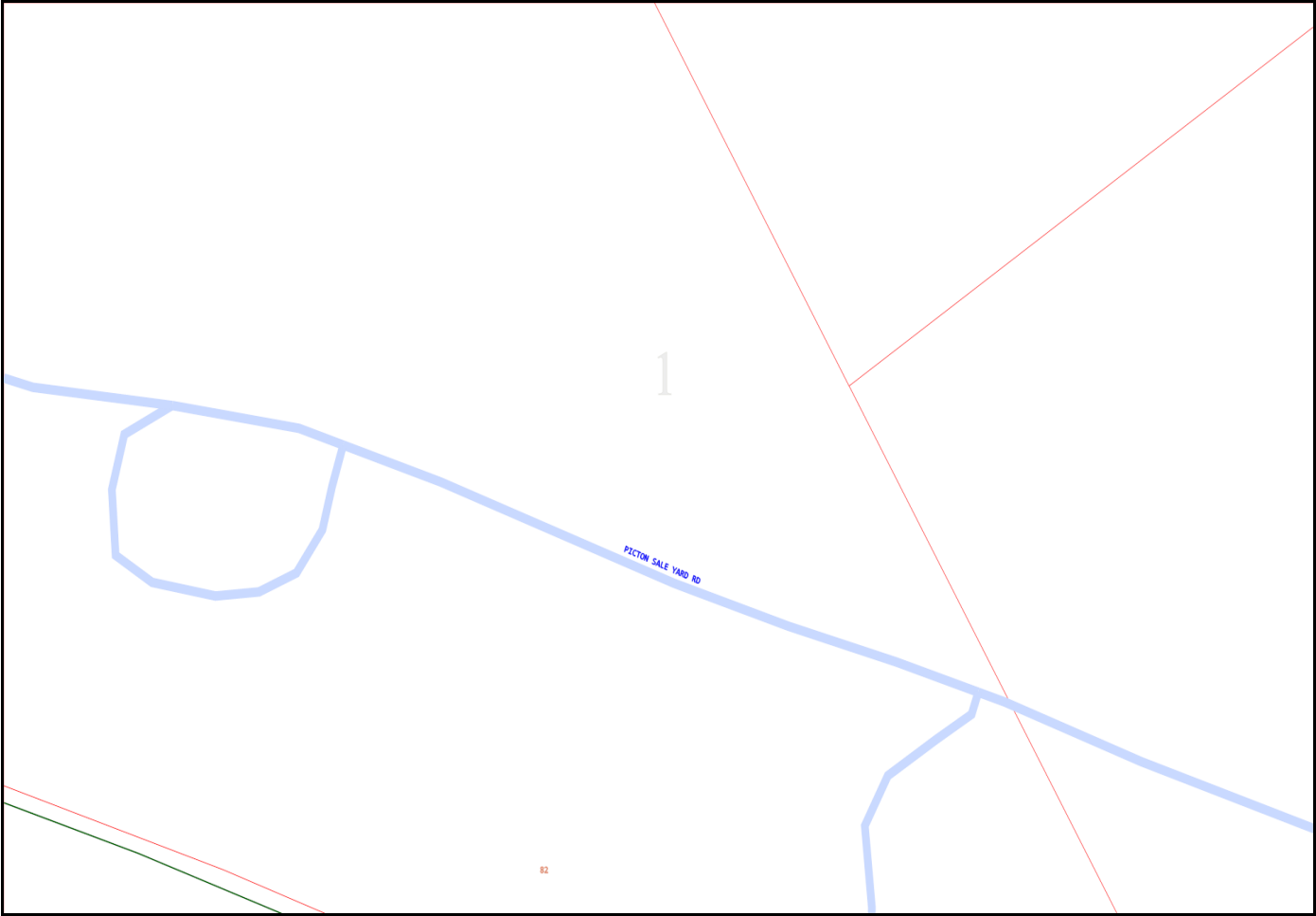
1	5	9	13
2	6	10	14
3	7	11	15
4	8	12	16

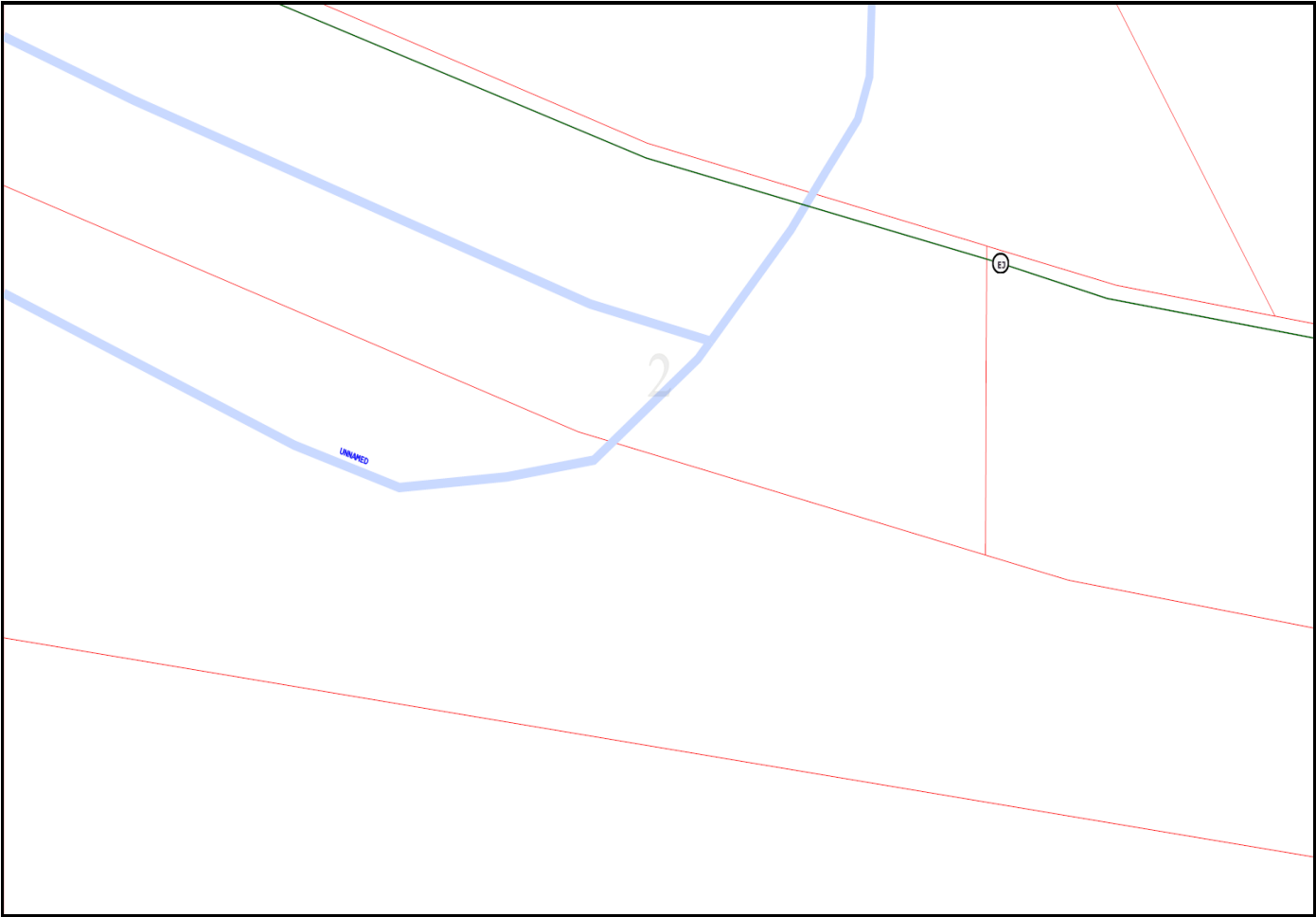


LEGEND



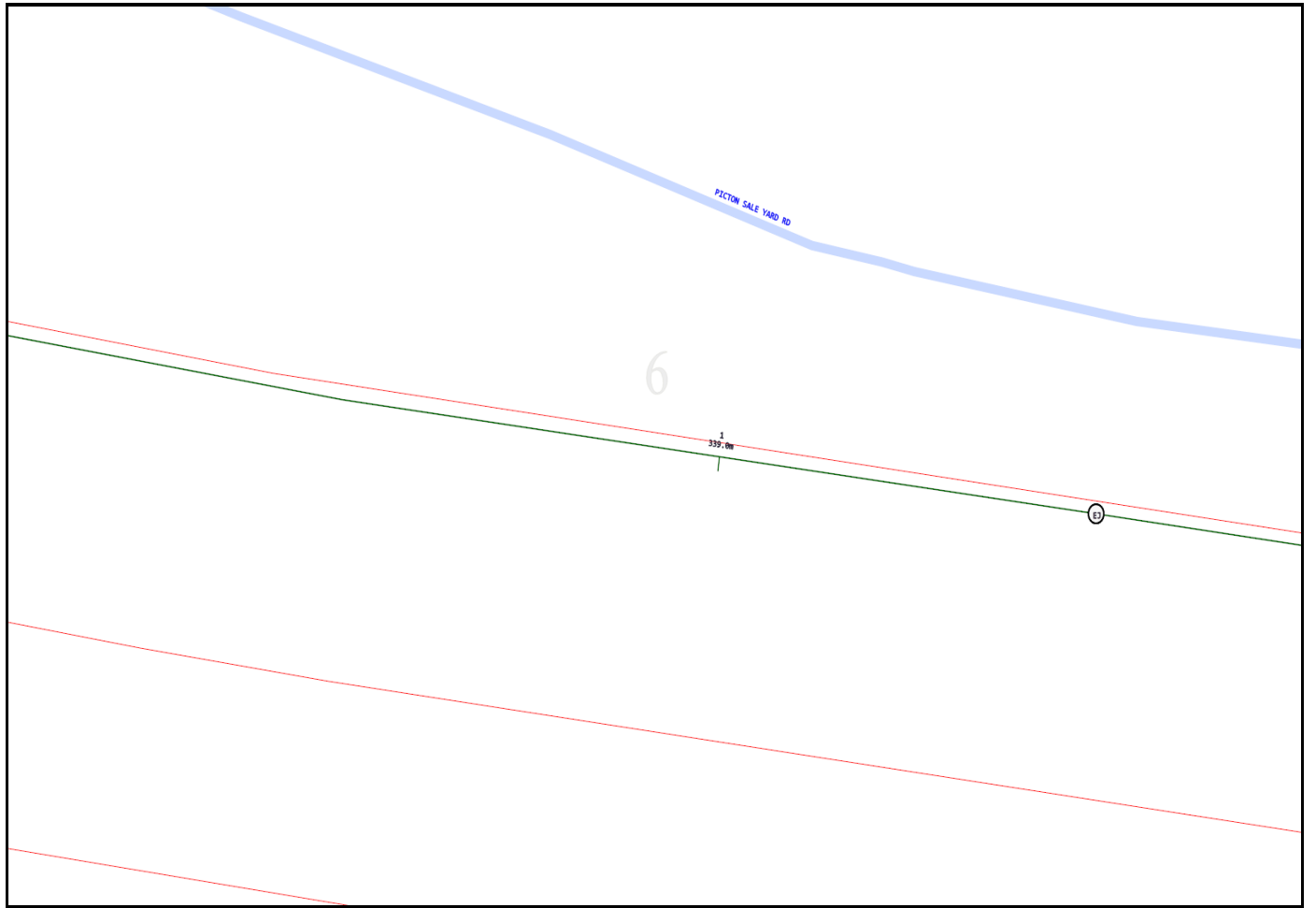
	Parcel and the location
	Pit with size "5"
	Power Pit with size "2E". Valid PIT Size: e.g. 2E, 5E, 6E, 8E, 9E, E, null.
	Manhole
	Pillar
2 PO – T- 25.0m P40 – 20.0m	Cable count of trench is 2. One "Other size" PVC conduit (PO) owned by Telstra (-T-), between pits of sizes, "5" and "9" are 25.0m apart. One 40mm PVC conduit (P40) owned by NBN, between pits of sizes, "5" and "9" are 20.0m apart.
2 10.0m	2 Direct buried cables between pits of sizes, "5" and "9" are 10.0m apart.
	Trench containing any INSERVICE/CONSTRUCTED (Copper/RF/Fibre) cables.
	Trench containing only DESIGNED/PLANNED (Copper/RF/Fibre/Power) cables.
	Trench containing any INSERVICE/CONSTRUCTED (Power) cables.
	Road and the street name "Broadway ST"
Scale	0 20 40 60 Meters 1:2000 1 cm equals 20 m

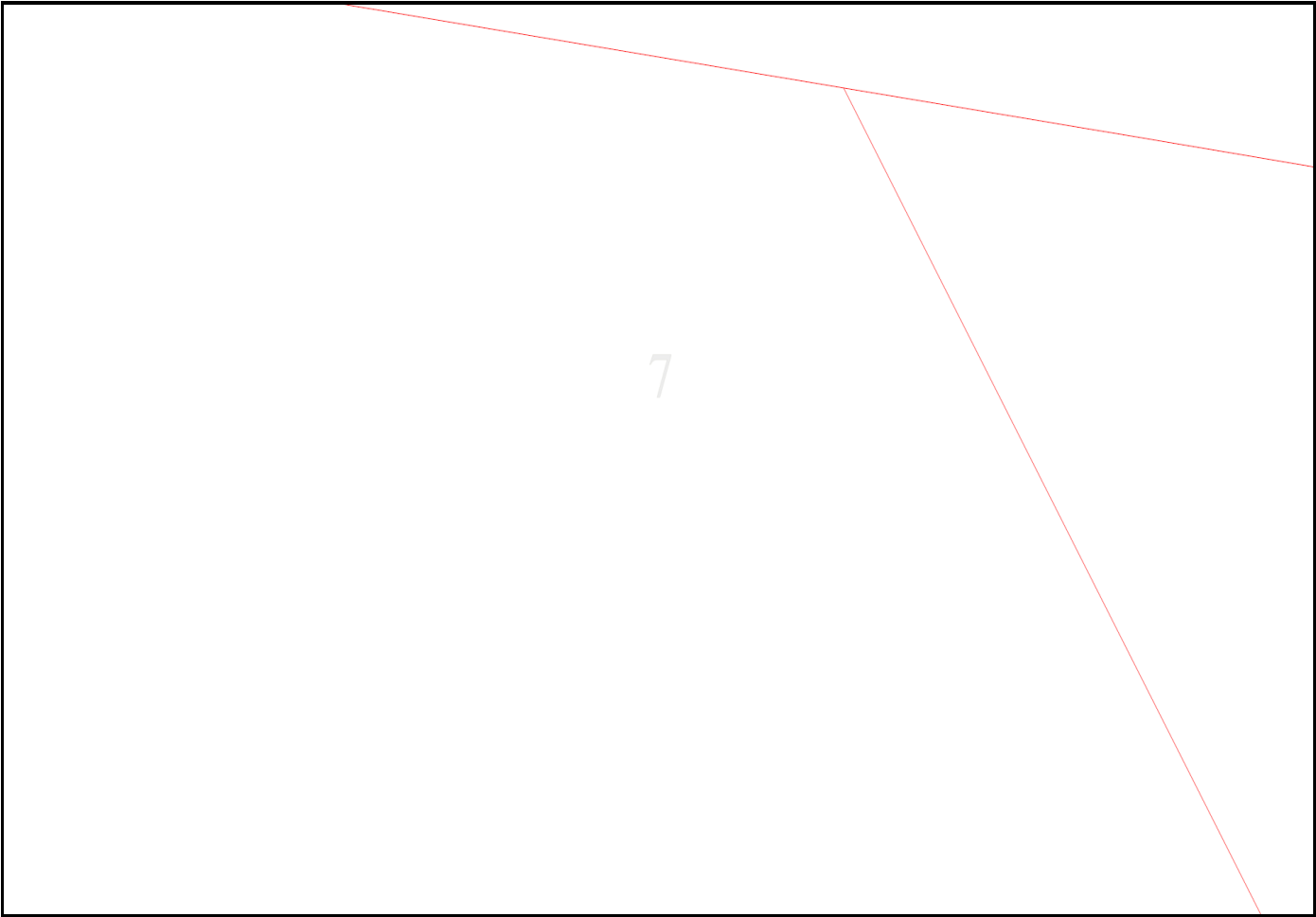


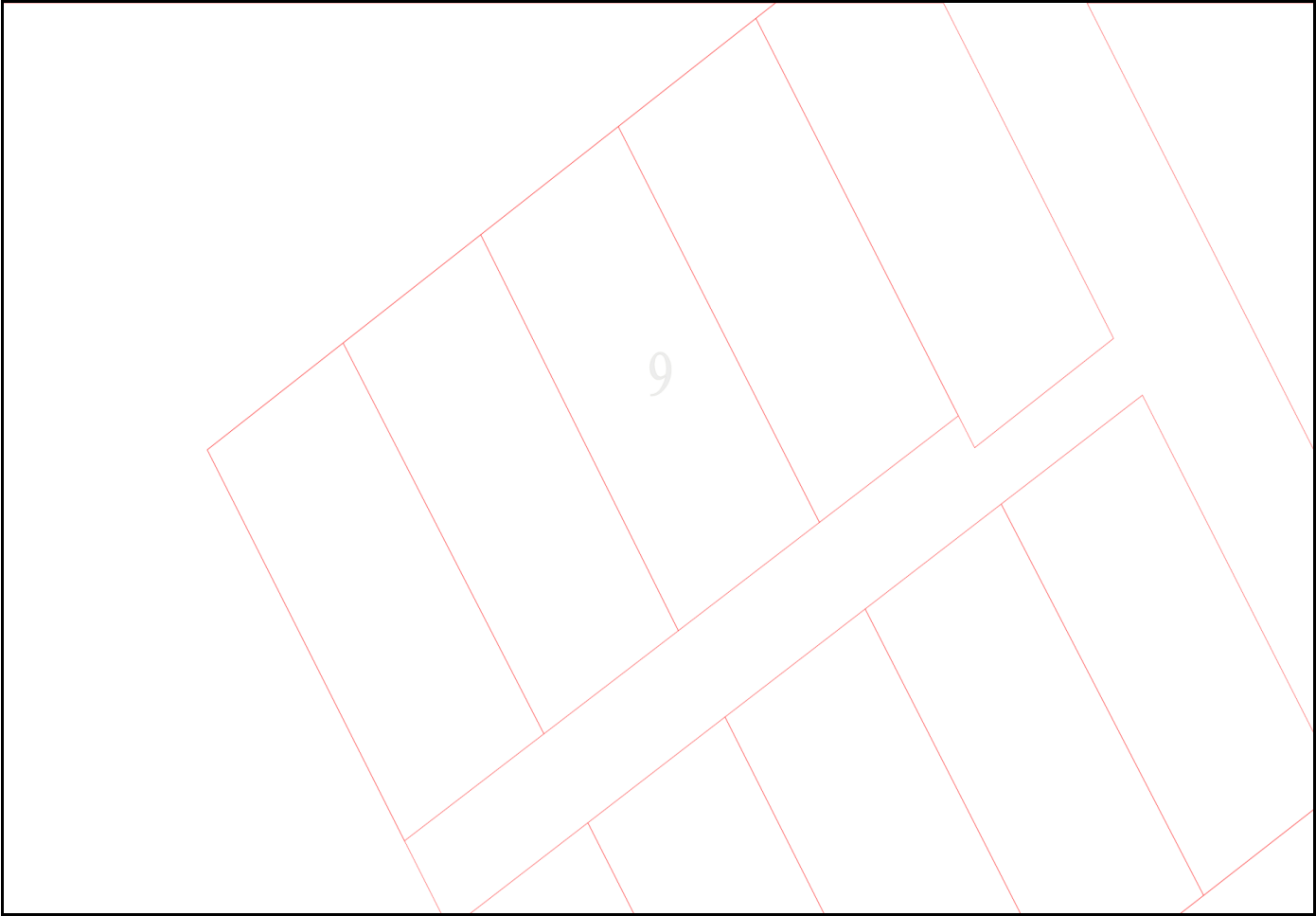


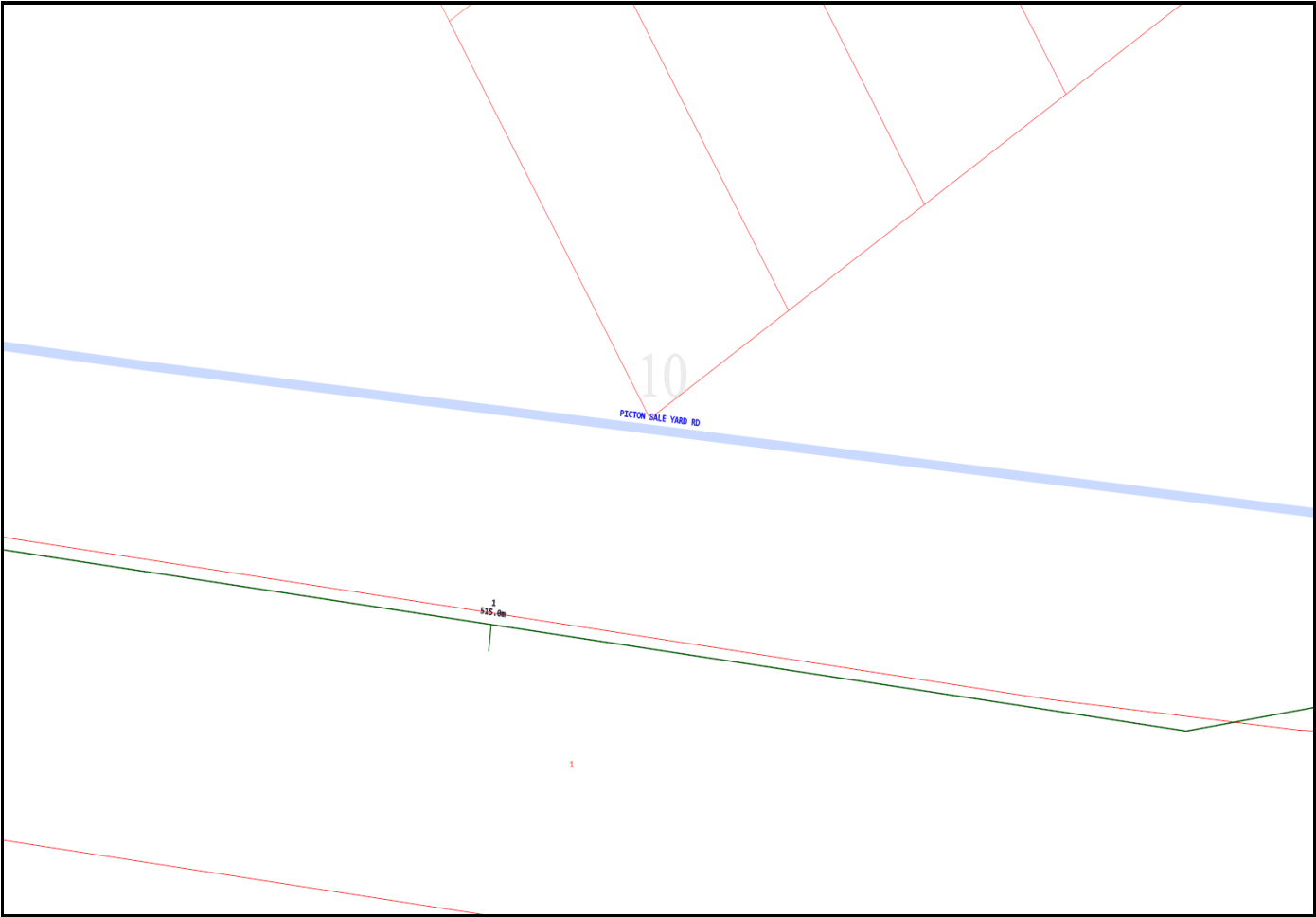
5

PICTON SALE YARD RD



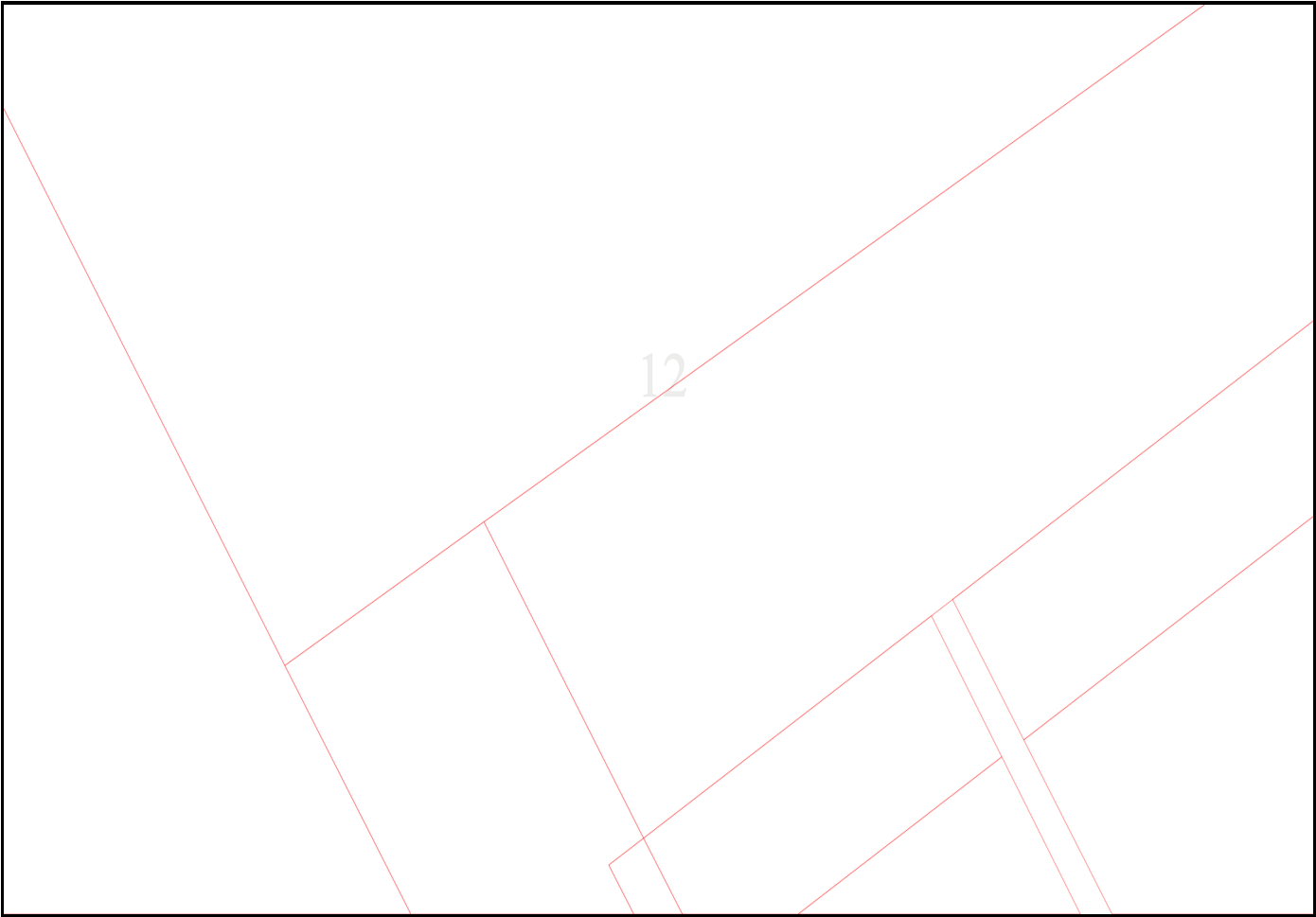


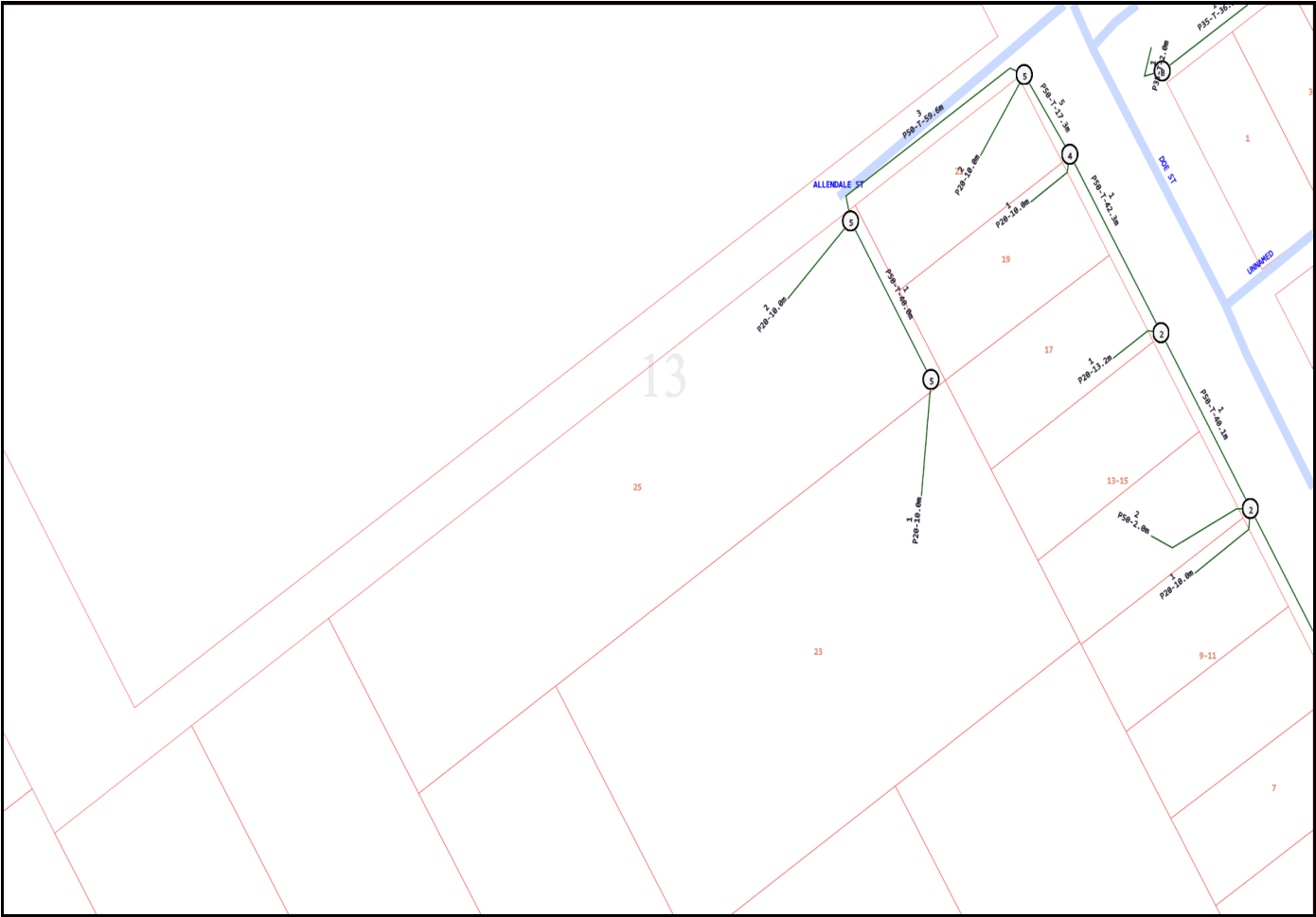


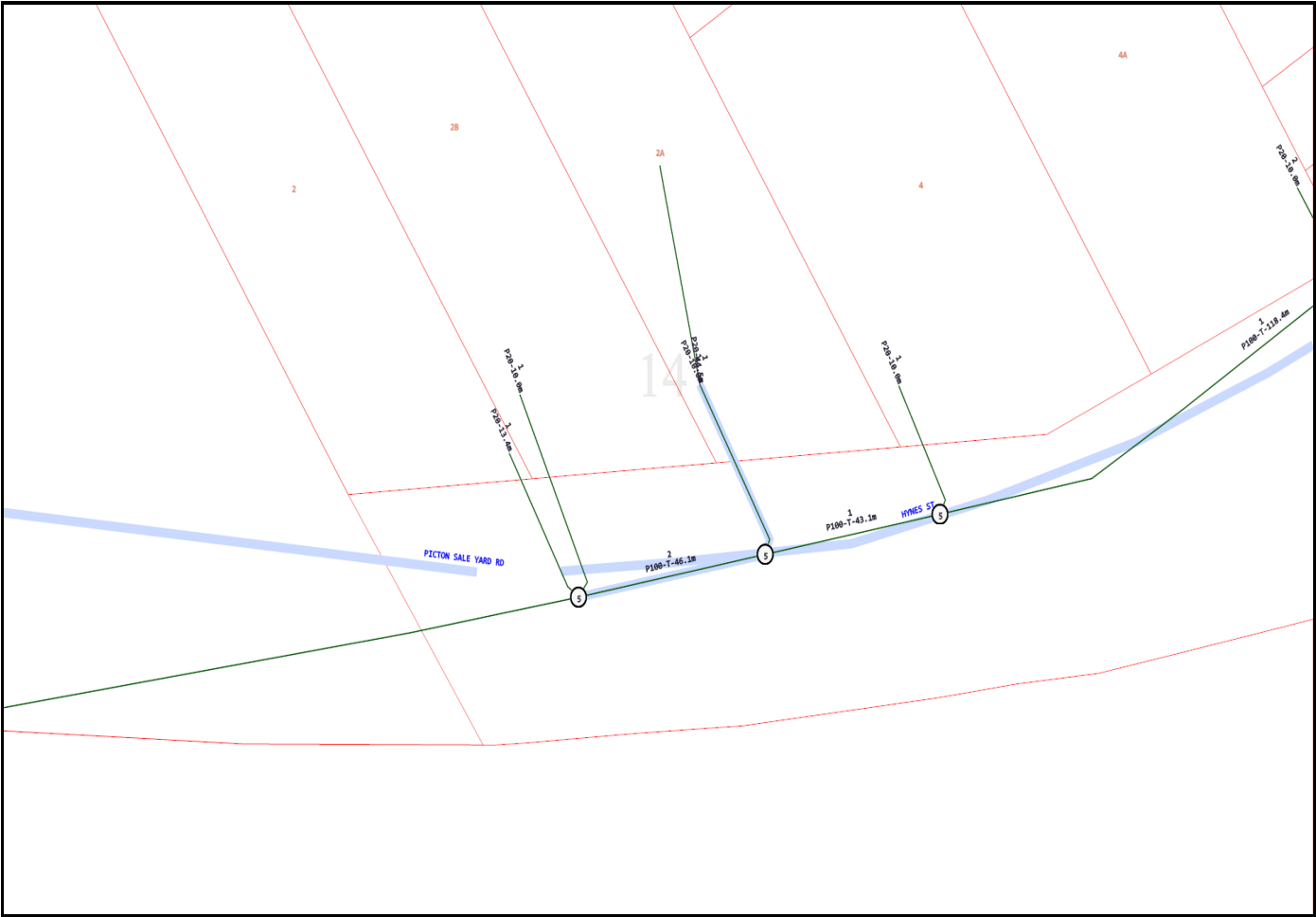


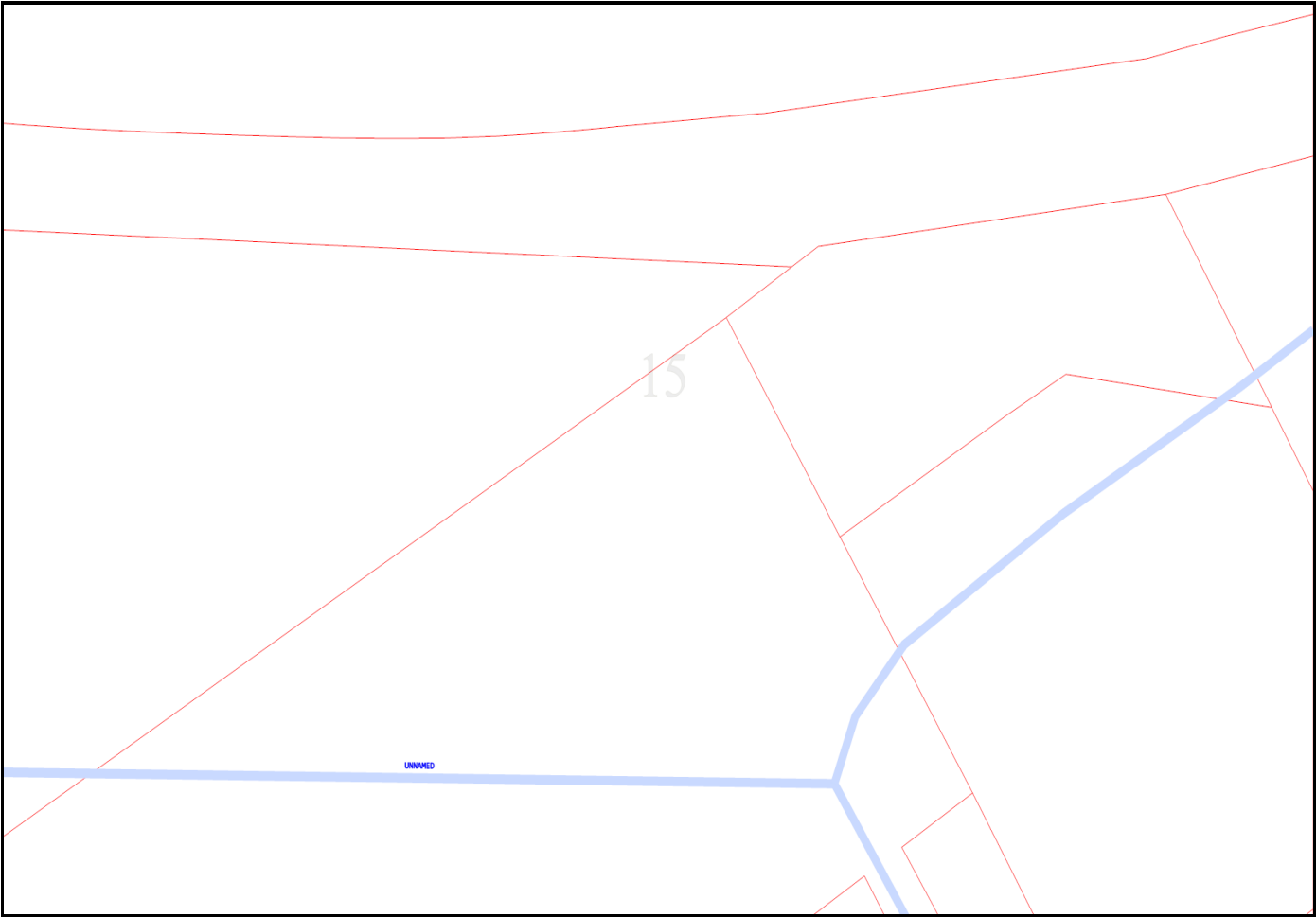
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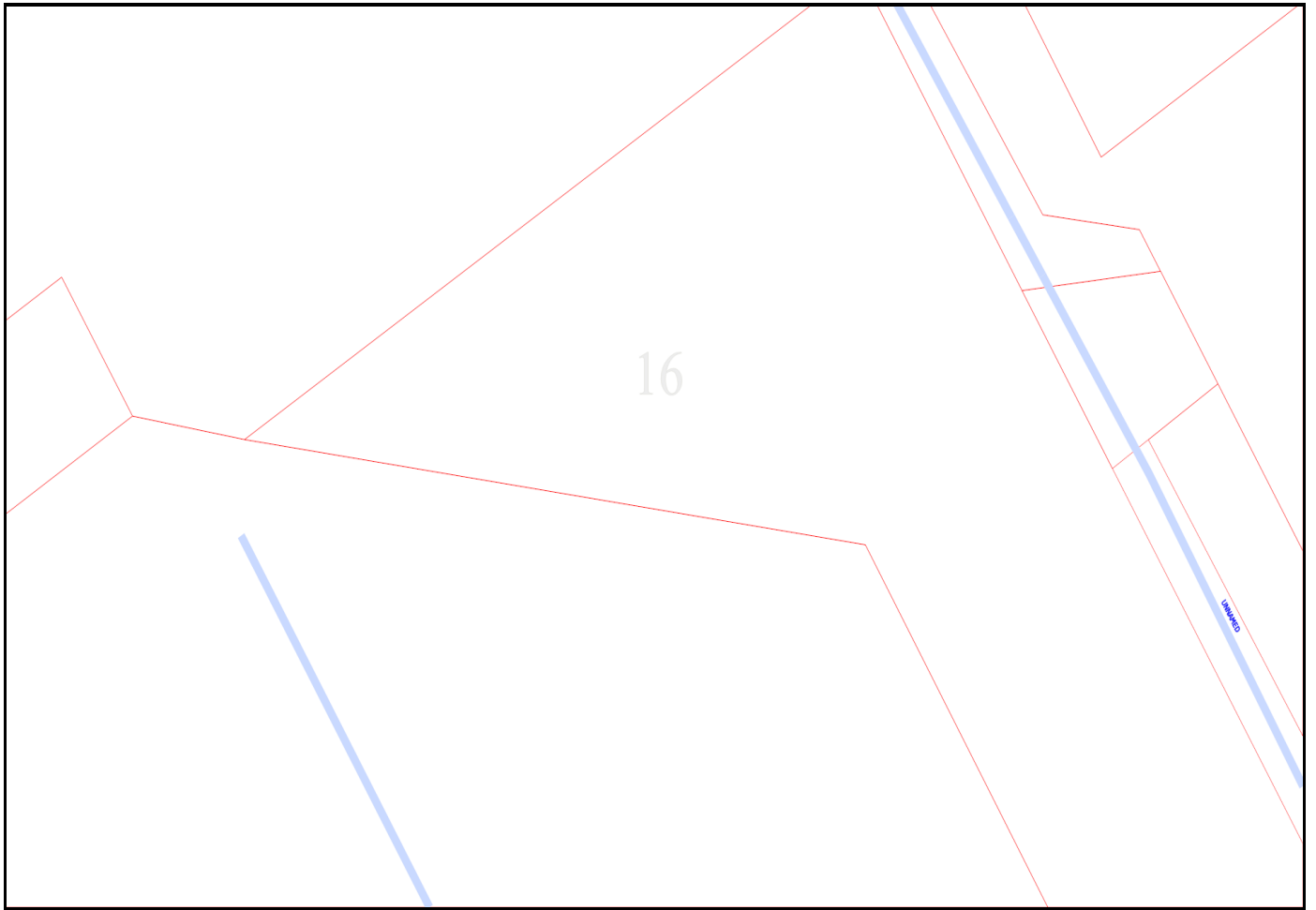
UNNAMED











Emergency Contacts

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

Appendix F

Photos from site walkover

SITE WALK THROUGH



Computer



Sheet Metal and Broken Glass



Some Construction waste, mostly Concrete
(may fall outside of property)