



mainroads
WESTERN AUSTRALIA

Asset and Geospatial Information Branch
Survey and Mapping Section

Underground Utilities Survey Standard

67-08-121

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Document Control

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Amendments

Revision Number	Revision Date	Description of Key Changes	Section / Page No.
1	August 2009	Standard Developed	All
2	May 2015	Revision / update of Standard	All
3	January 2015	Revision / update of Standard	All
4	January 2016	Revision / revised accuracies	All
5	August 2016	Remove logo from examples	Appendices
6	March 2017	New Format / Review	All
7	June 2018	Revision update of standard	All
8	August 2019	Revision update of standard	All
9	August 2020	Revision update of standard	All
10	July 2023	Revision update of standard	All
11	August 2023	Amended General Requirements (TRIM Revision 11)	Section 2
12	August 2024	Revision update of standard	All
13	May 2026	Remove “General Requirements”	
14	September 2026	Add note for Revision 13, fix section numbering and Table of Contents	

1 INTRODUCTION

Main Roads WA requires the collection of underground utility data for the purposes of planning, detail design, maintenance and construction. Each process requires differing levels of detail and accuracy with regard to the collection of this data.

1.1 PURPOSE

The purpose of this standard is to establish the requirements of all work related to the collection and presentation of underground utilities and utilities data for Main Roads.

All work must be performed and presented in accordance with the following standard to ensure that Main Roads has certainty in delivery quality and procedure.

1.2 SCOPE

This Standard must apply to all work related to the supply of utility data. Advice and further information on this standard can be obtained by contacting the Senior Engineering Surveyor, Asset & Geospatial Information Branch at Main Roads.

survey@mainroads.wa.gov.au or call 138 138.

1.3 DEFINITIONS

Term	Definition
AHD	Australian Height Datum
AusGeoid	Models used to convert ellipsoid heights (used in GNSS) to Australian Height Datum (AHD) heights.
Contractor	The party named in the contract to collect and present underground utility data.
Data	Transmissible and storable computer information
Detail Ground Survey	Features that have been surveyed in accordance with the Main Roads standard 67-08-43 Detail Ground Survey Standard to define its position and level. These features can be used to indicate the presence of services and identify logical service end points.
DGN	MicroStation CAD file format.
Electrical Design Manager	Custodian of Main Roads Electrical plans and information. electricalplanrequest@mainroads.wa.gov.au
GDA	Geodetic Datum, Australia
GenIO	An ASCII file format formally used by MRWA to input data into MX road design software and Open Roads.
GNSS	Global Navigation Satellite System.
GPR	Ground Penetrating Radar - Electronic detection method of locating underground services.
MRWA	Main Roads Western Australia.
OpenRoads	MicroStation Road Design Software
Project Manager	The Main Roads officer responsible for the overall works project.
RTK	Real Time Kinematic. A GNSS survey technique utilising GNSS.
SLK	Straight Line Kilometre
Survey Manager	The Main Roads officer responsible to deliver the specific utilities data to the Main Roads Project Manager.
Survey Portal	Online Open platform for sharing Main Roads WA Survey Information
UUS	Underground Utilities Survey
UUS Search Area	The extent of the area that all locatable services are to be or have been identified by the underground utilities survey.

1.4 REFERENCES AND RELATED DOCUMENTS

Survey standards, guidelines and documents are available on the Main Roads website.

DGS - [Digital Ground Survey Guidelines](#)

UUS - [Underground Utilities Survey Guideline](#)

Document Number	Description
67-08-43	Digital Ground Survey Standard
D22#371770	Geodetic Control Survey Standard
D15#321963	Survey Metadata Standard
D15#329521	Metadata Statement Form – Underground Utilities
D15#329507	Metadata Statement Form – Digital Ground Survey
D17#301448	Survey Report Template
D12#434788	Data Lodgment Guideline
	Traffic Management for Works on Roads - Code of Practice
D15#15663	Specification 106 Utilities and Services
	Main Roads WA Survey Portal
	Contractor Reporting Forms
External References	
	AS 5488-2019 Australian Standard
	Utility Providers Code of Practice for Western Australia
	http://www.1100.com.au Before You Dig Australia Website
	Before You Dig Australia (BYDA) Best Practice Guides
	Geoscience Australia website

1.5 Utility Providers contact list - Non Comprehensive

Utility Provider	Non-Emergency Contact information	
APA	apaprotection@apa.com.au	1800 103 452
ATCO	drawing.office@atcogas.com.au	131 352
DBNGP	landmanagement@agig.com.au	9223 4928
Horizon Power	Regional Contact Centres	
NBN	dbyd@nbnco.com.au	1800 626 762
NextGen/Vocus	Damage.Relocations@vocus.com.au	1800 032 532
Optus	Sue.Devenyns@optus.com.au	1800 505 777
Pipe Networks	dbyd@pipenetworks.com	1800 201 100 (opt 4)
City of Swan	swan@swan.wa.gov.au	9267 9267
Telstra	Telstra.Plans@team.telstra.com	1800 653 935
Water Corp	131395	08 9424 8115
Water Corp - SLIP	https://catalogue.data.wa.gov.au/dataset?organization=water-corporation	
Western Power	enquiry@westernpower.com.au	1300769345
Western Power SLIP	https://catalogue.data.wa.gov.au/organization/western-power	

2 COORDINATE SYSTEM & DATUM

Survey models are to be supplied in the requested Main Roads' Project Zone coordinate system.

Where more than one zone may appear applicable, the most appropriate zone is to be defined by the MRWA Senior Geodetic Surveyor or Surveying & Mapping specialist. Where a project spans multiple zones, the areas for each zone are to be clearly defined in the scope of works.

Project zone parameters are available online via the Main Roads WA online Surveying GIS web page, known as the "Survey Portal", or from the Senior Geodetic Surveyor.

Heights are to be relative to the Australian Height Datum (AHD).

Features captured with GNSS must use the AUSGeoid09 model for GDA94 datum surveys and the Ausgeoid2020 model for GDA2020 datum surveys, to derive AHD height. These AusGeoid models are available from the Geoscience Australia website.

The Project zone, height datum and Geoid model used must be specified on the metadata statement.

2.1 SURVEY CONTROL

All survey control used is to meet or exceed positional standards (horizontal and vertical) specified in Main Roads Standard **D22#371770** Geodetic Control Survey Standard.

Suitable and sufficient survey control is required to meet specified accuracies relative to capture methodology and equipment.

2.2 VERTICAL NETWORK

When new survey control is required or existing control has issues to be rectified, a differential level traverse is to be undertaken for the extents of the survey area.

All existing control immediately adjacent to a survey site must be included in the differential level traverse.

Differential levelling is to be in accordance with MRWA standard **D22#371770** Geodetic Control Survey Standard.

2.3 DETAILS OF SURVEY CONTROL

Details of survey control used, adjacent to and relevant to the survey are required, and must be included in the "Survey Report".

This is in addition to the requirements of any other applicable standards.

Any new Road Reference Marks required must be established according to Main Roads Standard **D22#371770** Geodetic Control Survey Standard.

2.4 SURVEY ACCURACY AND QUALITY

All utilities data must be 3D and relate to the Australian Height Datum (AHD). If the utility provider supplies 2D data, then the data must be converted to 3D and have, -999 nominated as the height component.

Survey procedures and equipment used must relate to the attainment of the spatial tolerance nominated for each data quality class.

Survey checks should identify the following types of errors:

- Systematic errors
- Instrument errors or equipment calibration
- Errors in information such as control marks, or design information
- Human error.

Preferably, the checks should be independent of the surveying process being checked. Repeating the same survey process as a check is discouraged as it will not identify systemic errors.

Examples of independent checks include:

- Closed traverse loops
- Checking distances between points radiated
- Check shots to survey control marks in electronic tachometry surveys
- Checking distances to other features whose position has been verified.

The objective is to assure that the survey is correct when completed. In this regard, an honest effort must be made to identify parts of the survey process that could produce errors and make every effort to assure against this happening.

3 CONDUCTING AN UNDERGROUND UTILITIES SURVEY

Before commencing the utilities search, the contractor must clearly understand the project requirements. All aspects of the project scope should be clarified with the Survey Manager before submitting a quote for service. Price variations may not be considered if the contractor failed to understand the level of service required.

An underground utilities survey will be requested by the Main Roads Survey Manager to meet one of, or a combination of the following quality classes to allow data to be customised to Main Roads requirements.

3.1 CLASS-D (DATA QUALITY)

The contractor will be required to perform the following tasks to complete a quality Class-D utilities search.

- Collect utilities data from Before You Dig Australia (BYDA) or the service providers / custodians. This can include property owners, mine sites, local government authorities, Main Roads etc.
- Supply all utility information in digital format adopting Main Roads codes and file formats.
- Supply all raw data obtained from the service providers; include evidence of no services in area responses.
- Provide an underground utilities survey metadata statement.
 - Class D validity date must be provided.
- Provide UUS search area extents file.

3.2 CLASS-C (PLANNING QUALITY)

The contractor will be required to perform the following tasks to conform to quality Class-C.

- Perform all tasks for a data quality class-D utilities search as above (see 4.1).
- Survey all surface utility features in accordance with the Main Roads Detail Ground Survey Standard 67-08-43 using the appropriate MRWA codes.
- Alter all subsurface utilities locations obtained from supplied plans to align with surveyed surface features to depict their location. These lines are to be clearly noted in the underground utilities survey metadata statement or on plots as "Class-C location only".
- Unless stipulated, service manholes/lids are not required to be accessed/lifted.
- Supply all utility information in digital format adopting Main Roads codes and file formats.
- Provide an underground utilities survey metadata statement.
- Provide UUS search area extents file.

All Class-D and Class-C Features are coded the same. Although Class-C Features maybe considered more reliable there cannot be, an accuracy assigned to the Quality of this information, as it is unknown how ground features are connected until the Class-B or Class-A search is completed.

3.3 CLASS-B (DESIGN QUALITY)

The contractor will be required to perform the following tasks to complete a quality Class-B underground utilities survey.

- Perform all tasks for a planning quality Class-C utilities search (see 4.2 CLASS-C (PLANNING QUALITY)).
- All utilities shall be surveyed by an indirect survey method. This can involve locating gas, electric, phone, water, sewer and cables with methods such as ground penetrating radar, active and passive frequency detectors, electromagnetic detectors, acoustic detection systems.
- The accuracy of the utilities shall be located to (+ or -) 150mm at a depth less than 1.2m an accuracy of (+ or -) 300mm for depths greater than 1.2m.
- **Contractors are required** to lift drainage pits/gully lids, for the capture of an invert and obvert levels by tape measure, where practicable, and maybe required to lift other service manhole lids to confirm pipe/conduit directions and measure pipe/conduit diameters.
- Invert (PIL) and Obvert (POL) points **do not** require stringing.
- Leave markings on the earth's surface to denote the position of the service underground.
- Supply all utility information in digital format adopting Main Roads codes and file formats.
- Provide an underground utilities survey metadata statement.
- Provide an underground utility plot.
- Provide UUS search area extents file.

Note on providing depths to services on traced features.

GPR and Electronic detection are not an accurate measure of depth information due to the potential for interference from adjacent services and other geological conditions. However, this information is useful in the early planning stages as a guide to potential clashes and must be supplied. All electronic depths are coded PZ_ and the use of these points is at the designer's own risk. The expected vertical accuracy is (+ or -) 150mm at a depth less than 1.2m an accuracy of (+ or -) 300mm for depths greater than 1.2m unless otherwise stated. If the electronic depth is unreliable or the locator is not confident with its accuracy, the depth is required and must be labelled as estimated depth +/- X meters. This text is to be included in the sketches and the GenIO file.

3.4 CLASS-A (CONSTRUCTION QUALITY)

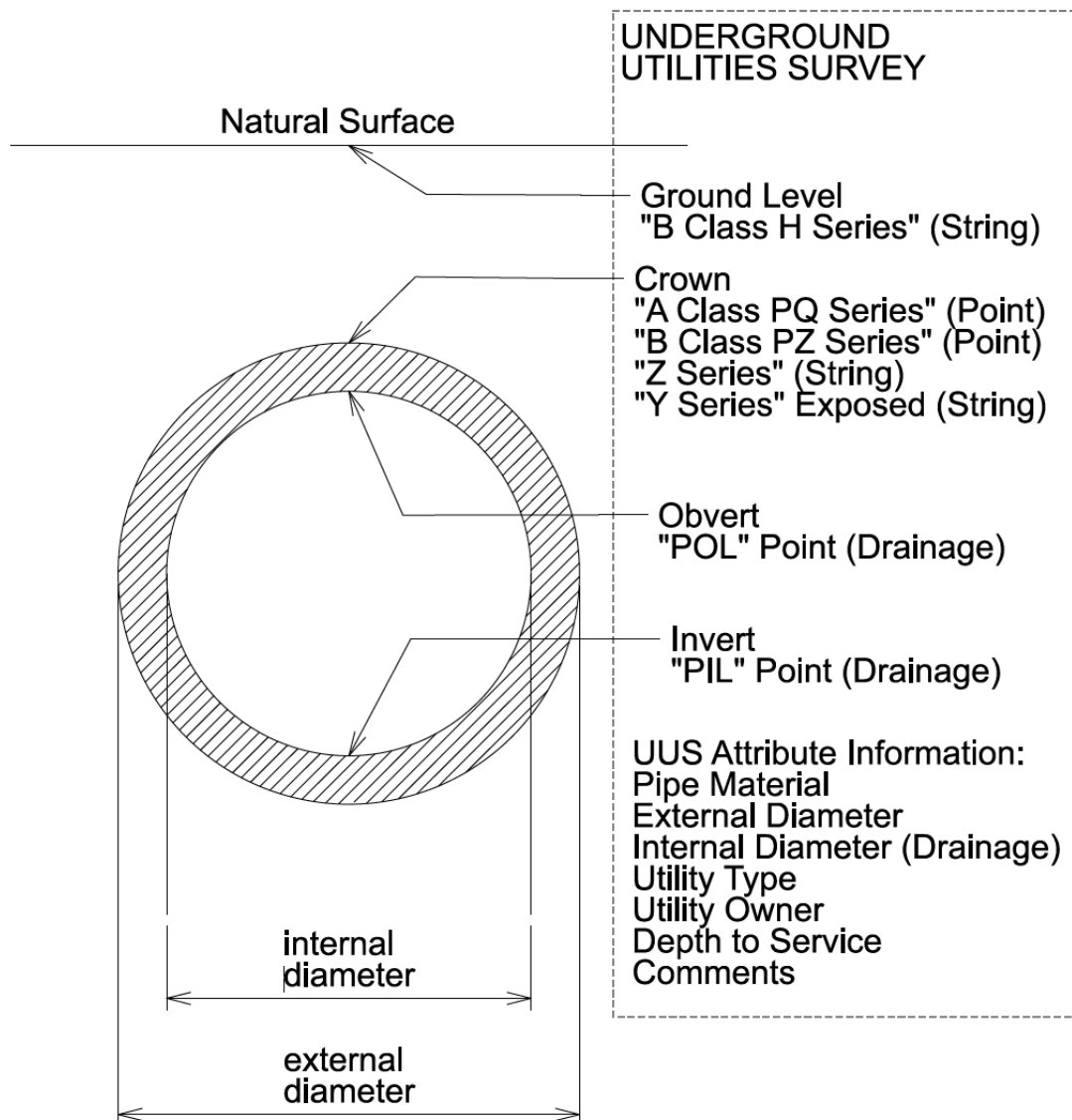
Quality Class-A is the highest accuracy order for an underground utilities survey. The contractor will be required to perform the following tasks to complete a quality Class-A underground utilities survey.

- Perform all tasks for a design quality Class-B utilities search (see CLASS-B (DESIGN QUALITY) 4.3) to search, identify and measure all utilities in critical areas that have an impact on the “scope of works”.
- Liaise with the Main Roads Survey Manager to identify required pothole locations.
- Expose / pothole the utility and measure directly to it using adequate survey methods.
- Survey methods must achieve accuracies of (+ or -) 50mm horizontally and (+ or -) 50mm vertically.
- Potholes performed in roads or pathways will require backfilling and re-instating to allow safe traffic movement after the works.
- The contractor must be licensed to expose the requested utilities or use a subcontractor who is. All necessary approvals must be in place to undertake the work.
- The contractor must ensure the integrity of the service and the safety of the workers and public are maintained at all times.
- Supply all utility information in digital format adopting Main Roads codes and file formats.
- Provide an underground utilities survey metadata statement.
- Provide an underground utility plot.
- Provide UUS search area extents file.

3.5 MEASURING SERVICE DEPTHS

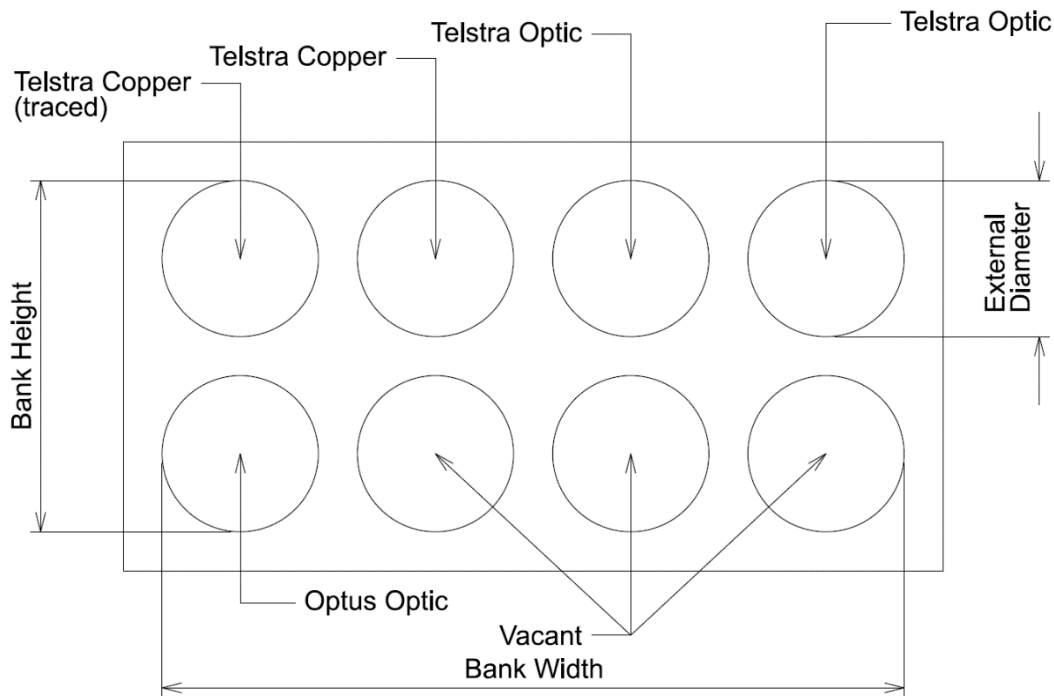
Existing services are surveyed primarily for clash detection; therefore, it is essential errors are not made in the clash modelling process. All pipes must be located to the Pipe Crown or to the highest central pipe in a bank of cables. It is important to keep this in mind when using multiple locating techniques and apply suitable offsets to ensure the best possible accuracy. For Utilities Surveys pipe diameters should be recorded as external diameter.

On occasion, pipe surveys may specifically request invert and an internal diameter for the purpose of drainage investigation, and manhole diagrams may also be requested in PDF format.



A bank of services that follow one alignment should be described on the Utility Plot and text added to the GenIO. A diagram showing the bank should be placed at start and end pits on the Utility Plot, which describes the layout (e.g., 4x2 P40), the utilities contained and which service was traced / located. Photos of the bank are also acceptable provided they clearly show the services

and are annotated.



3.6 COLLATING DATA

Although the Before You Dig Australia website is an excellent source of information, not all utility asset owners are members and therefore this is not a complete list of the assets in the area. Upon site inspection any indication of assets such as MRWA or local government street lighting, Public Transport Authority cables or unexpected service pits must be investigated further with the asset owner and a record of communication added to the utilities search metadata statement.

The Survey Manager will provide MRWA asset drawings for the required area of works upon request for quote.

All original utilities search data provided from the utility provider must be supplied to Main Roads in addition to the final utilities data that has been altered to comply with Main Roads coordinate system, string codes and file format.

All Asset Owner's plans and digital files in the original data format and coordinate system must be supplied to Main Roads.

3.7 VERIFYING SERVICES ON-SITE

A site visit is necessary to identify any assets not identified in preliminary data searches and if required, survey the assets to improve data accuracy.

3.8 PERSONNEL

All personnel who attend site must hold a Construction Safety Awareness Blue/White card.

All survey work must be undertaken by a survey professional with a relevant Bachelor Degree or Diploma of Surveying, adopting survey methods that meet the required accuracies outlined in the code lists (7 A).

The lead location technician must be a suitably trained professional with minimum 2 years' experience locating services in Western Australia and a competency in RIICCM202D – Identify, Locate and Protect Underground Services.

The following inductions are essential when working around the relevant services:

- ATCO GAS HP accreditation
- Western Power – network authority card and RIC accreditation
- Water Corp induction card
- Optic fibre location accreditation
- Telstra's plant location accreditation.

Location personnel must be prepared to identify the indicated depth to all services as measured by their equipment. Failure to meet this requirement will be considered a breach of contract; it is up to the surveyor to indicate the accuracy of these measurements with appropriate coding and in the metadata statement.

3.9 EQUIPMENT

All survey and location equipment used must be maintained to the manufacturer's recommendation with regular calibration to ensure data integrity. Locating methods must be reported in the metadata statement.

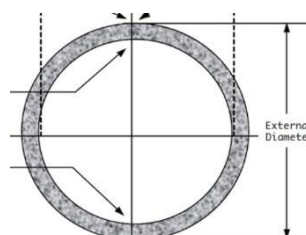
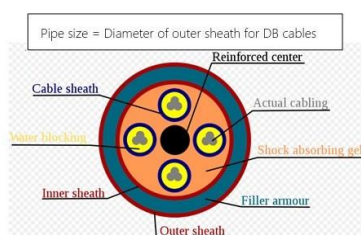
3.10 IDENTIFYING FEATURES

Services located are to be marked on-site with crayon, paint, pegs or PVC pipe markers with colours that match the site sketch and any files lodged in the final submission, refer to section 5.0 STANDARD COLOURS. Erroneous marks should be removed if possible or covered over. Ensure buildings and properties are not damaged by paint markings.

Class A Features

Each Potholed service should be described in the GenIO and Utility Plot by the following:

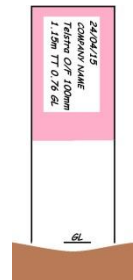
- Main Roads Survey Code
 - All coding must relate to appropriate Main Roads standard feature codes (PQ series) or be clarified in the metadata statement.
- Pipe Material Type
 - Pipe Type is used to identify the pipe construction material, i.e. PE, PVC, RCP, Steel, etc.
- Pipe Size
 - Size is used to identify the external pipe diameter for clash modeling and must be in millimetres



- Utility Status
 - Status is used to identify whether the service is live or abandoned.
 - Abandoned services should have text identify the service owner within the GenIO.
- Utility Type
 - Utility Type is used to identify additional information like high pressure or High Voltage, pressure or gravity
- Utility Owner
 - Utility owner is used to identify the asset owner - ATCO, Water Corp Western Power, etc.
- Depth to Service
 - Depth to service is the depth below ground level and must be in metres.
- Comments - additional notes or identifiers.
 - E.g. Bank of 12 (3x4) or top of protective slab approx. 0.3m above cable
 - E.g. Trace lost – Therefore Class D has been used.

Markers used to identify potholing locations should include the following information:

- Date
- Location company
- Service type / size
- Depth to service (mark at ground Level)



PVC markers should have ribbon or paint colour to match service type.

PVC markers that are not placed directly on the service (e.g. Gas) must contain clear notes or diagrams to show the gap between the bottom of the pipe and the service.

Class B Features

Each service should be described by the following.

- Main Roads Survey Code
 - All Coding must relate to the appropriate Main Roads standard feature codes or clarified in the metadata statement.

Class B (H series codes – surface strings) shall be surveyed at 15m – 20m intervals on linear runs and at all changes in direction for all services.

Indicative depths Class B (PZ series) shall be surveyed and recorded every time a “H series” code is surveyed. With the exception of drainage, where only start and end points are required.

All “PZ & PQ Series” codes will be strung together via “Z Series” string.

Z Series strings are **interpolated** lines between two points which have been located onsite either indirectly (Class B) or directly (Class A). At these points they hold the respective accuracies, however, Z series strings hold no accuracy and therefore, using this string for accurate depths is at the users own risk.

Services information shall be marked at start and finish of the service run with adequate detail to match the service with its Class A potholes.

In the case where no potholing is captured each service is to be identified at a pit with the descriptions of services found and verified by the BYDA information.

Class C/D Features

Descriptions are to be supplied from the BYDA information.

3.11 TRACING SERVICES

Services should always be traced to a logical end point or far enough past the extent of the Project area to ensure the service does not return inside the UUS search area. If a logical end point is not found on a service, this must be brought to the attention of the Survey Manager for further action. If a trace is lost *within* the survey boundary, then this service should be shown as Class C/D

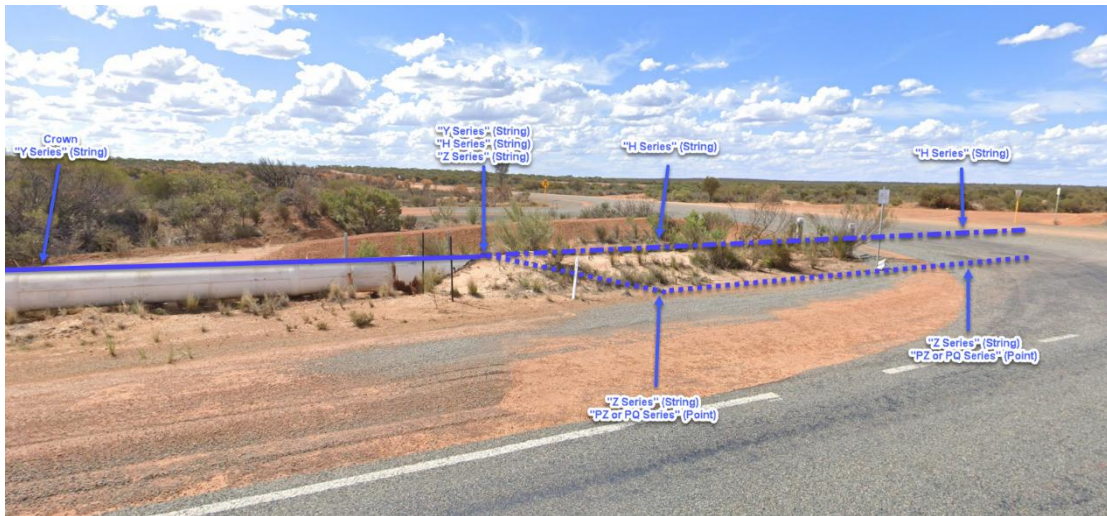
4 STANDARD COLOURS

The following colours are recommended for use in the field and on location plans and sketches. These colours are a guide only and it is encouraged to use shades of colours to help further separate attributes such as HP Gas or HV power. Any suitable colours can be used; however, it is most important that colours used are consistent throughout a site and must correlate between all supplied data, field plans and sketches.

- Cadastral boundaries – Grey
- Text – Preferably black with a white halo otherwise Black or White
- Utilities related to water supply – Blue
- Utilities related to storm water – Green
- Utilities related to oil and fuel - Yellow
- Utilities related to sewerage – Brown
- Utilities related to optic fibre – Pink or Purple
- Utilities related to copper communications – White
- Utilities related to electricity – Red
- Utilities related to gas – Yellow
- Utilities related to MRWA – Orange
- Reticulation – Dark Green
- Unknown services – Black
- Other features – can be any colour as long as it is clearly indicated in the legend of the plot.
- A Cyan boundary string must be used to clearly identify the UUS search area in which all services have been located.

5 EXPOSED AS-BUILD SERVICES

When the surveyor has direct access to a length of exposed pipe/service and can confidently obtain the linear capture of the service, the exposed pipe features are to be captured utilizing the “Y Series” codes.



6 LODGED INFORMATION

The following items must be lodged with the nominated Main Roads Survey Representative. The Survey Representative will then deliver all the information to the Main Roads, Asset and Geospatial Information Data Manager in accordance with the Data Lodgment guideline.

- i. The Underground Utilities Survey file. (GenIO format)
- ii. UUS Search Area Boundary file. (GenIO format)
- iii. Detail Ground Survey Features file. (GenIO format)
- iv. Original Utilities Search Data. (as received from provider)
- v. Service Locators Utilities Plot. (PDF)
- vi. Survey Report and Control listing. (Word Document)
- vii. Metadata Statement in accordance with the Survey Metadata Standard. (PDF)

6.1 FILE NAMING CONVENTION

All underground utilities survey data must be provided to Main Roads in GenIO format files.

Digital files shall be named in accordance with the following naming convention and consist of two files. These are the utilities data and the boundary of the UUS search area (ext.).

For example, if the Great Northern Highway had utilities collected within the road reserve corridor from 25 – 55 SLK then two data files would be supplied and labelled accordingly:

All data would be supplied within the data file named:

H006_25_55_XXXXXX_PCG94.ext

Where:

H6 is the Main Roads code for the Great Northern Highway

25 is the start SLK

55 is the end SLK and

XXXXXX is the annotation to denote survey Type, Quality Level and description

- i. **"UUSGEN"** Utilities Survey (.gen)
- ii. **"UUSEXT"** Search Boundary (.gen)
- iii. **"DGSGEN"** Detail Survey (.gen)
- iv. **"UUSRSP"** Utility Owners responses for Data requests (.zip)
- v. **"UUSPLT"** Service Locator Sketches (.pdf)
- vi. **"UUSREP"** Survey Report (.docx)
- vii. **"UUSMTD"** Metadata Statement (.pdf)

PCG94 is the Project grid used for the survey.

The project grid, road numbers and SLKs for each project will be supplied by the Survey Manager.

6.2 UNDERGROUND UTILITIES SURVEY FILE

All utilities are to be searched, converted and supplied as GenIO data files.

Scaling of hard copy utility provider plans may only be performed when no electronic version exists with the utility provider.

Each individual component of a service should only be represented once in the file.

Once the quality of a services location has been improved from a lower data quality standard to a higher standard, the old version must be removed to avoid confusion over the number of services in the ground.

Only Main Roads feature codes detailed at Appendix A can be used. Any relevant feature not represented in the code list must still be captured. A unique code is to be assigned. Point feature codes must start with 'P'. Non-standard feature codes are to be detailed in the metadata report. All additional approved codes must be clearly noted within the underground utilities survey metadata statement. Existing Main Roads codes must be used with text clearly denoting differences in details. Identified features used to show logical end points and other relevant utility markers must be coded according to the 67-08-43 Detail Ground Survey Standard.

All utilities must be 3D. Where original utilities are without levels these must be made 3D and given a null level of – 999.000.

6.3 TEXT

Text is to appear on all existing roads of interest, roads intersecting the road of interest and areas of importance (i.e. Lakes, Rivers etc.).

Text / annotation must be situated at an appropriate coordinate location accompanying the feature or characteristic being described. The orientation of the text / annotation should maximize legibility but minimize interference with other features.

The maximum length (including spaces) for any single element of text / annotation is 44 characters. If the description exceeds 44 characters, multiple text elements are required and must be positioned correctly to ensure legibility.

The height of the text is to be 1m in ground units.

6.4 UUS SEARCH AREA BOUNDARY FILE

The Boundary area file is required to show the areas where services have been identified. This area should not include areas that have not been adequately investigated or areas where services were not able to be traced. An outline of the UUS search area must be supplied in a single file and labelled as a two-dimensional "B" string. The string must form a closed polygon.

6.5 DETAIL GROUND SURVEY FEATURES FILE

Additional surveyed detail such as utility pits, taps, meters, markers etc. should be removed from the underground utilities survey model. This information should be supplied separately and in accordance with the Main Roads standard 67-08-43 Detail Ground Survey Standard.

6.6 ORIGINAL UTILITIES SEARCH DATA

All original utilities search data provided by the utility provider must be supplied to Main Roads along with contact details (contact name, date of contact, company). The earliest validity timeframe noted by service providers needs to be placed in the comments section of the UUS Metadata Statement.

6.7 SERVICE LOCATORS' UTILITIES PLOTS

The underground utilities plots must be provided and checked by the lead location technician who conducted the field search. These plots are to verify the information gathered by the survey team.

The following details apply:

- The plot shall be supplied in (pdf) file to standard A3 series page sizes.
- All service plots must be supplied at a scale that allows all services to be clearly identified.
- All utilities data is to overlay base data that will consist of aerial imagery and/or cadastral data. The base data shall be the latest information available at the time of the plan creation and can be supplied by Main Roads WA. Contractors must request the base data from Main Roads if it has not been provided.
- Every effort should be made to make the locator plots mirror the delivered digital data as close as possible. (Z* strings not required)
- Example plots are attached in APPENDIX B: PLOT LAYOUT EXAMPLES.
- Not required for Class-D or Class-C surveys.
- An example of the MRWA UUS Plot Template is available from the Survey and Mapping team if required. surveying@mainroads.wa.gov.au

6.8 LEGEND KEY

Each plan will include a legend key identifying the colours used and the services located. The colours used in the Legend must match the colours used in the plot and the field.

The legend and sketch should be used to identify features that are not clearly identified in the code list. Examples include high voltage and low voltage power, high pressure gas mains and medium pressure gas lines.

6.9 MAIN ROADS LOGO AND DISCLAIMER

The “Government of Western Australia” and “Main Roads Western Australia” logo must appear on all plots. The Government of Western Australia logo must appear before the Main Roads Western Australia logo as shown below.



The logos must be accompanied with the following disclaimer below it:

“Copyright and Intellectual property over the information displayed on this plan shall remain the property of Main Roads. The copying, exchange, sale or release of the information cannot be undertaken without prior notification and written agreement of Main Roads.”

6.10 NORTH POINT

A Clear North point is to be located on each plot. North points are never to face downwards.

6.11 COMPANY LOGOS

Company logos and acknowledgements may be discretely placed on the utilities plot within the title bar or on the title pages of a booklet. The placement of the logos is as per APPENDIX B: PLOT LAYOUT EXAMPLES. A company's logo, address, phone numbers etc. (combined) must not be larger than the Main Roads logo.

6.12 SURVEY REPORT & CONTROL LISTING

The survey report template is available to assist with reporting on any additional details or issues identified during the survey contract. The template is designed for a variety of circumstances to cover a range of issues. This template should be modified to suit the requirements of each specific contract.

Issues such as services that were unable to be traced must be reported with any explanations and recommendations for each item.

The local control network used and checked shall be reported in the summary table along with any issues highlighted.

Survey Control checks for Contract 2018UUS0123 Mitchell Fwy SB Widening Hepburn to Warwick

Point ID	Easting	Published		Check from	Surveyed			Notes
		Northing	Elevation		Δ East	Δ North	Δ Elev	
UMET-123	46001.123	243701.456	8.789	UMET-126	0.005	0.003	0.002	Check to RM's mark appears stable
UMET-124	46002.123	243702.456	9.789	UMET-126	0.003	0.099	-0.001	

6.13 UNDERGROUND UTILITIES SURVEY METADATA STATEMENT

Any survey supplied to Main Roads must have a metadata statement attached. The report template is supplied through the Asset & Geospatial Data Manager.

All sections of the statement should be filled out correctly and additional information can be attached if required.

An example of the statement is attached at APPENDIX C: METADATA STATEMENT – UNDERGROUND UTILITIES. A blank metadata form and report template can be downloaded from the Main Roads website.

6.14 OWNERSHIP OF DATA

All materials and information as part of undertaking projects for Main Roads WA shall become the property of Main Roads WA. It shall not be used, copied or reproduced for any other purpose without the prior written approval by Main Roads WA.

APPENDICES

Appendix	Title
Appendix A	Utility Feature Codes
Appendix B	Plot Layout Examples
Appendix C	Metadata Statement – Underground Utilities

7 APPENDIX A: UTILITY FEATURE CODES

7.1 CLASS-A CODES

The surveyed point measured at top of cable, pipe, or protective case.

Feature Type	Accuracy (m)		Code	DGN Level
	Horizontal	Vertical		
U/G AMCOM / VOCUS CABLE	0.05	0.05	PQA	E-UUA0-AMCOM VOCUS CABLE
U/G DRAINAGE PIPE - STORMWATER	0.05	0.05	PQC	E-UUA0-DRAINAGE PIPE - STORMWATER
U/G ELECTRIC CABLE	0.05	0.05	PQE	E-UUA0-ELECTRIC CABLE
U/G WESTERN POWER COMMS	0.05	0.05	PQF	E-UUA0-WESTERN POWER COMMS
U/G GAS LINE	0.05	0.05	PQG	E-UUA0-GAS LINE
U/G MRWA COMMS	0.05	0.05	PQH	E-UUA0-MRWA COMMS
U/G MRWA POWER	0.05	0.05	PQI	E-UUA0-MRWA POWER
U/G NBN COMMS	0.05	0.05	PQJ	E-UUA0-NBN FIBRE
U/G OTHER COMMS	0.05	0.05	PQK	E-UUA0-OTHER COMMS
U/G FUEL / OIL	0.05	0.05	PQL	E-UUA0-FUEL OIL
U/G NEXT GEN COMMS	0.05	0.05	PQN	E-UUA0-NEXT GEN COMMS
U/G OPTUS FIBRE OPTIC	0.05	0.05	PQO	E-UUA0-OPTUS FIBRE OPTIC
U/G OPTUS COPPER	0.05	0.05	PQP	E-UUA0-OPTUS COPPER
U/G RAIL SERVICES	0.05	0.05	PQR	E-UUA0-RAIL SERVICES
U/G SEWER PIPE	0.05	0.05	PQS	E-UUA0-SEWER PIPE
U/G TELSTRA COPPER	0.05	0.05	PQT	E-UUA0-TELSTRA COPPER
UNKNOWN U/G SERVICE	0.05	0.05	PQU	E-UUA0-UNKNOWN
U/G TELSTRA OPTIC	0.05	0.05	PQV	E-UUA0-TELSTRA OPTIC
U/G WATER PIPE	0.05	0.05	PQW	E-UUA0-WATER PIPE
U/G RETICULATION	0.05	0.05	PQX	E-UUA0-RETICULATION
U/G ABANDONED NOT IN USE SERVICE	0.05	0.05	PQZ	E-UUA0-ABANDONED SERVICE

7.2 CLASS-B CODES

The surveyed point measured at ground level directly above traced service.

Feature Type	Accuracy (m)		Code	DGN Level
	Horizontal	Vertical		
U/G AMCOM / VOCUS CABLE	0.3	0.05	HA	E-UUBE-AMCOM VOCUS CABLE
U/G DRAINAGE PIPE - STORMWATER	0.3	0.05	HC	E-UUBE-DRAINAGE PIPE - STORMWATER
U/G ELECTRIC CABLE	0.3	0.05	HE	E-UUBE-ELECTRIC CABLE
U/G WESTERN POWER COMMS	0.3	0.05	HF	E-UUBE-WESTERN POWER COMMS
U/G GAS LINE	0.3	0.05	HG	E-UUBE-GAS LINE
U/G MRWA COMMS	0.3	0.05	HH	E-UUBE-MRWA COMMS
U/G MRWA POWER	0.3	0.05	HI	E-UUBE-MRWA POWER
U/G NBN COMMS	0.3	0.05	HJ	E-UUBE-NBN FIBRE
U/G OTHER COMMS	0.3	0.05	HK	E-UUBE-OTHER COMMS
U/G FUEL / OIL	0.3	0.05	HL	E-UUBE-FUEL OIL
U/G NEXT GEN COMMS	0.3	0.05	HN	E-UUBE-NEXT GEN COMMS
U/G OPTUS FIBRE OPTIC	0.3	0.05	HO	E-UUBE-OPTUS FIBRE OPTIC
U/G OPTUS COPPER	0.3	0.05	HP	E-UUBE-OPTUS COPPER
U/G RAIL SERVICES	0.3	0.05	HR	E-UUBE-RAIL SERVICES
U/G SEWER PIPE	0.3	0.05	HS	E-UUBE-SEWER PIPE
U/G TELSTRA COPPER	0.3	0.05	HT	E-UUBE-TELSTRA COPPER
UNKNOWN U/G SERVICE	0.3	0.05	HU	E-UUBE-UNKNOWN
U/G TELSTRA OPTIC	0.3	0.05	HV	E-UUBE-TELSTRA OPTIC
U/G WATER PIPE	0.3	0.05	HW	E-UUBE-WATER PIPE
U/G RETICULATION	0.3	0.05	HX	E-UUBE-RETICULATION
U/G ABANDONED NOT IN USE SERVICE	0.3	0.05	HZ	E-UUBE-ABANDONED

7.3 CLASS-B CODES FOR INDIRECT MEASUREMENT

Surveyed point measured using tracing equipment to indicate approximate depth only.

Feature Type	Accuracy (m)		Code	DGN Level
	Horizontal	Vertical		
I/M AMCOM / VOCUS CABLE	0.3	0.5	PZA	E-UUB0-AMCOM VOCUS CABLE
I/M DRAINAGE PIPE - STORMWATER	0.3	0.5	PZC	E-UUB0-DRAINAGE PIPE - STORMWATER
I/M ELECTRIC CABLE	0.3	0.5	PZE	E-UUB0-ELECTRIC CABLE
I/M WESTERN POWER COMMS	0.3	0.5	PZF	E-UUB0-WESTERN POWER COMMS
I/M GAS LINE	0.3	0.5	PZG	E-UUB0-GAS LINE
I/M MRWA COMMS	0.3	0.5	PZH	E-UUB0-MRWA COMMS
I/M MRWA POWER	0.3	0.5	PZI	E-UUB0-MRWA POWER
I/M NBN COMMS	0.3	0.5	PZJ	E-UUB0-NBN COMMS
I/M OTHER COMMS	0.3	0.5	PZK	E-UUB0-OTHER COMMS
I/M FUEL / OIL	0.3	0.5	PZL	E-UUB0-FUEL OIL
I/M NEXT GEN COMMS	0.3	0.5	PZN	E-UUB0-NEXT GEN COMMS
I/M OPTUS FIBRE OPTIC	0.3	0.5	PZO	E-UUB0-OPTUS FIBRE OPTIC
I/M OPTUS COPPER	0.3	0.5	PZP	E-UUB0-OPTUS COPPER
I/M RAIL SERVICES	0.3	0.5	PZR	E-UUB0-RAIL SERVICES
I/M SEWER PIPE	0.3	0.5	PZS	E-UUB0-SEWER PIPE
I/M TELSTRA COPPER	0.3	0.5	PZT	E-UUB0-TELSTRA COPPER
I/M UNKNOWN U/G SERVICE	0.3	0.5	PZU	E-UUB0-UNKNOWN
I/M TELSTRA OPTIC	0.3	0.5	PZV	E-UUB0-TELSTRA OPTIC
I/M WATER PIPE	0.3	0.5	PZW	E-UUB0-WATER PIPE
I/M RETICULATION	0.3	0.5	PZX	E-UUB0-RETICULATION
I/M ABANDONED NOT IN USE SERVICE	0.3	0.5	PZZ	E-UUB0-ABANDONED

7.4 CLASS-C & CLASS-D CODES

Features extracted from Utility owners' data or using the connection of logical features such as lighting, pits taps and valves.

Feature Type	Accuracy (m)		Code	DGN Level
	Horizontal	Vertical		
U/G AMCOM / VOCUS CABLE	-999	-999	QA	E-UUDE-AMCOM-VOCUS CABLE
U/G DRAINAGE PIPE - STORMWATER	-999	-999	QC	E-UUDE-DRAINAGE PIPE - STORMWATER
U/G ELECTRIC CABLE	-999	-999	QE	E-UUDE-ELECTRIC CABLE
U/G WESTERN POWER COMMS	-999	-999	QF	E-UUDE-WESTERN POWER COMMS
U/G GAS LINE	-999	-999	QG	E-UUDE-GAS LINE
U/G MRWA COMMS	-999	-999	QH	E-UUDE-MRWA COMMS
U/G MRWA POWER	-999	-999	QI	E-UUDE-MRWA POWER
U/G NBN COMMS	-999	-999	QJ	E-UUDE-NBN FIBRE
U/G OTHER COMMS	-999	-999	QK	E-UUDE-OTHER COMMS
U/G FUEL / OIL	-999	-999	QL	E-UUDE-FUEL OIL
U/G NEXT GEN COMMS	-999	-999	QN	E-UUDE-NEXT GEN COMMS
U/G OPTUS FIBRE OPTIC	-999	-999	QO	E-UUDE-OPTUS FIBRE OPTIC
U/G OPTUS COPPER	-999	-999	QP	E-UUDE-OPTUS COPPER
U/G RAIL SERVICES	-999	-999	QR	E-UUDE-RAIL SERVICES
U/G SEWER PIPE	-999	-999	QS	E-UUDE-SEWER PIPE
U/G TELSTRA COPPER	-999	-999	QT	E-UUDE-TELSTRA COPPER
UNKNOWN U/G SERVICE	-999	-999	QU	E-UUDE-UNKNOWN SERVICE
U/G TELSTRA OPTIC	-999	-999	QV	E-UUDE-TELSTRA OPTIC
U/G WATER PIPE	-999	-999	QW	E-UUDE-WATER PIPE
U/G RETICULATION	-999	-999	QX	E-UUDE-RETICULATION
U/G ABANDONED NOT IN USE SERVICE	-999	-999	QZ	E-UUDE-ABANDONED NOT IN USE SERVICE

7.5 CLASS-Y CODES

Surveyed points of above ground services

Feature Type	Accuracy (m)		Code	DGN Level
	Horizontal	Vertical		
U/G AMCOM / VOCUS CABLE	0.05	0.05	YA	E-UUAE-AMCOM-VOCUS CABLE
U/G DRAINAGE PIPE - STORMWATER	0.05	0.05	YC	E-UUAE-DRAINAGE PIPE - STORMWATER
U/G ELECTRIC CABLE	0.05	0.05	YE	E-UUAE-ELECTRIC CABLE
U/G WESTERN POWER COMMS	0.05	0.05	YF	E-UUAE-WESTERN POWER COMMS
U/G GAS LINE	0.05	0.05	YG	E-UUAE-GAS LINE
U/G MRWA COMMS	0.05	0.05	YH	E-UUAE-MRWA COMMS
U/G MRWA POWER	0.05	0.05	YI	E-UUAE-MRWA POWER
U/G NBN COMMS	0.05	0.05	YJ	E-UUAE-NBN FIBRE
U/G OTHER COMMS	0.05	0.05	YK	E-UUAE-OTHER COMMS
U/G FUEL / OIL	0.05	0.05	YL	E-UUAE-FUEL OIL
U/G NEXT GEN COMMS	0.05	0.05	YN	E-UUAE-NEXT GEN COMMS
U/G OPTUS FIBRE OPTIC	0.05	0.05	YO	E-UUAE-OPTUS FIBRE OPTIC
U/G OPTUS COPPER	0.05	0.05	YP	E-UUAE-OPTUS COPPER
U/G RAIL SERVICES	0.05	0.05	YR	E-UUAE-RAIL SERVICES
U/G SEWER PIPE	0.05	0.05	YS	E-UUAE-SEWER PIPE
U/G TELSTRA COPPER	0.05	0.05	YT	E-UUAE-TELSTRA COPPER
UNKNOWN U/G SERVICE	0.05	0.05	YU	E-UUAE-UNKNOWN SERVICE
U/G TELSTRA OPTIC	0.05	0.05	YV	E-UUAE-TELSTRA OPTIC
U/G WATER PIPE	0.05	0.05	YW	E-UUAE-WATER PIPE
U/G RETICULATION	0.05	0.05	YX	E-UUAE-RETICULATION
U/G ABANDONED NOT IN USE SERVICE	0.05	0.05	Y Z	E-UUAE-ABANDONED NOT IN USE SERVICE

7.6 CLASS-Z CODES

The joined surveyed points (Class A or B) of a traced service.

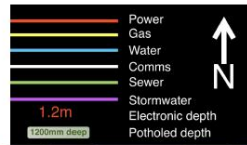
Feature Type	Code	DGN Level
U/G AMCOM / VOCUS CABLE	ZA	E-UUZE-AMCOM-VOCUS CABLE
U/G DRAINAGE PIPE - STORMWATER	ZC	E-UUZE-DRAINAGE PIPE - STORMWATER
U/G ELECTRIC CABLE	ZE	E-UUZE-ELECTRIC CABLE
U/G WESTERN POWER COMMS	ZF	E-UUZE-WESTERN POWER COMMS
U/G GAS LINE	ZG	E-UUZE-GAS LINE
U/G MRWA COMMS	ZH	E-UUZE-MRWA COMMS
U/G MRWA POWER	ZI	E-UUZE-MRWA POWER
U/G NBN COMMS	ZJ	E-UUZE-NBN FIBRE
U/G OTHER COMMS	ZK	E-UUZE-OTHER COMMS
U/G FUEL / OIL	ZL	E-UUZE-FUEL OIL
U/G NEXT GEN COMMS	ZN	E-UUZE-NEXT GEN COMMS
U/G OPTUS FIBRE OPTIC	ZO	E-UUZE-OPTUS FIBRE OPTIC
U/G OPTUS COPPER	ZP	E-UUZE-OPTUS COPPER
U/G RAIL SERVICES	ZR	E-UUZE-RAIL SERVICES
U/G SEWER PIPE	ZS	E-UUZE-SEWER PIPE
U/G TELSTRA COPPER	ZT	E-UUZE-TELSTRA COPPER
UNKNOWN U/G SERVICE	ZU	E-UUZE-UNKNOWN SERVICE
U/G TELSTRA OPTIC	ZV	E-UUZE-TELSTRA OPTIC
U/G WATER PIPE	ZW	E-UUZE-WATER PIPE
U/G RETICULATION	ZX	E-UUZE-RETICULATION
U/G ABANDONED NOT IN USE SERVICE	ZZ	E-UUZE-ABANDONED NOT IN USE SERVICE

8 APPENDIX B: PLOT LAYOUT EXAMPLES

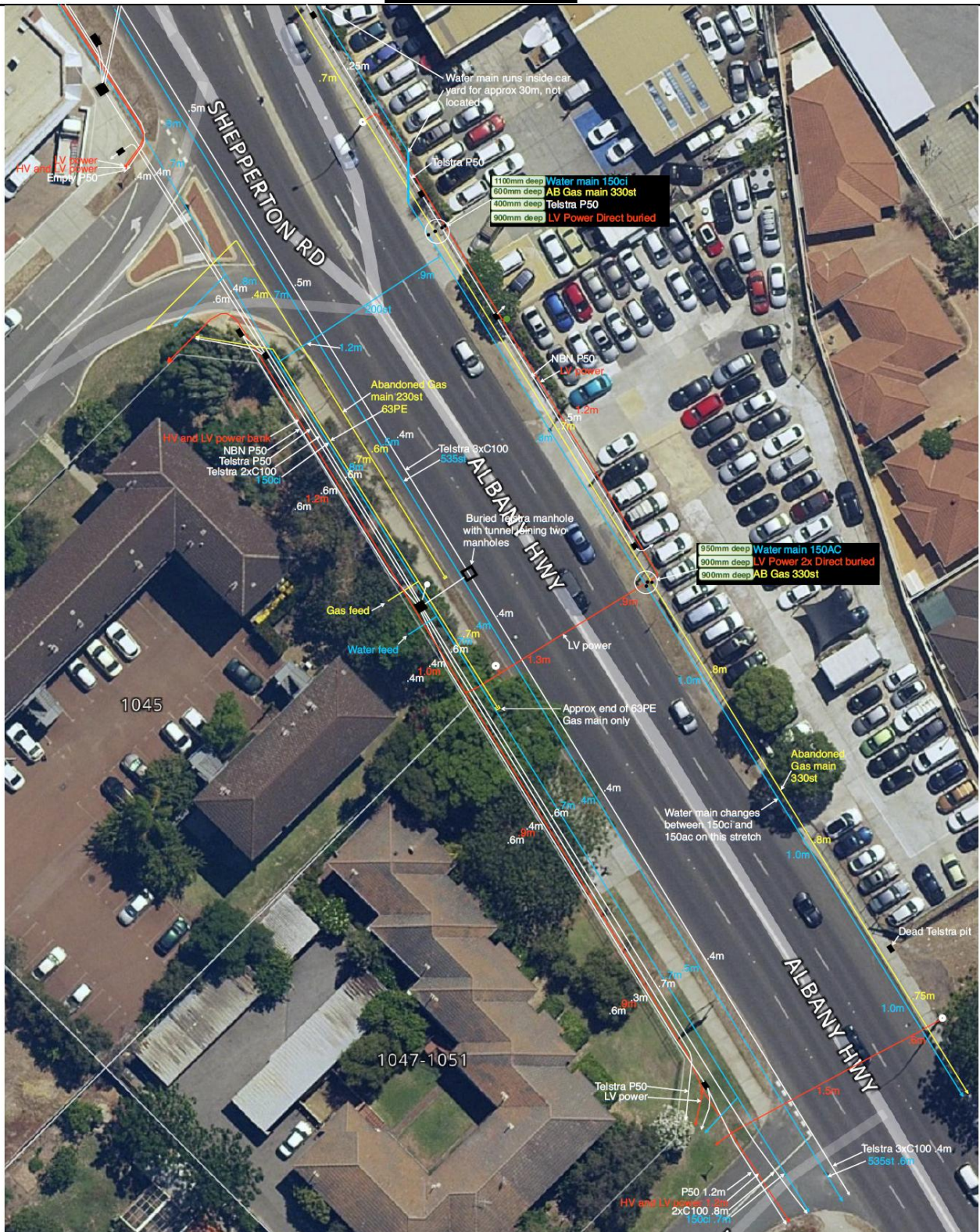


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CLIENT: _____
SITE ADDRESS: _____
DATE: _____
SERVICE STATEMENT #: _____
PLAN#: _____



Location Tech: _____
DBYD Number: _____



9 APPENDIX C: METADATA STATEMENT – UNDERGROUND UTILITIES



Metadata Statement - Underground Utilities

Asset and Geospatial Information Branch

KEY DETAILS

Survey Title Class A/B Survey of Main Street

Panel Contract Job # 2022UUS001

Consultant Ref # SW3354

GEOGRAPHIC DETAILS

Road Name / #	H001 - Main Street	Start SLK	1	SLK End	2.5
Projection	PCG94	Horizontal Datum	GDA 94		
Geoid	Ausgeoid 94	Vertical Datum	AHD71		

Service Data Collection Method (check all that apply)

- ☐ DBYD Conversion ☒ EMF
☒ Potholing ☒ GPR

Data Class (check all that apply)

- ☒ Construction (A)
☒ Design (B)
☐ Planning (C)
☐ Data (D)

Survey Data Collection Method (check all that apply)

- ☐ Total Station ☒ RTK - GPS
 Other _____

STANDARDS USED (check all that apply)

- ☒ Underground Utilities Survey
 Other _____

List of Attached Files (check all that apply)

- ☒ UUS Data - GENIO
☒ Boundary File - GENIO (supplied)
☒ DBYD : Utilites Search data - zip file
☒ Service Locators Utilities plot - pdf
☒ Survey Report - word .doc

SURVEY CONTROL USED

RTK Base at H001-025
Checks as per survey report

NON STANDARD CODES USED

DATA COLLECTED

Start Date 01/01/2022

End Date 15/02/2022

Survey Consultant Details

Organisation Survey West

Position Survey Manager

Telephone 03 9447 6985

Contact Name Max Power

E-mail max.power@surveywest.com.au

Mobile 0432 958 655

Sub-Surface Consultant Details

Organisation Subsurface WA

Position Lead Locator

Telephone 03 9123 5874

Contact Name Mike Underground

E-mail MUnderground@subWA.com.au

Mobile 032 958 887

OTHER NOTES / COMMENTS

Class D (DBYD) Validity Date - Searched xx/xx/xxxx Expires xx/xx/xxxx