



Ergon Energy Corporation Limited

Specification for Engineering Survey Works

Sub Transmission Standards

This Material is made available on the basis that it may be necessary for a Registered Surveyor with an appropriate endorsement to undertake the survey requirements to meet statutory obligations.

All Surveys shall be conducted according to the requirements defined in the Department of Natural Resources and Mines Survey Requirements. It is the Surveyors responsibility to ensure they hold any registration required by the Surveyors Act in order to undertake the work. In addition, they shall be conducted according to the accepted current practices of the Registering Authority. The type of engineering survey to be effected will be nominated by the Principal.

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1. Purpose and Scope

- 1.1** This Specification is compiled for the guidance and direction of surveyors concerned with the control and execution of surveys for Sub Transmission and Transmission Lines. Its purpose is to ensure uniformity in the conduct of line surveys; to describe and define the information that must be obtained; and to establish uniform standards for the recording and presentation of survey information.
- 1.2** The Specification is principally directed towards the conduct of the Engineering Survey of the Sub Transmission and Transmission Lines. When easement surveys are affected, they shall be conducted according to the requirements defined in the Ergon Energy Specification for Easement Survey Works and the Department of Natural Resources and Mines Survey Requirements. In addition, they shall be conducted according to the accepted current practices of the Registering Authority. The type of easement survey to be effected will be nominated by the Principal.
- 1.3** All information shall be supplied in the following format:-

Datum - Geocentric Datum of Australia (GDA94) in the applicable Zone
Projection - Map Grid of Australia 1994 (MGA94) Universal Trans Mercator using the Geodetic Reference System 1980 Ellipsoid (GRS80)
Elevation – Australian Height Datum (AHD) values based on AUSGeoid98
Feature Codes - Ergon Energy Pty Ltd supplied feature codes
CAD Drawing Layers – All points to be layered to their feature code

2. References

2.1 Ergon Energy controlled documents

[RSC04](#) – Clearing and Access Works

2.2 Other sources

2.2.1 Surveyors Act 2003

2.2.2 Survey and Mapping Infrastructure Act 2003.

2.2.3 Department of Natural Resources and Mines Survey Requirements

2.2.4 Survey and Mapping Regulations and Standards

3. Definitions, Acronyms, and Abbreviations

3.1 Definitions

- 3.1.1 Sub Transmission:** Voltages of 33 000 volts up to, and including, 110 000 volts.
- 3.1.2 Transmission:** Voltages of 132 000 volts and above.
- 3.1.3 Conductor:** Wires used on powerlines.
- 3.1.4 Principal:** For the purposes of this specification the Principal shall be Ergon Energy Pty Ltd unless stated otherwise.
- 3.1.5 Tee-Off:** A location where the conductors may head off in a different direction whilst the main line continues on its current path. The conductors will be joined to the main line at this point.
- 3.1.6 Undercrossing:** A location where conductors may come from a different direction or source and are not joined to the current line.
- 3.1.7 Span:** Conductor distance between two adjoining poles.
- 3.1.8 Stay Wires:** Wires used as guys to help hold the conductor and wind loads. These wires will typically radiate from the pole to ground or from the pole to a bollard pole.
- 3.1.9 Feature Code:** Alpha or Numeric codes used to identify and record the type of point surveyed.
- 3.1.10 Geo-referenced:** Aligned to its real world location.
- 3.1.11 LIDAR:** Light Detection and Ranging. For the purposes of this Specification it will be the aerial survey method which uses lasers mounted on aircraft to record information over the line route at a nominated swath width.

3.2 Acronyms and Abbreviations

The following Acronyms appear in this Specification.

- POA** Point of attachment. e.g. The point where a conductor attaches to an insulator.
- OHEW** Overhead Earthwire. For the purposes of this specification, this shall also include Optical Ground Wires (OPGW).
- PLS-CADD™** Power Line Systems – Computer Aided Design and Drafting. Overhead line design Software used by the Ergon Transmission Design section.
- CAD** Computer Aided Drafting. Software packages used for general drafting work.
- AHD** Australian Height Datum

4. Security

Nil

5. Safety, Environmental and Cultural Heritage Considerations

5.1 Safety

Refer to the Project Safety Plan provided by the Project Manager.

5.2 Environmental and Cultural Heritage

Refer to the Principal's Project Management Plan supplied by the Project Manager.

The Principal requires all work to be undertaken in an environmentally sound manner. The Consultant is responsible for ensuring that the Principal's requirements for environmental protection are implemented and the following brief outline of the environmental protection requirements for this contract is provided for the guidance of Consultants.

All vehicles, machinery and equipment to be used on the job must be certified "clean" of all declared plants and noxious weeds by the Consultant.

Should any declared plants or noxious weeds be encountered during the survey, the Consultant shall notify the Principal within 24 hours. Only necessary machinery, vehicles and equipment shall proceed through the infested area.

In areas of weed infestation, all vehicles shall be washed down as they leave the infested area and/or at property boundaries as advised. Vehicles not required to enter the weed areas shall remain on designated 'clean' areas or routes. Access routes, clean areas and infested areas shall be clearly identified by the Consultant and restrictions on moving between clean and infested areas shall be strictly observed.

The Consultant shall ensure that all works are planned and executed with appropriate safeguards to:

- minimise vegetation disturbance;
- minimise earthworks activities which could result in hazards for animals (e.g. pit traps);
- prevent the introduction of exotic species and diseases;
- minimise noise, dust, erosion, sedimentation, water pollution and traffic hazards;
- minimise the disturbance of natural watercourses;
- protect Aboriginal sites and artefacts in accordance with the relevant legislation, and measures to protect other heritage sites;
- minimise the effects of accommodating and servicing the Consultant's workforce; and
- address the need for access and security arrangements and buffer zones to protect the public and the facilities.

The Consultant shall also ensure that all activities are compatible with the principles of sound environmental protection practice.

The Consultant shall comply with all the environmental requirements described above and shall make allowance for this in their tender. The total tender price will be deemed to include allowance for complying with the Principal's environmental protection requirements.

Should the Consultant become aware of any aboriginal cultural heritage objects or areas on the route of the power line, they should not disturb the objects or areas but report them to the Project Manager as soon as possible. In this regard the requirements of the "Aboriginal Cultural Heritage Act 2004" shall be strictly observed.

6. General

6.1 Survey of Transmission Line Routes consists of three principal segments:

(a) Setting out a centre line and providing field information from which a longitudinal section can be derived and structure positions determined. The survey shall use the Ergon Feature Table (refer Appendix B) unless prior approval has been granted by Ergon. The survey must include, as a minimum, the following details where assets are existing or a new centreline is being proposed, using the Ergon feature codes:

(i) For new line routes:

- Natural Surface levels
- The position of changes of grade
- Locations of cultivated areas
- Location of property boundaries
- Unsuitable pole locations
- The position, diameter and height of all significant trees which have been needed to be accommodated in the line design because of Environmental, Cultural Heritage or other reasons.
- Top of bank and Toe of bank for rivers, creeks, gullies etc.
- Edges and centrelines of Highways, roads, tracks etc.
- Location, and height where applicable, of any crossings or nearby features such as roads, railways, Telstra, signs, streetlights, power lines, fences etc
- The location of any poles to which a crossing conductor connects and the POA of the conductors at each pole (i.e. poles either side of crossing)
- The voltage of the undercrossing and a photo clearly showing the conductors attaching to the poles either side of the proposed new centreline. (Refer Figure A2 in Appendix A)
- 3 measurements per span for each voltage (conductor) on any crossing
- Date, Time, Wind Speed and ambient temperature of conductor shots

(ii) For existing line routes, in addition to the above requirements:

- Over Head Earth Wire (OHEW) point of attachment (POA)
- 33kV, 66kV, 110kV or 132kV conductors POA
- LV, 11kV, 33kV or any other underbuilt conductors POA
- POA of any tee-off conductors
- The location of poles to which the tee-off connects and the POA of the conductors at this pole

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- The location of any poles to which an undercrossing conductor connects and the POA of the conductors at each pole (i.e. poles either side of undercrossing)
 - The voltage of the undercrossing and a photo clearly showing the conductors attaching to the poles either side of the proposed new centreline. (Refer Figure A2 in Appendix A)
 - The position, diameter and height of all significant trees which have been needed to be accommodated in the line design because of Environmental, Cultural Heritage or other reasons.
 - 3 measurements per span for each voltage (conductor) including Tee-offs and undercrossings
 - Date, Time, Wind Speed and ambient temperature of conductor shots
 - Attachment height and ground location of stay wires
 - Location, and height where applicable, of any crossings or nearby features such as roads, railways, Telstra, signs, streetlights, power lines, fences etc.
- (b)** High quality photography, including geo-referencing data, of all structures, spans, obstacles and other relevant information.
- (c)** Effecting easement surveys when required. The measurements derived from either (a) or (b) or both may be utilised in effecting easement surveys as defined in the Survey and Mapping Infrastructure Act 2003 and associated Regulations and Standards.
- 6.2** The Principal uses PLS-CADD™ computer software to generate the design and structure location.
- 6.3** The reliability and economics of the design depend on the information supplied by the surveyor. To this end it is essential to record survey information in the manner specified.
- 6.4** This Specification is based on the use of Total Station; Semi Total Station, or GPS survey equipment, and may include aerial photogrammetric or remote sensing surveys where the output is horizontal and vertical positions with codes to describe different features. The output required is in the format specified in Section 11 and Appendix A.
- 6.5** In this Specification the use of word or expression "Structure" implies any support structure.
- 6.6** The Project Manager referred to throughout this Specification is the officer nominated by the Principal.
- 6.7** A Consulting Surveyor engaged to carry out any survey on behalf of the Principal shall not subcontract the instruction or any part thereof to another Consulting Surveyor or Firm without written approval from the Principal.

7. Location and Setting Out

- 7.1** The location of the proposed survey route is defined on the supplied approved route plan.

7.2 Attention is drawn to the importance of the dimensions shown on the route plans.

7.3 Details of preliminary survey work executed shall be recorded and supplied.

8. Longitudinal Section

The longitudinal section is based on a terrain model of 40m width (20m either side of the centre line).

8.1 The position of all changes of grade, significant detail, or points as required, are captured for development of the terrain model. However, as a general rule, no two consecutive centre line distance measurements should be taken more than 50 metres apart.

8.2 For the purpose of defining the centre line marks should be placed on the centre line such that they are intervisible, and at a distance no greater than 250m apart.

9. Order of Accuracy

The required order of accuracy in relation to this survey are as follows:

9.1 Horizontal Distance

Order of accuracy is related to three forms of survey.

9.1.1 Engineering Survey Only

Minimum horizontal accuracy – 1 in 500

Distance to pegs and survey stations should be recorded to the nearest 0.01 metres.

9.1.2 Easement Survey Associated with Engineering Survey

The distances obtained on the engineering survey of the centre line may be used in effecting easement surveys of various types. The order of accuracy of the engineering survey measurements should therefore be appropriate to the easement survey requirements defined in the Survey and Mapping Infrastructure Act 2003 and Surveyors Act 2003 and associated Regulations and Standards. Should this requirement not apply, separate instructions will be issued.

9.1.3 Intermediate Shots

Intermediate shots should be recorded to the nearest 0.1 metres. However, it is often convenient to have more accurate measurements to intersections of boundaries and other marks for comparison with real property surveys or for other purposes.

9.2 Elevation

The following clauses relate the order of accuracy required in elevation to:

- (a) Route distance.
- (b) Quality of information available for comparison of level values.

The Project Manager may require, or make arrangements for, a re-survey in sufficient detail to check the correctness of a model in terms of Paragraph 11.5, even though the vertical accuracy stated in paragraph 9.2.1 is achieved.

9.2.1 Vertical Accuracy

The minimum vertical accuracy for centre line distances in excess of one (1) kilometre, when compared with level values of independent control points, should be:

0.2 metres multiplied by the square root of the distance in kilometres.

9.3 Horizontal Angle at Intersections

The angle should be reduced to a deflection left or right, in the direction of the survey and be recorded to at least 20 seconds of arc.

9.4 Engineering/Detail Survey Requirements: Where Requested (Substation Sites)

Refer Substation Design Manual Section 8.5.

10. Field Book

- 10.1** For diagrammatic detail and additional information not recorded in the data recorder, a field book must be kept.
- 10.2** A diagrammatic representation of detail is required with a unique identifier for shots recorded with coded entries which are unable to display the detail.
- 10.3** Property boundaries and descriptions should be recorded wherever possible to assist spatial identification.
- 10.4** The original field book is to be forwarded to the Principal with the survey data to which it corresponds and thereafter will not be removed from the office.

11. Detail

The location and measurement of relevant detail information is essential to the design of the transmission line. Items listed in paragraph 6.1 shall be obtained as a minimum. Some of these features are described in more detail below. All points taken must contain x, y and z locations. For any fixed assets the Asset ID (pole number) must also be recorded.

11.1 Pole and span details required on existing infrastructure

- 11.1.1 Over-head earthwire POA:** The survey shall include the height of the earthwire conductor as well as the height of the earthwire attachment.
- 11.1.2 Conductor POA:** The survey shall include the height of the conductor as well as the height of eyebolts, crossarm kingbolts, conductor hangers or other attachment points.
- 11.1.3 Underbuild Conductor POA:** The survey shall include the height of the conductor as well as the height of eyebolts, crossarm kingbolts, conductor hangers or other attachment points.
- 11.1.4 Tee-off feeder POA:** Tee-off's shall be detailed in the survey with the POA of all tee-off crossarms as well as the location and span length to adjacent tee-off poles and the POA of conductors at the adjacent tee-off pole.
- 11.1.5 Undercrossings:** All undercrossings shall be detailed in the survey with the POA of the conductors as well as the location of the poles at each end the undercrossing span. Conductor mid-span shots shall be recorded as per 11.1.6.
- 11.1.6 Mid-span measurements:** The survey shall include the time, date, wind speed and temperature of all mid-span conductor height measurements. There shall be a minimum of 3 conductor elevation shots per span. Shots may be recorded as a ground shot with an additional height to conductor, or an x, y location with the R.L. of the conductor.
- 11.1.7 Staywire POA and ground location:** The survey shall include the pole attachment height of all staywires in addition to the ground location of the staywire anchors.

11.2 Features Intersected by the Centre Line

- 11.2.1** The position and direction of all located boundaries, constructions and features crossed are to be noted. The position and height of any construction or overhead wires should be observed.
- 11.2.2** A major construction such as a highway, railway, road overpass, road intersection or high voltage transmission line should be detailed accurately in relation to the centre line. A surveyor must take sufficient measurements to all aerial installations such that their elevations can be determined by means of the relevant computer data entry codings.

For safety of personnel and in accordance with statutory regulations, measurements to all electrical conductors must be made by the use of indirect survey methods. Physical contact with conductors, using any type of measuring rod, tape, etc., is prohibited.

11.2.3 When crossing an existing powerline, it is necessary to obtain the height above the ground of the overhead earthwire, the highest conductor, and the height of the lowest conductor. The height of the conductors varies with change in temperature and sufficient detail to relate to the design of the intersected line is required. The date and time of the measurement together with the ambient temperature and wind speed should be recorded. The existing structures on both sides of the crossing are to be located; at these structures the following information is required; ground level, height of top and bottom conductors at the point of attachment (point where wire is attached to the insulator).

11.2.4 Highway and railway crossings require additional information as formal plans of the crossing details are forwarded by Ergon Energy to TMR and Queensland Rail. Highway crossings require Main Roads chainage usually obtained from Bench marks adjacent to the crossing point as well as detail described in 11.1.2.

Rail crossings require Railway chainage; names of sidings or stations adjacent to crossing on either side, and location and reduced level of each rail crossed.

11.2.5 Telstra underground cable locations must be recorded when crossed by the survey centreline and the location of the cable relative to the centreline must be recorded when the cable is within 15m of the centreline. At deviation points, the cable location is to be recorded within a radius of 30 m of the deviation point, this is necessary to allow staywire placement without damaging the cable.

11.2.6 Any cultivated area, Sugar Cane Bin unloading area, Sugar Cane Tramway etc. that is within 30m of the Centreline shall be accurately recorded. These areas have specific requirements for the design of the Transmission Line.

11.2.7 All Waterway Crossings shall have a recording taken at the current water level along with the time and date of the recording to allow for specific design requirements and drawings which are required to be submitted to Harbour Boards and Council Flooding studies etc.

11.3 Obstructions and Unusual Features Not Intersected by the Centre Line

All obstructions and unusual features within thirty (30) metres of the centre line must be located. The surveyor must measure the height relative to the centre line of all obstructions or features that could affect the design of the line, with particular recognition of the lateral swing of the conductor. This would include a parallel power line where each structure and its height would need to be captured.

The position, diameter and height of all significant trees which have been needed to be accommodated in the line design because of Environmental, Cultural Heritage or other reasons shall be recorded.

11.4 Hill Crests

Special care is necessary to record the definition of the terrain when going over the tops of hills or spurs. Readings should be taken at a sufficient number of positions

such that the actual profile does not deviate more than 0.3 metres from the chord between two adjacent readings.

11.5 Checking of Survey

11.5.1 The extent of the required checking of the survey will be defined by the Project Manager.

11.5.2 The checks to be applied may consist of broad overall checks for horizontal and vertical reliability, and/or detailed checks to verify that information within a span is correct for purposes of the survey.

11.5.3 The following typical broad checks may be applicable:

- (a) Connection to existing vertical and horizontal control points established by others;
- (b) Connection to existing vertical control points only. (See also Paragraph 11.6.)
- (c) Establishment of a control transverse in association with the transmission line, either along or adjacent to the centre line;
- (d) Comparison of reduced levels with existing mapped contours;
- (e) Comparison of route distance with existing route mapping, especially cadastral boundaries

11.5.4 The following method of checking detailed profile information will be required.

At the time of pegging the structures, critical points on the profile are measured, as well as the pegged span length.

11.6 Level Datum

Levels are computed in terms of Australian Height Datum within the limits of accuracy of the survey. Checks onto existing control points are utilised as a check against gross error. Frequency of these checks depends on circumstances and must be decided in association with the Project Manager.

12. Additional Data to Assist in Structure Spotting

12.1 At all stages of the survey, measured and subjective data having an impact on the location and design of structure positions should be recorded. This data may include such items as changes in vegetation types, density of vegetation, position of cattle camps and heights of trees within the camps, location and height of outstanding trees such as large fig and cedar trees, soil types and structure site accessibility.

12.2 The location and heights of trees should be measured in environmentally sensitive areas such as road crossings in tourist and scenic areas and near gullies and creeks where clearing may not be required for conductor clearance.

13. Connection to Adjoining Survey

It is the responsibility of the Surveyor to ensure that adequate connection is made to previously surveyed adjoining sections, such that a continuous terrain model can be obtained.

14. Survey Pegs

14.1 Dumpy pegs shall be used to identify the exact location of the asset installation. A dumpy peg shall also be used at a nominated offset from the asset location. Dumpy pegs that may pose a Safety Hazard to pedestrian traffic (e.g. Urban areas) are to be installed flush with the ground with no finder peg. A clearly marked offset dumpy and offset finder peg placed at an appropriate safe distance shall nominate the distance to the asset's dumpy peg.

14.2 A finder peg shall be placed within 150mm of the dumpy peg for ease of location or for back sighting. Flagging tape the same colour as the peg shall be used on all finder pegs. Finder pegs that pose a Safety Hazard to pedestrian traffic (e.g. Urban areas) are not to be installed. A clearly marked offset dumpy and offset finder peg placed at an appropriate safe distance shall nominate the distance to the asset's dumpy peg.

14.3 Offset pegs shall be placed at a safe distance (typically 15m in Rural areas and as required for Urban areas) from the dumpy peg to reduce the risk to pedestrian traffic and to enable restoration of an asset dumpy peg should it be removed or disturbed. The distance to the asset's dumpy peg shall be clearly marked on the Offset peg.

Peg sizes, colours and uses shall be as below.

Peg Use	Peg Colour	Peg Size	Additional Comments	Flagging Tape Colour
Pole Dumpy Peg	Red	200x50x38	Pole Number to be marked on peg (e.g. PV101) as appropriate	N/A
Pole Finder Peg	Red	1200x50x25	Pole Number to be marked on peg (e.g. PV101)	Red
Stay Dumpy Peg	Blue	200x50x38	Pole & Stay Number to be marked on peg(e.g. PV101S1) as appropriate	N/A
Stay Finder Peg	Blue	1200x50x25	Pole & Stay Number to be marked on peg (e.g. PV101S1)	Red
Pole Offset Dumpy Peg	Yellow	200x50x38	Peg to be marked with Pole Number followed by "OS" (e.g. PV101OS) as appropriate	N/A

Pole Offset Finder Peg	Yellow	1200x50x25	Peg to be marked with Pole Number followed by "OS" (e.g. PV101OS)	Red
Bend Point Dumpy Peg	Red	200x50x38	Bend Point ID to be marked on peg as appropriate	N/A
Bend Point Finder Peg	Red	1200x50x25	Bend Point ID to be marked on peg	Red

15. Aerial Surveying

Full waveform LIDAR systems that include the entire backscatter signal of each laser pulse (and process this information to provide additional points, particularly for areas where there is vegetation cover) shall be used. Wherever the proposed centreline crosses any overhead powerlines, the closest structure and span on both side of the crossing shall be surveyed and photographed. The date, time and climatic conditions (wind speed, temperature etc) at ground level shall be recorded for any survey undertaken.

15.1 Before LiDAR survey is undertaken the following shall be supplied for approval:-

- Equipment details and software capabilities
- Estimated Accuracy (minimum $\pm 0.15\text{m}$ Vertical, $\pm 0.5\text{m}$ Horizontal relative accuracy required)
- Point density
- Digital Terrain Model format
- Georeferenced image format
- Expected delivery timeframe

15.2 Digital Terrain Model data shall be described by coordinate position and elevation. DTM data shall be comma delimited text with one record per line. The data shall be provided in the coordinate system specified in 1.3. Typical format of a record is Easting (m), Northing (m), Elevation (m), Feature Code, Comment (optional).

15.3 Separate Data Files are required for the following features:-

- Bare earth terrain and surface water points (points that do not significantly add to the surface definition may be thinned)
- Conductors and structures combined (points may NOT be thinned) and structures photographed
- Vegetation
- Breaklines where appropriate

16. Appendices

Appendix A - Pole and span details required on existing infrastructure

Figure A1, Example suspension pole, 66kV 'wishbone' construction with 11kV under build

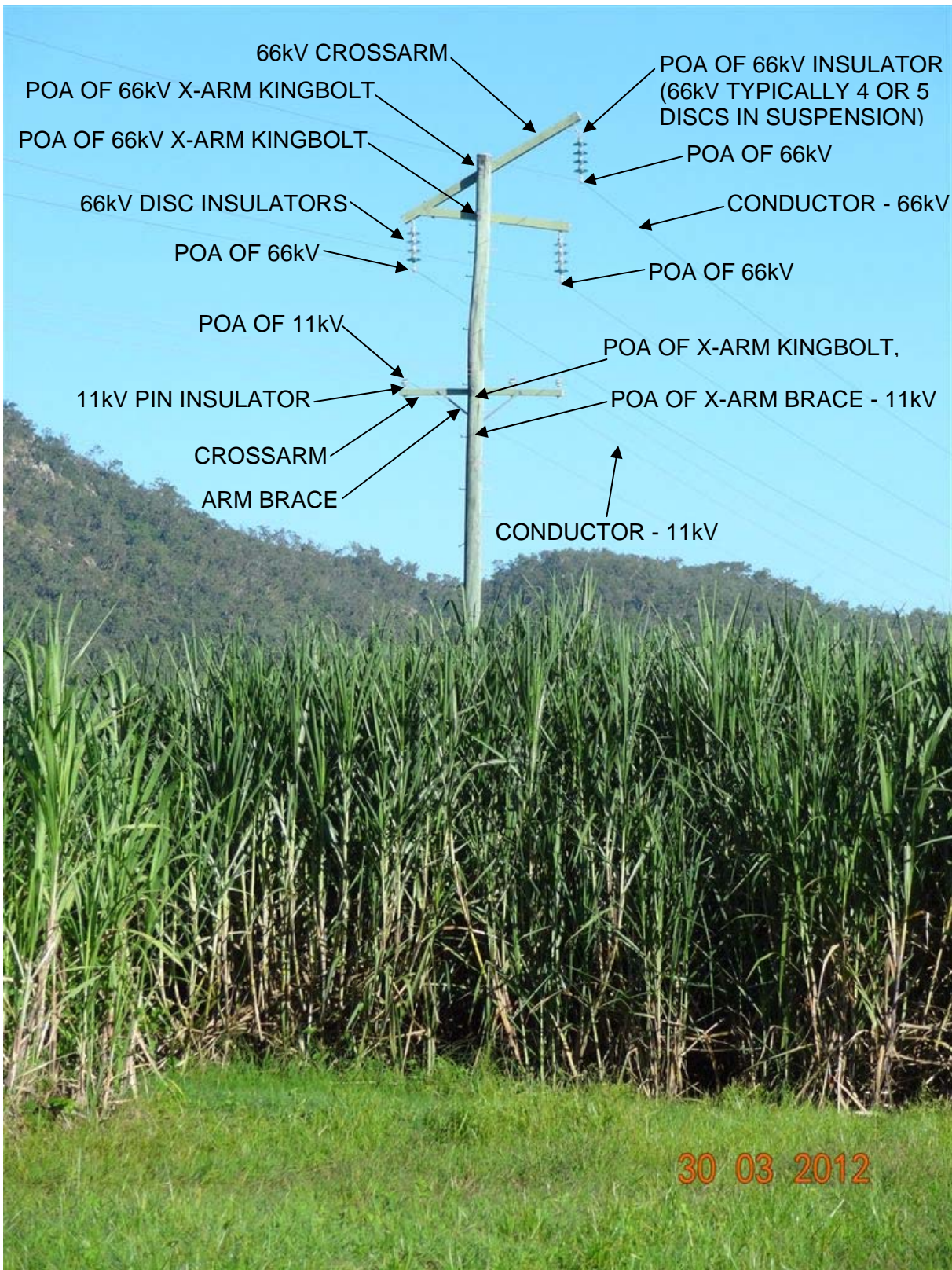


Figure A2, Example intermediate pole, 66kV post insulators with 11kV under build, tee-off, and pilot wire

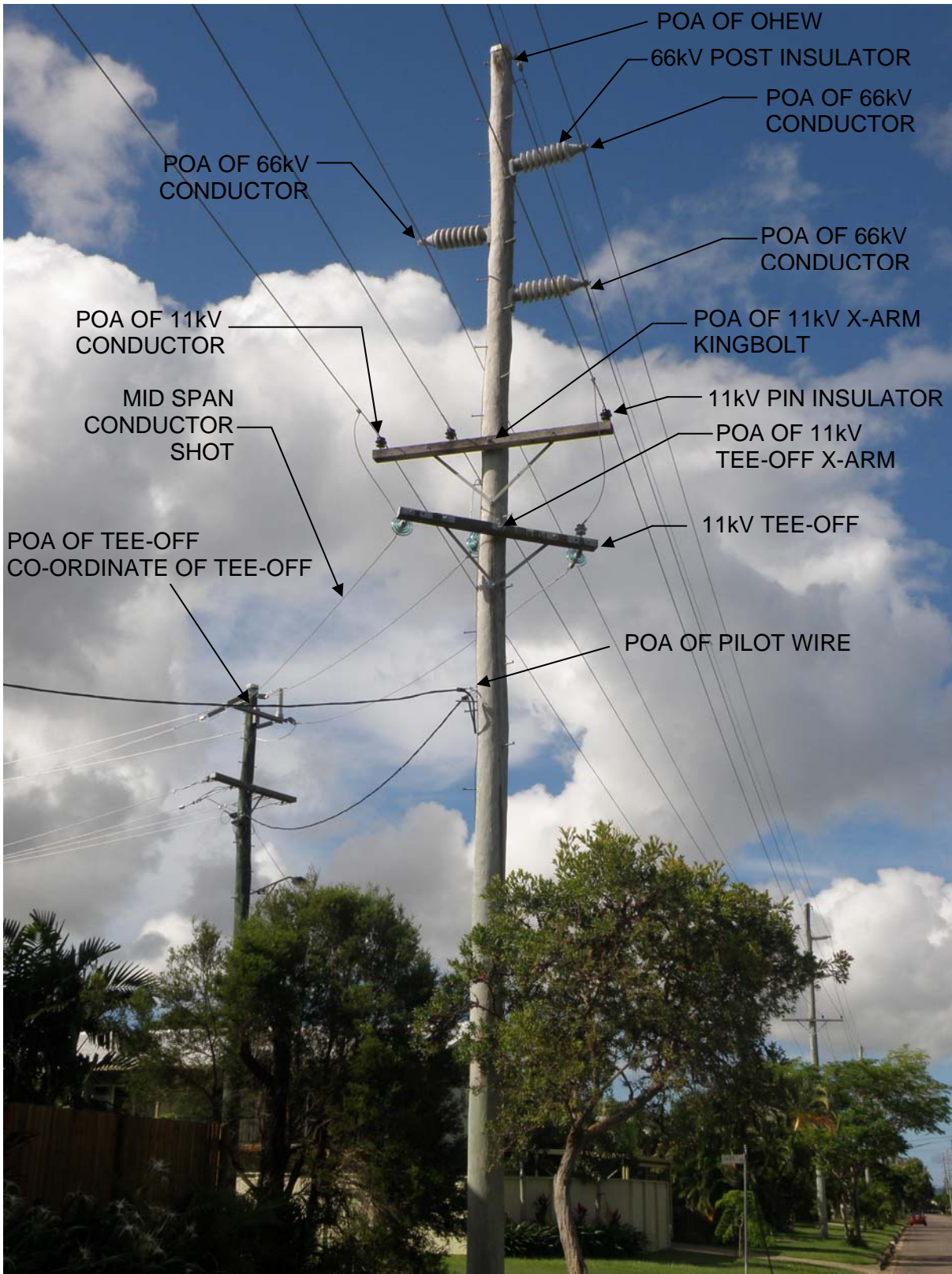
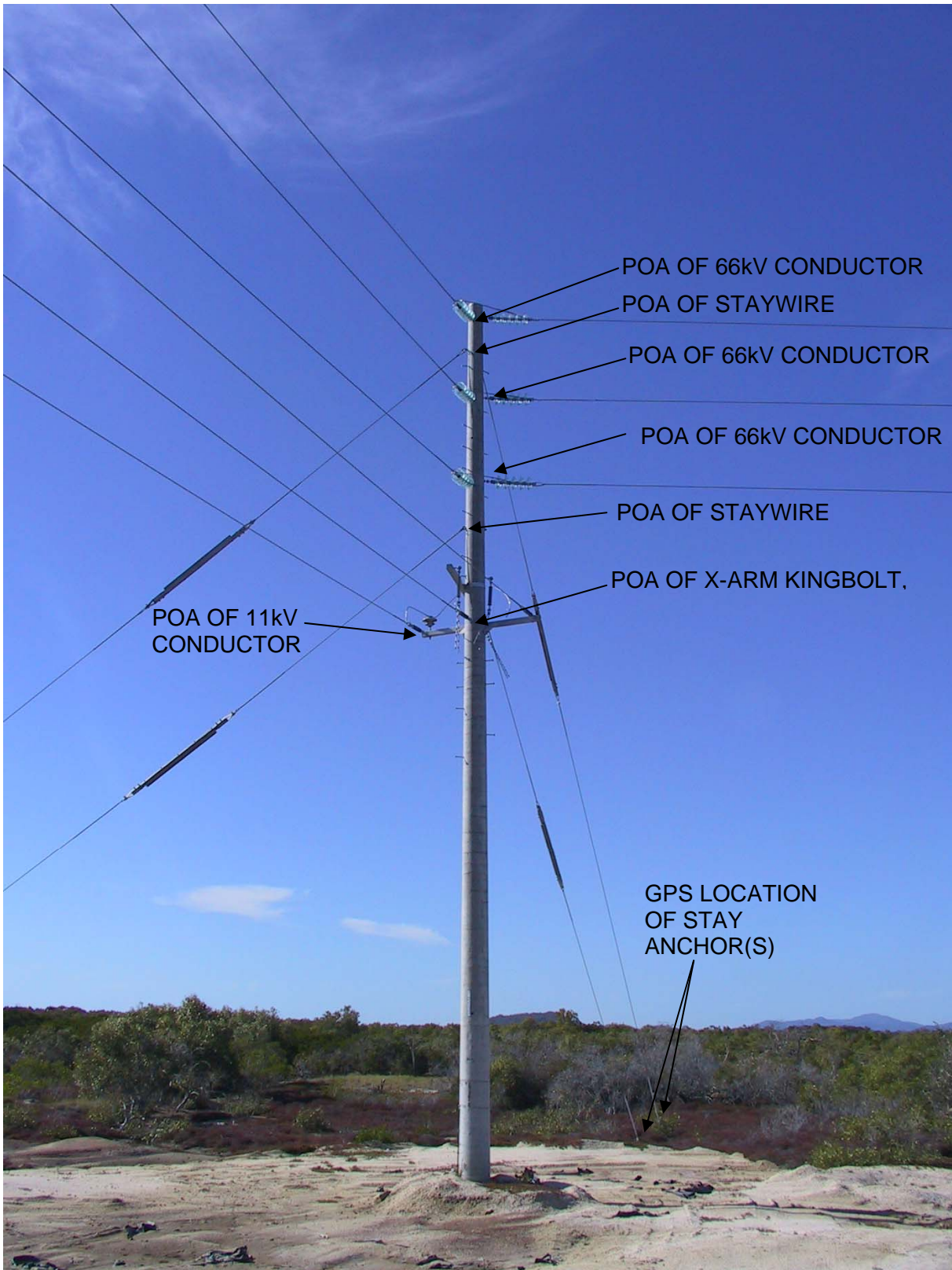


Figure A3, Example termination pole, 66kV strain construction with 11kV under build, upper and lower stays



Appendix B – Ergon Preferred Feature Codes

Feature Code	Description	Feature Type	Linetype	Linetype Scale	Layer	Colour	Use in Surface	Symbol	Symbol Name	Attribute Name	Entry Mode	Default Text Value
TOPB	Top of Bank	Line	Top of Bank	100	Ground	Yellow	Yes	No	N/A	Text	Optional	Top Bank
TOEB	Toe of Bank	Line	Solid	1	Ground	White	Yes	No	N/A	Text	Optional	Toe Bank
GRND	Ground	Point	N/A	N/A	Ground	White	Yes	Yes	Grnd	Text	Optional	Blank
CHGR	Change of Grade	Line	Dashed 1-1	100	Ground	Light Grey	Yes	No	N/A	Text	Optional	Change Grade
ECROP	Edge of Crops	Line	Solid	1	Cultivation	Yellow	Yes	No	N/A	Text	Optional	Edge of Crops
Crop	Crop Spot Level	Point	N/A	N/A	Cultivation	Yellow	Yes	No	N/A	Text	Optional	Cultivation Spot Level
CSIDE	Cane Siding	Line	Solid	1	Cane Siding	White	Yes	No	N/A	Text	Optional	Cane Siding
PSM	Permanent Survey Mark	Point	N/A	N/A	Survey Control	White	Yes	Yes	PSM	PSM No	Optional	PSM Number
SVYM	Survey Mark	Point	N/A	N/A	Survey Control	White	Yes	Yes	SVYM	Text	Optional	Dumpy Peg
BNDY	Boundary	Line	Solid	1	Property	Yellow	Yes	No	N/A	Nil	N/A	N/A
TREE	Tree	Point	N/A	N/A	Landscape	Light Grey	Yes	Yes	Tree	Type	Optional	Tree Type
										Width	Optional	Width of Tree
										Photo	Optional	N/A
GULY	Gully	Line	Watercourse	100	Ground	White	Yes	No	N/A	Text	Optional	Gully
WATR	Edge of Water	Line	Watercourse	100	Water	Blue	Yes	No	N/A	Name	Optional	Creek Name
										Photo	Optional	N/A
CBIT	Centre of Bitumen	Line	Centre line	50	Roadway	White	Yes	No	N/A	Text	Optional	Road Name
EBIT	Edge of Bitumen	Line	Solid	1	Roadway	Yellow	Yes	No	N/A	Text	Optional	Road Name
FPTH	Footpath	Line	Solid	1	Landscape	Light Grey	Yes	No	N/A	Text	Optional	Footpath
DWAY	Driveway	Line	Solid	1	Roadway	White	Yes	No	N/A	Text	Optional	Driveway
EGRV	Edge of Gravel	Line	Solid	1	Roadway	Yellow	Yes	No	N/A	Text	Optional	Road Name

Feature Code	Description	Feature Type	Linetype	Linetype Scale	Layer	Colour	Use in Surface	Symbol	Symbol Name	Attribute Name	Entry Mode	Default Text Value
CGRV	Centre of Gravel	Line	Centre line	50	Roadway	White	Yes	No	N/A	Text	Optional	Road Name
ETRK	Edge of Track	Line	Solid	1	Track	White	Yes	No	N/A	Text	Optional	Edge of Track
GARD	Guardrail	Line	Solid	1	Roadway	White	Yes	No	N/A	N/A	Optional	Guardrail
SIGN	Sign	Point	N/A	N/A	Landscape	Light Grey	Yes	Yes	Sign	Text	Optional	Sign
BLDG	Building	Line	Solid	1	Building	White	Yes	No	N/A	Text	Optional	Building
BRDG	Bridge	Line	Solid	1	Roadway	Yellow	Yes	No	N/A	Text	Optional	Creek Name
SLAB	Slab	Line	Solid	1	Landscape	Light Grey	Yes	No	N/A	N/A	Optional	Slab
PILE	Stockpile	Point	N/A	N/A	Ground	White	Yes	Yes	Grnd	Text	Optional	Stockpile
11	11kV Conductor	Point	N/A	N/A	11kV	Yellow	No	Yes	Cond	Conductor Type	Optional	Conductor Type
										Shot Location	Optional	Span
										Date & Time	Auto Generate	
										Wind	Optional	m/s
22	22kV Conductor	Point	N/A	N/A	22kV	Yellow	No	Yes	Cond	Conductor Type	Optional	Conductor Type
										Shot Location	Optional	Span
										Date & Time	Auto Generate	
										Wind	Optional	m/s
33	33kV Conductor	Point	N/A	N/A	33kV	Yellow	No	Yes	Cond	Conductor Type	Optional	Conductor Type
										Shot Location	Optional	Span
										Date & Time	Auto Generate	
										Wind	Optional	m/s
66	66kV Conductor	Point	N/A	N/A	66kV	Yellow	No	Yes	Cond	Conductor Type	Optional	Conductor Type
										Shot Location	Optional	Span

Feature Code	Description	Feature Type	Linetype	Linetype Scale	Layer	Colour	Use in Surface	Symbol	Symbol Name	Attribute Name	Entry Mode	Default Text Value
										Date & Time	Auto Generate	
										Wind	Optional	m/s
132	132kV Conductor	Point	N/A	N/A	132kV	Yellow	No	Yes	Cond	Conductor Type	Optional	Conductor Type
										Shot Location	Optional	Span
										Date & Time	Auto Generate	
										Wind	Optional	m/s
275	275kV Conductor	Point	N/A	N/A	275kV	Yellow	No	Yes	Cond	Conductor Type	Optional	Conductor Type
										Shot Location	Optional	Span
										Date & Time	Auto Generate	
										Wind	Optional	m/s
KBLT	King Bolt	Point	N/A	N/A	Structures	Light Gray	No	Yes	KBLT	King Bolt Locn	Optional	66kV Top Arm
STAY	Stay	Point	N/A	N/A	Structures	Yellow	Yes	Yes	Stay	Stay Posn	Optional	Upper Stay
BOLL	Bollard	Point	N/A	N/A	Structures	Yellow	Yes	Yes	Boll	Bollard No	Required	1234567
										Type	Optional	Timber
POLE	Pole	Point	N/A	N/A	Structures	Yellow	Yes	Yes	Pole	Asset No	Required	1234567
										Pole No	Optional	MH123
										Type	Required	Timber
										Text	Optional	Blank
										Photo	Optional	
TOWR	Tower	Point	N/A	N/A	Structures	Yellow	Yes	Yes	TWR	TWR No	Required	1234-STR-1234
										Twr FDR	Optional	7123
										Photo	Optional	

Feature Code	Description	Feature Type	Linetype	Linetype Scale	Layer	Colour	Use in Surface	Symbol	Symbol Name	Attribute Name	Entry Mode	Default Text Value
UGCA	Underground Cable	Line	Centre line	50	Underground Cable	Yellow	Yes	No	N/A	Text	Optional	Cable Type
TELE	Telstra	Point	N/A	N/A	Telstra	Yellow	Yes	Yes	Telstra	Telstra	Optional	Pit, Pillar etc
UGOF	Optic Fibre Underground	Line	Optic Fibre	50	Opt Underg	Light Purple	Yes	No	N/A	UGOF	Optional	Optic Fibre Underground
GAMH	Gas Manhole	Point	N/A	N/A	Gas	Yellow	Yes	Yes	Manhole	Manhole	Optional	Gas Manhole
GAVA	Gas Valve	Point	N/A	N/A	Gas	Yellow	Yes	Yes	Valve	Valve	Optional	Gas Valve
GAUC	Gas Unclassified	Point	N/A	N/A	Gas	Yellow	Yes	Yes	GAUC	GAUC	Optional	Gas Unclassified
GAUG	Gas Underground	Line	Gas	50	Gas	Yellow	Yes	No	N/A	N/A	Optional	Gas Underground
SWMH	Sewer Man Hole	Point	N/A	N/A	Sewer	White	Yes	Yes	SWMH	Sewer Man Hole	Optional	Sewer Man Hole
WAMH	Water Manhole	Point	N/A	N/A	Water	Blue	Yes	Yes	Manhole	Manhole	Optional	Water Manhole
WAVA	Water Valve	Point	N/A	N/A	Water	Blue	Yes	Yes	Valve	Valve	Optional	Water Valve
WTAP	Water Tap	Point	N/A	N/A	Water	Blue	Yes	Yes	Tap	Tap	Optional	Water Tap
FIRE	Fire Hydrant	Point	N/A	N/A	Water	Blue	Yes	Yes	Fire Hyd	Fire Hyd	Optional	Fire Hydrant
WMET	Water Meter	Point	N/A	N/A	Water	Blue	Yes	Yes	Meter	Meter	Optional	Water Meter
WAUC	Water Unclassified	Point	N/A	N/A	Water	Blue	Yes	Yes	WAUC	WAUC	Optional	Water Unclassified
WAUG	Water Underground	Line	Water Course	100	Water	Blue	Yes	No	N/A	N/A	Optional	Water Underground
WRES	Water Reservoir	Point	N/A	N/A	Water	Blue	Yes	Yes	Reservoir	Reservoir	Optional	Water Reservoir
QRTK	QR Track	Line	Solid	1	QR	White	Yes	No	N/A	Description	Optional	QR Track Description
QRPO	QR Pole	Point	N/A	N/A	QR	White	Yes	Yes	QR Pole	Pole No	Optional	QR Pole No
CTTK	Cane Tram Track	Line	Solid	1	Cane Tram	White	Yes	No	N/A	Description	Optional	Cane Tram Line
QRCH	QR Chainage	Point	N/A	N/A	QR	White	Yes	Yes	QRCHGE	QR Chge	Optional	QR Chainage Marker
QROH	QR Overhead Conductor	Point	N/A	N/A	QR	White	No	Yes	QROH	Shot Info	Auto Generate	Shot Time & Date

Feature Code	Description	Feature Type	Linetype	Linetype Scale	Layer	Colour	Use in Surface	Symbol	Symbol Name	Attribute Name	Entry Mode	Default Text Value
										Wind	Optional	m/s
										Shot	Optional	Span
GRID	Cattle Grid	Line	Solid	1	Roadway	White	Yes	No	N/A	N/A	Optional	Cattle Grid
FENC	Fence	Line	Fence	100	Landscape	White	Yes	No	N/A	Fence	Optional	Description
GATE	Gate	Line	Gate	100	Landscape	White	Yes	No	N/A	Gate	Optional	Gate
SUSL	Start USL	Point	N/A	N/A	USL	Cyan	Yes	No	N/A	Start USL	Required	Start USL
EUSL	End USL	Point	N/A	N/A	USL	Cyan	Yes	No	N/A	End USL	Required	End USL
OTHR	Any other feature	Point	N/A	N/A	Other	White	Yes	No	N/A	Other	Required	What is the feature