

Network Asset Technical Document

Constructing distribution power lines and cables in the vicinity of pipelines



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Documents Referenced In This Document

| DMS# | Title of Document |
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Other Documents That Reference This Document

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1 Objective

To minimise risk associated with the construction of new distribution power lines in the vicinity of pipelines.

2 Context

Pipelines may be damaged during the construction of distribution power lines. In addition, steel pipelines can also be adversely affected by the installation of high voltage earthing systems, because of the rise in earth potential; or by low-frequency induction due to the parallel positioning of the pipeline and high voltage overhead power lines.

It is therefore essential to identify the location of all pipelines in the vicinity of a proposed power line and to take precautionary action.

3 References and supporting documentation

- <http://standards.mainroads.wa.gov.au/nr/rdonlyres/0b774c88-78a5-44f6-850b-f012e9a1f265/0/utility.pdf> - Main Roads web site - *Utility Providers Code of Practice*.
- http://www.era.wa.gov.au/2/296/50/pipeline_infras.pm - Economic Regulation Authority, map titled: *Gas Pipeline Infrastructure in Western Australia*.
- http://www.energy.wa.gov.au/cproot/915/6525/Gas_Transmission_Pipelines_260906.pdf Office of Energy, fact sheet titled: *Gas Transmission Pipelines*.
- [Petroleum Pipelines Act 1969](#) - State Law Publisher web site - *Petroleum Pipelines Act 1969*.
- [Dampier to Bunbury Pipeline Act 1997](#) - State Law Publisher web site, *Dampier to Bunbury Pipeline Act 1997*.
- <http://www.dpi.wa.gov.au/stateland/15565.asp> - Department for Planning and Infrastructure web site - *DBNGP Corridor Management Role and Function*.
- <http://www.dpi.wa.gov.au/stateland/15544.asp>- Department for Planning and Infrastructure web site - *DBNGP corridor land use guidelines*.
- http://www.dpi.wa.gov.au/mediaFiles/crown_faxapplication2.pdf - Department for Planning and Infrastructure web site - Application to undertake activities or works in the Dampier to Bunbury natural gas pipeline corridor, Section 41 *Dampier to Bunbury Pipeline Act 1997*.
- <http://www.dbp.net.au/about/> - DBP web site - DBP and Pipeline Information.
- <http://www.wng.com.au/energy/>- West Net web site – Operations map, Dampier to Bunbury Natural Gas Pipeline.
- <http://www.pipelinetrust.com.au/4/4-5set.html> - Australian Pipeline Trust web site – pipelines owned in Western Australia.

- <http://www.ggt.com.au/html/09wor0.htm> - Goldfields Gas Transmission (GGT) web site – *A Guide to Pipeline Safety*.
- <http://www.agility.net.au/Agility/Corporate+Information/Office+Locations/Default.htm> - Agility web site - Office locations.
- <http://www.esperance-energy.com/contact.htm> - Esperance Pipeline Company contact details.
- http://www.watercorporation.com.au/files/PublicationsRegister/16/WC_OSH_23_Clearance_to_Work.pdf - Water Corporation web site – Developers' Manual (Attachment 1: *Clearance to Work Permit Guidelines*).
- http://www.watercorporation.com.au/files/PublicationsRegister/16/WC_OSH_23_Clearance_to_Work.pdf - Water Corporation web site – Clearance to Work Permit.
- <http://www.watercorporation.com.au/graphics/education/GSTWSmap.jpg> - Water Corporation web site – map showing main pipelines supplying South West towns.
- <http://www.aqwest.wa.gov.au/About/Map.aspx> - AQWEST - map showing the location of water mains in the Bunbury area.
- <http://www.busseltonwater.wa.gov.au/> - Busselton Water Board web site.
- AS/NZS 4853:2000, *Electrical hazards on metallic pipelines*.
- <https://www2.landgate.wa.gov.au/slip/portal/about/about.html>- SLIP web site.
- [http://www.dli.wa.gov.au/docvault.nsf/web/MR_DLI_20072006/\\$FILE/MR_DLI_20072006.pdf](http://www.dli.wa.gov.au/docvault.nsf/web/MR_DLI_20072006/$FILE/MR_DLI_20072006.pdf) - DPI web site - Appendix 1 – Register of Interests (ROI).
- http://www.egov.dpc.wa.gov.au/documents/SLIP_RoIFocusAreaImpPlan_Fin_271004.pdf - Office of e-Government web site - Register of Interests (ROI) implementation plan.

4 Introduction

Pipelines are mostly used to transport petroleum products (gas, petrol, diesel etc.) and water (including sewer, waste water, piped drains and slurry pipelines).

Maps of major gas pipelines are available from the following links:

- http://www.era.wa.gov.au/2/296/50/pipeline_infras.pm
- http://www.energy.wa.gov.au/cproot/915/6525/Gas_Transmission_Pipelines_260906.pdf

4.1 List of pipeline operators in Western Australia:

4.1.1 Gas pipelines

- a. [Alinta](#), responsible for:
 - Distribution gas pipelines in the Perth Metropolitan area and a number of country districts.
 - The Dampier to Bunbury Natural Gas Pipeline (DBNGP) – a high-pressure transmission pipeline, managed by [Dampier Bunbury Pipeline](#).
- b. [Agility](#), responsible for the operation and maintenance of the following transmission pipelines owned by the [Australian Pipeline Trust](#):
 - Goldfields Gas Pipeline, between Yarraloola (near Pannawonica) and Kambalda, managed by [Goldfields Gas Transmission](#).
 - **Parmelia Gas Pipeline, between Beharra Springs (near Dongara) and Perth.**
 - **Mid West Pipeline, between Geraldton and Windimurra.**
- c. [Esperance Pipeline Company](#), responsible for operation and maintenance of the Kambalda to Esperance Gas Pipeline.

4.1.2 Fuel pipelines

BP Refinery Kwinana – fuel gas pipelines between Kwinana and Fremantle and Kwinana and Kewdale.

4.1.3 Water Pipelines

a. [Water Corporation](#):

- Main water pipelines between Perth and Kalgoorlie.
- Main water pipeline between Stirling Dam and Perth.
- Main [water pipelines](#) supplying more than 30 Great Southern towns from Harris Dam (until 1990, water was supplied from the Wellington Dam).
- Over 30,000 km of pipes supplying water to individual customers.
- Sewer pipelines.

b. [AQWEST - Bunbury Water Board](#) – supplying water within the Bunbury City Council area.

c. [Busselton Water Board](#) – Supplying water within the Busselton Shire area.

4.1.4 Other pipelines

- a. A number of privately-operated pipelines in the Kwinana Industrial Area.
- b. The slurry pipeline from Collie to the coast.

4.2 Information on working in the vicinity of petroleum pipelines

The land around high-pressure gas transmission and other petroleum pipeline corridors is protected under two acts of State Parliament:

- [Petroleum Pipelines Act 1969](#)
- [Dampier to Bunbury Pipeline Act 1997](#)

The typical width of a petroleum pipeline corridor is 30 metres. However, this distance may vary. For example, the width of the Dampier to Bunbury Natural Gas Pipeline (DBNGP) corridor varies from 30 to 100 metres.

Please note that according to these acts, any unauthorised work within pipeline corridors or easements may be subject to penalties. In addition, severe penalties will apply to any person damaging the pipeline.

The DBNGP corridor (including activities and works) comes under the Minister for Planning and Infrastructure and is administered by the Department for Planning and Infrastructure (DPI). According to the information on the [DPI web site](#), when planning work in the corridor, it is necessary to fill in an application form and/or write an application letter with the following details:

- the area where access is required;
- the type of work to be carried out;
- a time frame for the commencement and completion of work;
- a map showing the location of the work;
- the company or party responsible for the work; and
- the company's sealing clause where applicable.

The application form is available from the following link: [Application form](#).
The application form and/or the letter should be sent to:

The Manager Infrastructure Corridors
Department for Planning and Infrastructure
PO Box 1575
Midland WA 6936

Or faxed to: (08) 9347 5007

Or sent via email to: infrastructurecorridors@dpi.wa.gov.au

Please note that according to [DBNGP corridor and use guidelines](#), above-ground services (towers, poles, antennae) within the corridor are generally discouraged and it is unlikely that any distribution poles would be approved.

For all petroleum pipelines constructed under the [Petroleum Pipelines Act 1969](#), pipeline operators are required to provide Warning Marker signs on all fence lines crossing the corridor and at other appropriate locations to provide clear warning of the pipeline's existence.

At present, the existence of easements cannot be determined without site visits and without contacting the pipeline operators. However, the State Government plans to develop the Shared Land Information Platform ([SLIP](#)) system which will provide fast and easy access to the State's spatial information. The SLIP project involves the development of a Register of Interest ([ROI](#)). The ROI will provide on-line access to all information. Work

on the ROI is progressing and it is [scheduled](#) for completion by the end of 2009.

4.3 Information on working in the vicinity of water pipelines

Water pipes can be classified as:

- General pipes, used to supply individual customers.
- Trunk / distribution mains.
- Main water pipelines, typically protected by easements, e.g. the pipeline between Perth and Kalgoorlie.

Water pipelines can be constructed using the materials listed in Table 1.

In the case of the Water Corporation, it is necessary to obtain a Clearance to Work Permit (CTW) when performing activities which involve disturbing the ground close to pipes or drains. The Water Corporation does not define specific distances from water pipes in its permit requirements. According to information provided in its Developers' Manual, Attachment 1, titled Clearance to Work Permit Guidelines, the requirement for a permit is essentially a product of:

- the type of asset;
- the proximity and depth of excavation in relation to an existing asset;
- soil conditions; and
- the construction method.

Assets types that are more likely to require a CTW permit include:

- water mains (especially those made of fragile materials, such as RC, AC, CI etc);
- pressure mains;
- main sewers; and
- piped Water Corporation main drains.

A copy of the permit form is available in Appendix B of the Water Corporation's, Safety and Health Procedure Manual, number WC-OSH 23, titled: Clearance to Work on Water Corporation Assets.

Table 1. Water pipe types

| Pipe Material | Acronym |
|-------------------------------|----------------|
| Asbestos Cement | AC |
| Poly Vinyl Chloride | PVC |
| High Density Polyethylene | HDPE |
| Cast Iron | CI |
| Cast Iron – Concrete lined | CICL |
| Reinforced Concrete | RC |
| Ductile Iron | DI |
| Ductile Iron – Concrete lined | DICL |
| Mild Steel – Concrete lined | MSCL |

4.4 Earth Potential Rise and Low Frequency Induction voltage levels

The earth potential rise (EPR) voltage limit expected at the maximum fault current and the low-frequency induction (LFI) voltage shall be calculated. The maximum acceptable levels for these voltages depend on the type of pipeline and on the fault clearing time.

Pipelines installed above ground, which can be accessed by the public, are classified by AS/NZS 4853:2000 as Category A. The maximum voltages limits for these pipelines are given in Table 2.

Table 2

Touch voltage limits for pipeline and its ancillaries accessible to public or unskilled staff.

| Protection fault clearance time | Volts a.c. |
|---|-------------------|
| ≤ 100 ms | 350 |
| > 100 ms ≤ 150 ms | 300 |
| > 150 ms ≤ 300 ms | 200 |
| > 300 ms ≤ 500 ms | 100 |
| > 500 ms ≤ 1 s | 50 |
| > 1 s including continuous load current | 32 |

Pipelines with restricted access by the public can be classified as Category B. According to AS/NZS 4853:2000, this category may also be applied when Category A touch-voltage limits 'are technically or economically not achievable or when the pipeline operator or owner deems the hazards to be negligible or controllable'. The maximum voltages limits for Category B pipelines are given in Table 3.

Table 3

Touch voltage limits for pipeline and its ancillaries for non-public access conditions.

| Protection fault clearance time | Volts a.c. |
|---------------------------------|------------|
| ≤ 1 s | 1000 |
| > 1 s and continuous | 32 |

In cases when initial calculations indicate that the touch voltage limits defined in AS/NZS 4853:2000 may not be satisfied, Western Power may have to employ specialist consultants to carry out formal investigation and to identify mitigation work (for example Power Earth Technologies or Safe Earth).

5 Policy statement

Power lines and cables should be designed and constructed to:

- a. comply with easement requirements around the existing pipeline and avoid any mechanical damage to the pipeline; and
- b. comply with EPR and LFI touch voltage limits defined in AS/NZS 4853:2000.

5.1 Compliance with laws associated with pipeline easements and avoiding mechanical damage

Power lines should be designed and constructed to comply with:

- [Petroleum Pipelines Act 1969](#)
- [Dampier to Bunbury Pipeline Act 1997](#)

These Acts basically prevent the installation of poles within the easements and state any parties working within the easements must seek authorisation from the pipeline owners to do so.

To avoid mechanical damage, the presence of pipelines should be checked using the Dial-Before-You-Dig service.

With regard to the risk associated with working near pipelines, pipelines can be classified into two types:

- General pipelines.

- High risk.

5.2 General pipelines:

All water and gas pipelines used for the distribution of water and gas to small and medium-sized customers can be classified as general.

Specifically, the following types of Alinta gas pipelines are classified as general pipelines:

- LP - Low pressure
- MLP - Medium Low Pressure
- MP - Medium Pressure
- PEHP - Polyethylene High Pressure, up to 110 mm DN.

The following requirements must be noted when constructing power lines in the vicinity of general pipelines:

1. Pipeline operators or owners do not need to be notified about the proposed work, except when it will be performed within one metre of a frangible water pipe (for example pipeline made of asbestos cement or cast iron).
2. The pipeline should be located by hand digging if the poles are to be installed within 1 metre of it.
3. The minimum distance between pole and pipeline is 300 mm.

5.3 High risk pipelines

High-risk pipelines are all pipelines (both gas and water) protected by formal easements.

Specifically, the following Alinta gas pipelines are classified as high risk:

- PEHP - Polyethylene High Pressure, greater to 110 mm DN
- HP - High Pressure
- CHP - City High Pressure
- FHP - Fremantle High Pressure.

The requirements associated with high-risk pipelines are listed in Table 1.

Table 1. Installation of poles in the vicinity of high-risk pipelines.

| Distance between poles or stays and high risk pipeline | Action |
|---|---|
| More than 15 metres | No action required |
| Less than 15 metres and more than 5 metres | a) Pipeline operator or owner must be notified about the proposed work. b) In case of Alinta pipelines, Western Power will be issued with a site-specific Notification Number. |
| Less than 5 metres and more than 1 metre | a) Pipeline operator or owner must be notified about the proposed work. b) In case of Alinta pipelines, Western Power will be issued with a site-specific Notification Number. An Alinta-accredited Pipe Locator must be on site to supervise disturbance of soil, e.g. pole installation. |
| Less than 1 metres | Poles should not be installed this close to a pipeline. Find an alternative location. |

5.4 EPR and LFI voltage limits

Power lines and cables that are to be located in the vicinity of an existing conductive pipeline should comply with the touch voltage limits defined in AS/NZS 4853:2000.

High Voltage earthing systems should not be installed within 15 metres of a high-risk pipeline.

The AS/NZS 4853:2000 touch voltage limits should be based on fault clearance times for primary protection devices and for maximum phase-to-earth fault current.

EPR voltages must be calculated for all earthing systems designed to be installed within 100 metres of a high-risk pipeline.

LFI voltages must be calculated for high-risk pipelines located within 500 metres of the proposed power line and with exposure lengths greater than:

- a. 200 metres - for all pipelines classified as Category A, and for Category B pipelines when they are located near overhead distribution power lines with fault clearance times longer than 1 second.
- b. 6,000 metres – for all Category B pipelines located near overhead distribution power lines with fault clearance times shorter than 1 second.

The pipeline operator or owner must be notified about all designs where initial calculations indicate that the touch voltage limits for (both EPR and LFI), defined in AS/NZS 4853:2000, may not be satisfied.

Designs should not be finalised until a formal reply from the pipeline's operator has been received.

5.5 Pipeline operator contact details

Alinta:

Postal address:
ANS Engineering Services
Alinta Network Services
GPO Box W2030, Perth WA, 6846
Fax: (08) 9486 3903
Email: engineering.services@alinta.net.au

Agility:

Postal address:
Agility Management Pty Ltd
8 Marchesi Street,
Kewdale WA 6105
Phone: (08) 9353 7517
Fax: (08) 9353 2452
Email: Gerard.Connell@agility.net.au

BRW Power Generation:

(facility manager for the Kambalda to Esperance Gas Pipeline)
Contact details for Perth:
L4 QV1, 250 St Georges Terrace
Perth WA 6000
Phone: (08) 9278 8345
Fax: (08) 9278 8383

Contact details for Esperance:

P.O. Box 2392
Esperance WA 6450
Phone: (08) 9072 1422
Fax: (08) 9072 1433

BP Refinery:

Postal address:
BP Refinery (Kwinana) Pty Ltd:
Mason Rd
Kwinana WA 6167
<http://www.whitepages.com.au/wp/search/redirect.jhtml?url=>
Phone: (08) 9419 9500 (switchboard)

Please note: the contact details for the BP Refinery provided in Appendix A of the Utility Providers Code of Practice are incorrect.

Water Corporation:

Contact the relevant regional office, by using the information provided in Appendix A of the Utility Providers Code of Practice.

AQWEST:

Postal address:

AQWEST

Box 400, Bunbury WA, 6231

Phone: (08) 9780 9500

Fax: (08) 9780 9509

Email: aqwest@aqwest.wa.gov.au

Busselton Water Board:

Postal Address:

PO Box 57

Busselton W.A 6280

Pone: (08) 9754 1811

Fax: (08) 9754 1075

Email: admin@busseltonwater.w

