Guideline for the Planning and Development of Land in the Vicinity of High Pressure Natural Gas and Liquid Petroleum Pipelines

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1. Introduction

1.1 Background

High pressure natural gas and liquid petroleum transmission pipelines (High Pressure Pipelines) have a level of risk, which must be assessed when considering land use and development of land in the vicinity of pipelines, to ensure that risk to people, property and the environment is within acceptable levels. While Australian pipelines have an excellent safety record, a High Pressure Pipeline failure can impact an area several hundreds of metres from a pipeline.

The most frequent cause of pipeline failure worldwide is damage caused by external interference resulting from construction or maintenance activities. Australian High Pressure Pipelines are designed, operated and maintained to protect them from threats that have the potential to cause failure. In order to maintain pipeline safety, it is essential that the Pipeline Operator is informed of changes in land use in the area that could be affected by a pipeline failure in order that plans to control new threats and consequences can be developed and implemented. Planners, developers and landowners, as well as Pipeline Operators, must be aware of the potential to impact on pipeline safety by planning or permitting development without consideration of its potential impact.

Two major high pressure gas transmission pipelines pass through the Adelaide metropolitan area. The Moomba to Adelaide pipeline, constructed in 1969 and operated by Epic Energy transports gas from the state's north into Adelaide. The Port Campbell to Adelaide pipeline, constructed in 2003 and operated by SEA Gas, transports gas from South West Victoria to Adelaide. These pipelines deliver all the natural gas used for electric power generation in Adelaide, and the gas used for residential, commercial and industrial purposes in South Australia. The pipelines are critical infrastructure, and generally they cannot be relocated.

The need for this guideline arose when the *30 Year Plan for Greater Adelaide* highlighted a number of areas in the vicinity of these High Pressure Pipelines which were planned for future urban and industrial development. The existing High Pressure Pipelines were designed to reflect the plans that existed (and were envisaged) at the time the pipelines were constructed and the impact of the land use changes must be taken into consideration. Accordingly, the planning and development of these areas needs to ensure people, properties and the environment are not exposed to unacceptable risks. In addition, the *30 Year Plan for Greater Adelaide* highlighted the need for greater communication with Pipeline Operators at an early stage of strategic planning and development design. The future potential of High Pressure Pipeline corridor/easements to supply gas must not be unreasonably constrained, which includes providing access for maintenance and considering the potential for pipeline capacity enhancement through pipe duplication or increasing pipeline pressures within the existing corridor/easements.

1.2 Purpose

This guideline outlines matters to be taken into account by the Department of Planning, Transport and Infrastructure (DPTI), local councils and developers when considering land use changes and development proposals in the vicinity of High Pressure Pipelines throughout South Australia.

The purpose of the guideline is to:

- Establish a Notification Area along the length of each High Pressure Pipeline within South Australia to clearly define the region that could be affected by pipeline failure.
- To establish a process whereby developments planned or being considered within the Notification Area are advised to the relevant Pipeline Operator in sufficient time for potential impacts on the safety profile of a pipeline to be managed, minimising the impact on both the pipeline and the development.
- Ensure future structure plans, development plans, development plan amendments, subdivisions and development will not inhibit the potential of an existing High Pressure Pipeline, to provide the future capacity required to meet the long-term needs for natural gas in South Australia.
- Provide a consistent approach for the assessment of structure plans, development plans, development plan amendments, subdivisions and development applications within the Notification Area of High Pressure Pipelines.

Once implemented, the process will:

- Ensure risk to persons, property and the environment is acceptable where structure plans, development plans, development plan amendments, subdivisions and developments are proposed within the Notification Area of a High Pressure Pipeline.
- Reduce potential risks to the Public and property arising from rupture of a High Pressure Pipeline during construction and maintenance works.

1.3 Definitions and Abbreviations

As low as Reasonably Practicable (ALARP) – means the cost of further risk reduction measures is grossly disproportionate to the benefit gained from the reduced risk that would result.

AS2885 – Australian Standard 2885 Pipelines: Gas and Liquid Petroleum.

High Pressure Pipelines - High pressure natural gas and liquid petroleum transmission pipelines.

Location Class – The classification of an area according to its predominant land use and density of human activity, reflecting both the threats to the pipeline system from land usage and the consequences for the population should the pipeline system suffer a loss of containment.

MAP – Moomba to Adelaide Natural Gas Transmission Pipeline

Measurement Length –The radius of the 4.7kW/m^2 radiation contour for an ignited failure of the pipe such that the cylinder has opened to a size at least equivalent to its diameter, calculated in accordance with AS/NZS 2885.6, applied at all locations along the pipeline. (Note: This radiation intensity is sufficient to cause fatality after 30 seconds exposure. The measurement length represents the area in which there will be a significant safety impact in the event of the worst case pipeline failure).

Notification Area – A radial distance from a pipeline equal to the Measurement Length or alternate distance defined by the Pipeline Operator within which Pipeline Operators are required to be consulted regarding rezoning proposals and development projects to ensure that any changes to the pipeline location class in accordance with AS2885 are identified.

PCA – Port Campbell to Adelaide Natural Gas Transmission Pipeline

Pipeline Operator – Pipeline Licensee or their nominee responsible for the operation and maintenance of pipelines.

DEM – Department for Energy and mining

Primary Location Class - Land through which the pipeline passes shall be classified as follows:

- *Rural (R1)* Land that is unused, undeveloped or is used for rural activities such as grazing, agriculture and horticulture. Rural applies where the population is distributed in isolated dwellings. Rural includes areas of land with public infrastructure serving the rural use, e.g. roads, railways, canals, utility easements.
- *Rural Residential (R2)* Land that meets any of the following criteria:
    i. Defined in a local land planning instrument as rural residential or its equivalent.
    ii. Occupied by single residence blocks typically in the range 1 ha to 5 ha.
    iii. Rural or semi-rural areas for which the number of dwellings within the MEASUREMENT LENGTH radius from any point on the pipeline does not exceed approximately 50.

Land used for other purposes but with similar population density shall be assigned rural residential Location Class. Rural Residential includes areas of land with public infrastructure serving the rural residential use; roads, railways, canals, utility easements.

- *Residential (T1)* Land that is developed for community living or is defined in a local planning instrument as residential or its equivalent. Residential applies where multiple dwellings exist in proximity to each other and dwellings are served by common public utilities. Residential includes areas of land with public infrastructure serving the residential use, e.g. roads, railways, recreational areas, camping grounds/caravan parks, suburban parks, small strip shopping centres. Residential land use may include isolated higher density areas provided they are not more than 10% of the land use within a radius of one Measurement Length at any point on the pipeline. Land used for other purposes but with similar population density shall be assigned Residential Location Class.
- *High Density (T2)* Land that is developed for high density community use or is defined in a local planning instrument as high density or its equivalent. High Density applies where multi-storey development predominates or where large numbers of people congregate in the normal use of the area. High Density includes areas of public infrastructure serving the high-density use; roads, railways, major sporting and cultural facilities and land use areas of major commercial developments; cities, town centres, shopping malls, hotels and motels. To assist in determining the Location Class boundary between T1 and T2, the T2 Location Class contains more than approximately 50 dwellings per hectare.

  Note: In Residential and High-Density areas, the societal risk associated with loss of containment is a dominant consideration.

Secondary Location Class - Location classes S, I, E, HI, CIC and C are secondary location classifications (or subclasses) that may occur in any primary Location Class. Where the land use through which the pipeline route passes is identified as S, I, E, HI, CIC and C the requirements of the primary Location Class (R1, R2, T1, T2) shall be applied together with additional consideration and additional requirements established for the S, I, E, HI, CIC and C location class, as follows:-

- *Sensitive use (S)* The sensitive use Location Class identifies land where the consequences of a failure event may be increased because it is developed for use by sectors of the community who may be unable to protect themselves from the consequences of a pipeline FAILURE EVENT. Sensitive uses are specifically defined in some jurisdictions, but include schools, hospitals, aged care facilities and prisons. Sensitive use Location Class shall be assigned to any section of the pipeline system where there is a sensitive development within a MEASUREMENT LENGTH. It shall also include locations of high environmental sensitivity to pipeline failure.

  The design requirements for High Density (T2) shall apply.

  Note: In sensitive use areas, the societal risk associated with loss of containment is a dominant consideration.

- *Environmental (E) The Environmental* Location Class identifies locations of high environmental sensitivity to pipeline failure, including particularly areas where the pipeline failure map

impact on threatened ecological communities or species where rectification of environmental damage may be difficult. Areas of high environmental sensitivity may be identified by analysis of government environmental mapping within the pipeline measurement length and, where required, may be validated by filed surveys conducted by competent persons. A consequence assessment shall be undertaken and depending on the assessed environmental severity the requirements of R2, T1, or T2 shall be applied.

- *Industrial (I)* The Industrial Location Class identifies land that poses a different range of threats because it is developed for manufacturing, processing, maintenance, storage or similar activities or is defined in a local land planning instrument as intended for light or general industrial use. Industrial applies where development for factories, warehouses, retail sales of vehicles and plant predominates. Industrial includes areas of land with public infrastructure serving the industrial use. Industrial Location Class shall be assigned to any portion of pipeline where the immediately adjoining land use is industrial.

  The design requirements for Residential (T1) shall apply.

  Note: In industrial use areas, the dominant consideration may be the THREATS associated with the land use or the societal risk associated with the loss of containment.

- *Heavy Industrial (HI)* Sites developed or zoned for use by heavy industry or for toxic industrial use locations shall be considered classified as Heavy Industrial. They shall be assessed individually to assess whether the industry or the surroundings include features that—

  i. contain unusual THREATS to the pipeline system; or

  ii. contain features that may cause a pipeline FAILURE EVENT to escalate either in terms of fire, or for the potential release of toxic or flammable materials.

  A consequence assessment shall be undertaken, and depending on the assessed severity, the requirements of R2, T1 or T2 shall be applied.

  Note: In heavy industrial use areas, the dominant consideration may be the threats associated with the land use or a range of location specific risks associated with the loss of containment.

- *Common Infrastructure Corridor (CIC)* Land which because of its function results in multiple (more than one) parallel infrastructure development within a common easement or reserve, or in easements which partially or fully overlay the pipeline easement.

  CIC classification includes pipelines within reserves or easements for roads, railways, powerlines, buried cables, or other pipelines. It does not include crossings, roads or tracks which are not gazetted, or where the pipeline is adjacent to but outside a road reserve.

  AS/NZS 2885.1 addresses procedural controls for CIC Location Class.

  Note: In CIC areas, the dominant consideration may be the THREATS associated with the land use by other infrastructure operators or the higher consequences of loss of containment associated with increased transient population (e.g. roads) or other parallel infrastructure.

- *Crowd (C)* The crowd Location Class shall be applied to locations where there may be crowds or congestion leading to concentrations of population that are both intermittent and much higher than typical for the prevailing primary Location Class. Examples include sports fields, roads subject to serious traffic congestion, and rural community halls.

  Where C Location Class is assigned, the Safety Management Study shall examine risk to the concentration of people with consideration of the number of people, the frequency and duration of assembly, the time of day or week that people are present, and the likelihood that threats and the population concentration will occur at the same time. Controls appropriate to the level of risk shall be applied.

  Note: In Crowd areas, the societal risk associated with loss of containment is a dominant consideration. The risk level may vary considerably. For example, the SMS may conclude that a country playing field, which is only used on occasional Sundays, presents a much lower risk than a motorway that becomes highly congested twice every weekday, because of both the frequency of congestion and the likelihood (or otherwise) of concurrent threats.

Safety Management Study (SMS) – The process that identifies threats to the safety and integrity of the pipeline system and applies controls to them, and (if necessary) undertakes assessment and treatment of any risks to ensure that residual risk is reduced to a level that is As Low As Reasonably Practicable.

Other definitions can be found in Australian Standard 2885: Pipelines - Gas and Liquid Petroleum

2. High Pressure Pipelines

High Pressure Pipelines are normally large diameter steel pipelines which operate at very high pressures to transport gas or liquids over long distances. These pipelines are considerably different to the much smaller distribution gas pipelines that transport natural gas to households and small businesses. High Pressure Pipelines may operate at pressures up to 15,306kPa or 2,220psi.

High Pressure Pipelines are buried underground and have a depth of cover of cover that typically ranges between 750mm and 1200mm. They are normally situated within an easement which is between 15m and 30m wide or similar tenure which restricts activities near the pipeline. High Pressure Pipelines can be identified by above ground markers.

There are two main high pressure natural gas transmission pipelines that deliver gas into Adelaide. The Moomba to Adelaide pipeline (MAP) transports gas predominately from Moomba in the state's north or Queensland into Adelaide and the Port Campbell to Adelaide pipeline (PCA) transports gas predominately from the Otway and Bass basins in Victoria into Adelaide. There are other lateral pipelines branching off these main transmission pipelines that provide gas to industrial customers and regional areas, such as Whyalla, Port Pirie, Mount Gambier, Berri and Murray Bridge. Gas supply in Adelaide is for residential, commercial and industrial use, as well as gas fired power stations, which provide approximately 50% South Australia's electricity requirements. This gas supply is critical to the State, not only for its economic development but also the health and wellbeing of all South Australians.

Specific details of South Australian High Pressure Pipelines are summarised in Table 1. The location of South Australian pipelines are shown in Figure 1.

Table 1: Pipeline Design Data

Pipeline	License Number (SA)	Maximum Allowable Operating Pressure	Pipeline Diameter	Wall Thickness
MAP[1]	PL.1	7,322 kPa	560mm	7-9mm
AMCOR Lateral[1]	PL.1	9,930 kPa	114.3mm	4.00mm
Burra Lateral[1]	PL.1	7,322 kPa	88.9mm	4.78mm
Angaston Lateral[1]	PL.1	7,322 kPa	219mm	4.78mm
Mintaro Lateral[1]	PL.1	7,322 kPa	219mm	4.78mm
Pelican Point Lateral[1]	PL.1	9,600 kPa	356mm	7.1mm
Port Bonython lateral[1]	PL.1	10,130 kPa	168.3mm	4.8mm
Port Pirie Lateral[1]	PL.1	8,240 kPa	168.3mm	4.3mm
Spencer Gulf Loop Line[1]	PL.1	10,130 kPa	114.3mm	8.8mm
Wasleys to Adelaide Gas Loop Pipeline[1]	PL.1	7,322 kPa	508mm	9mm
Whyalla Lateral[1]	PL.1	10,130 kPa	219.1mm	4.3mm

Table 1: Pipeline Design Data (Continued)

Pipeline	License Number (SA)	Maximum Allowable Operating Pressure	Pipeline Diameter	Wall Thickness
Liquids Line [1]	PL.2	10,340kPa	355mm	7.1mm
Katnook to SAFRIES[1]	PL.3	10,000kPa	60.3mm	3.9mm
Nangwarry Lateral[1]	PL.4	9,850kPa	88.9mm	3.2mm-4.0mm
South East Pipeline – (Katnook to Mt Gambier and Snuggery)[1]	PL.4	10,000kPa	168.3mm	4.2mm – 5.0mm
Riverland Pipeline[2]	PL.6	9,880 kPa	114.3mm	3.0-4.8mm
Berri to Mildura Pipeline[2]	PL.11	9,525 kPa	114.3mm	3.2-4.8mm
PCA (east of Coomandook)[3]	PL.13	15,306 kPa	350mm (2 parallel pipelines)	7.8mm – 9.8mm
PCA (west of Coomandook)[3]	PL.13	15,306 kPa	450mm	10.1mm – 12.1mm
SESA Lateral (Poolaijelo to Penola)[2]	PL.16	10,200 kPa	219mm	4.10mm – 6.77mm

1. Operator - Epic Energy
2. Operator - APA Group
3. Operator - South East Australia Gas Pty Ltd

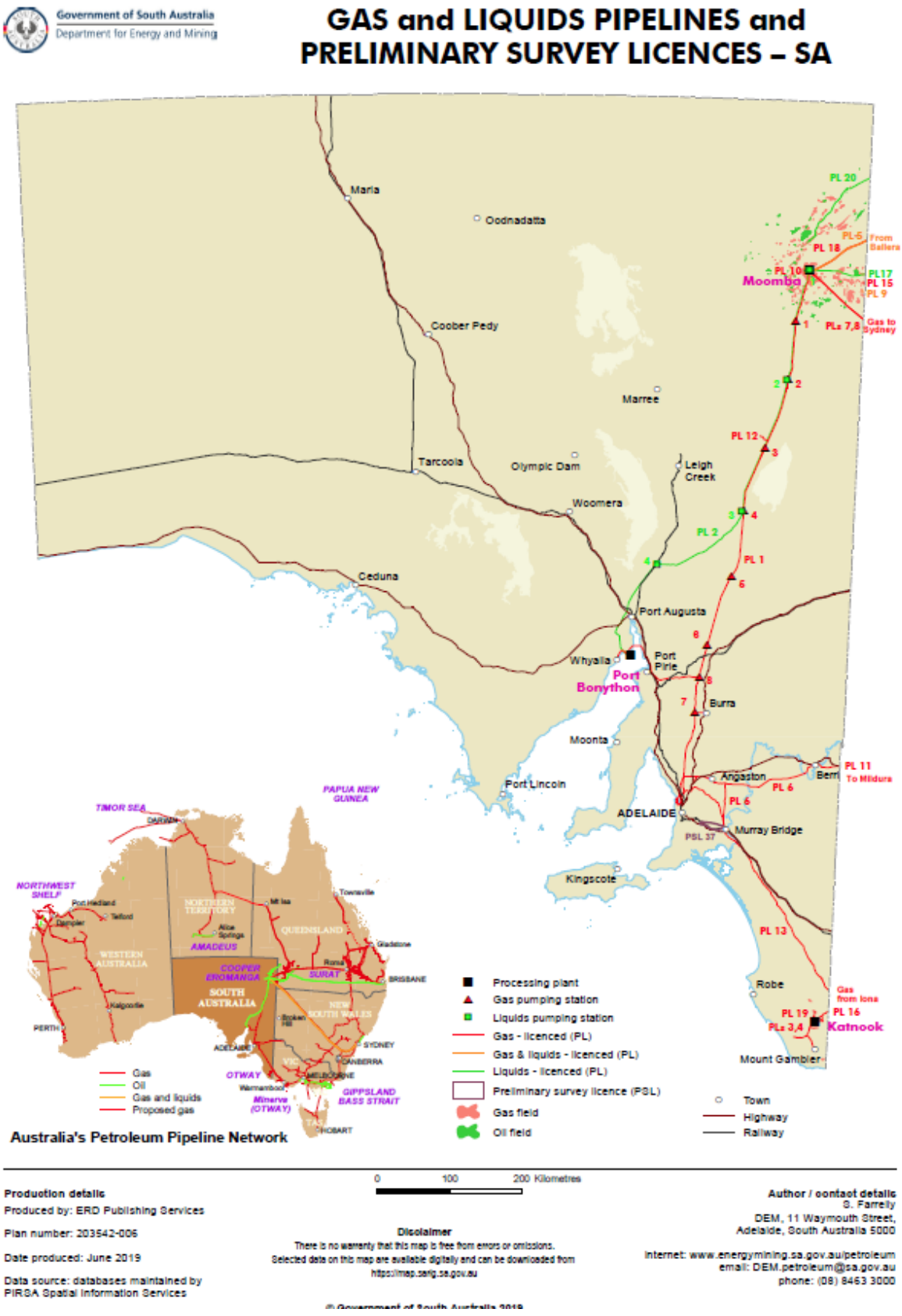


Figure 1: High Pressure Pipelines in South Australia

3. Applicable Standards and Legislation

High Pressure Pipelines are licenced and regulated by the Energy Resources Division of the Department of State Development (DEM) under the *Petroleum and Geothermal Energy Act 2000* (PGE Act). The *Petroleum and Geothermal Energy Regulations 2000* require all High Pressure Pipelines to be designed, constructed, operated and maintained in accordance with Australian Standard *(AS) 2885: Pipelines – Gas and Liquid Petroleum.* This standard exists to ensure protection of the pipeline, which in turn ensures the safety of the community, protection of the environment and security of gas supply to users. The application of this Standard has maintained an enviable safety record for gas pipeline operation in Australia.

Australian Standard 2885 requires the Pipeline Operator to define a Primary Location Class and where necessary a Secondary Location Class within the pipeline Measurement Length. If there is a change in pipeline location class, or construction activity is proposed on or adjacent to a pipeline corridor /easement, AS2885 requires a detailed Safety Management Study (SMS) to be undertaken, which incorporates a risk assessment, as described in Section 7 of this guideline. As a location class moves from rural to residential, the level of pipeline protection required generally increases to ensure protection of the pipeline and to manage the risk to persons, property and the environment.

The rights of a Pipeline Operator to operate a High Pressure Pipeline are provided for under Section 46 of the *Petroleum and Geothermal Energy Act 2000.* High Pressure Pipelines are normally situated within an easement, although can be installed in other forms of land tenure, such as a lease, license or “right of way”. All of these forms of tenure are negotiated with landholders and interested parties at the time of construction. Easements provide the Pipeline Operator with guaranteed access to the land and a level of protection is also afforded through the conditions associated with easements. Easements are normally registered on titles, although the MAP and South East Pipelines are afforded a statutory easement under the *Natural Gas Authority Act 1967* and may not be registered on titles. Pipeline Operators may need to carry out maintenance on easements, or may require additional space adjacent to the easement for capacity enhancement.

A pipeline easement restricts land owner and third party activity. Unauthorised activity that interferes with the operation and management of a pipeline is prohibited under Section 93 of the PGE Act.

4. Notification Area

4.1 Notification Area Concept

Some jurisdictions attempt to provide for High Pressure Pipeline safety by nominating a setback distance from a pipeline that prohibits development within a nominated distance from the pipeline, while others mandate specific factors that increase the pipeline wall thickness in areas of increasing population density. The first concept can control development close to a pipeline, but it fails the logic test, because the consequence distance of a pipeline failure is so large, that to be effective, the safe setback distance would unnecessarily prevent development of large areas of land. The second concept fails because the only way it can deal with development is to require the pipeline to be abandoned, or for the operating pressure to be reduced. This imposes significant cost impacts, and assuming the demand remains, will require construction of additional High Pressure Pipelines which arguably increase the overall risk.

The Australian Standard requires the pipeline Licensee to be responsible for pipeline safety. In the pipeline design phase, the Licensee is required to design the pipeline for safety based on the planning schemes implemented at that time, or which can be reasonably foreseen. Usually this involves negotiation with the responsible land planning authorities. Through the operating phase, the Pipeline Operator is required to maintain the pipeline safety by identifying threats arising from changes to the environment through which the pipeline passes.

While Pipeline Operators have procedures to monitor changes in land use, experience has shown that by the time changes are identified, the plans have developed to a point where it is difficult to influence the plan so as to reduce the safety impact.

The Notification Area concept is promoted as a method by which the Pipeline Operator can be notified of potential developments sufficiently early in the process for proper consideration of pipeline safety in development planning. The Notification Area is identified as an area of interest on land planning maps and geographic information systems which is in addition to the pipeline centreline and the corridor / easement that provides tenure for the pipeline.

Experience has shown that the Notification Area process can work well and it is supported by both Pipeline Operators and Planning Authorities. The Notification Area concept should be implemented across the whole planning regime including high level state planning, regional planning managed by councils and development applications within planning zones that may impact locally on the pipeline safety profile.

The Australian Pipelines and Gas Association (APGA) has on behalf of the industry, set up a working group which is continuing to support the industry and planning authorities in each State to develop Notification Areas. A database has been established to provide planners with access to geospatial information on pipeline locations and notification areas and can be accessed at:

https://maps.landpartners.com.au/apd/ .

APGA along with South Australia pipeline operators are continuing to work with South Australian authorities to improve State Planning process with respect to land use change and development in the vicinity of pipelines

4.2 Notification Areas for South Australian Pipelines

While easements exist to control access to pipelines, a much larger area should be considered when planning and developing land in the vicinity of High Pressure Pipelines. The term Notification Area has been used in this guideline to define the area in which Pipeline Operators should be consulted regarding rezoning proposals and development projects in the vicinity of a High Pressure Pipeline to ensure that any changes to the pipeline location class in accordance with AS2885 are identified. Proposals requiring notification are rezonings from rural to urban or urban deferred, and rezonings in a planning or local scheme, which increase residential densities, introduce certain industrial uses or introduce the potential for sensitive use. Sensitive use refers to areas where the consequences of a pipeline failure may be increased due to the community sector impacted by the failure having limited ability to protect themselves from the consequences of a pipeline incident. Sensitive use includes schools, hospitals, aged care facilities and prisons.

Notification Areas are defined in Table 2, which sets out the distances within which planning and development approval authorities should notify Pipeline Operators of rezoning proposals for High Pressure Pipelines in South Australia. The Notification Area is the radial distance from the pipeline within which Pipeline Operators should be aware of any proposed activity so they can work with planning authorities and developers to implement design changes that reduce the risk to and from the pipeline. Early consultation will ensure that the impact of any constraints can be minimised. Notification Areas for the MAP and PCA are shown in Figure 2.

Table 2: Notification Area for High Pressure Pipelines in South Australia

Pipeline	**Notification Area (radial distance from pipeline)**
MAP	560m
Amcor Lateral	55m
Burra Lateral	33m
Angaston Lateral	98m
Mintaro Lateral	98m
Port Bonython lateral	46m
Port Pirie Lateral	73m
Spencer Gulf Loop Line	109m
Wasleys to Adelaide Gas Loop Pipeline	560m
Whyalla Lateral	109m
Liquids Line	400m
Katnook to SAFRIES	86m
Nangwarry Lateral	40m
South East Pipeline – Katnook to Mt Gambier and Snuggery	86m
Riverland Pipeline	200m
Berri to Mildura Pipeline	200m

PCA	585m[1]
SESA Lateral	403m

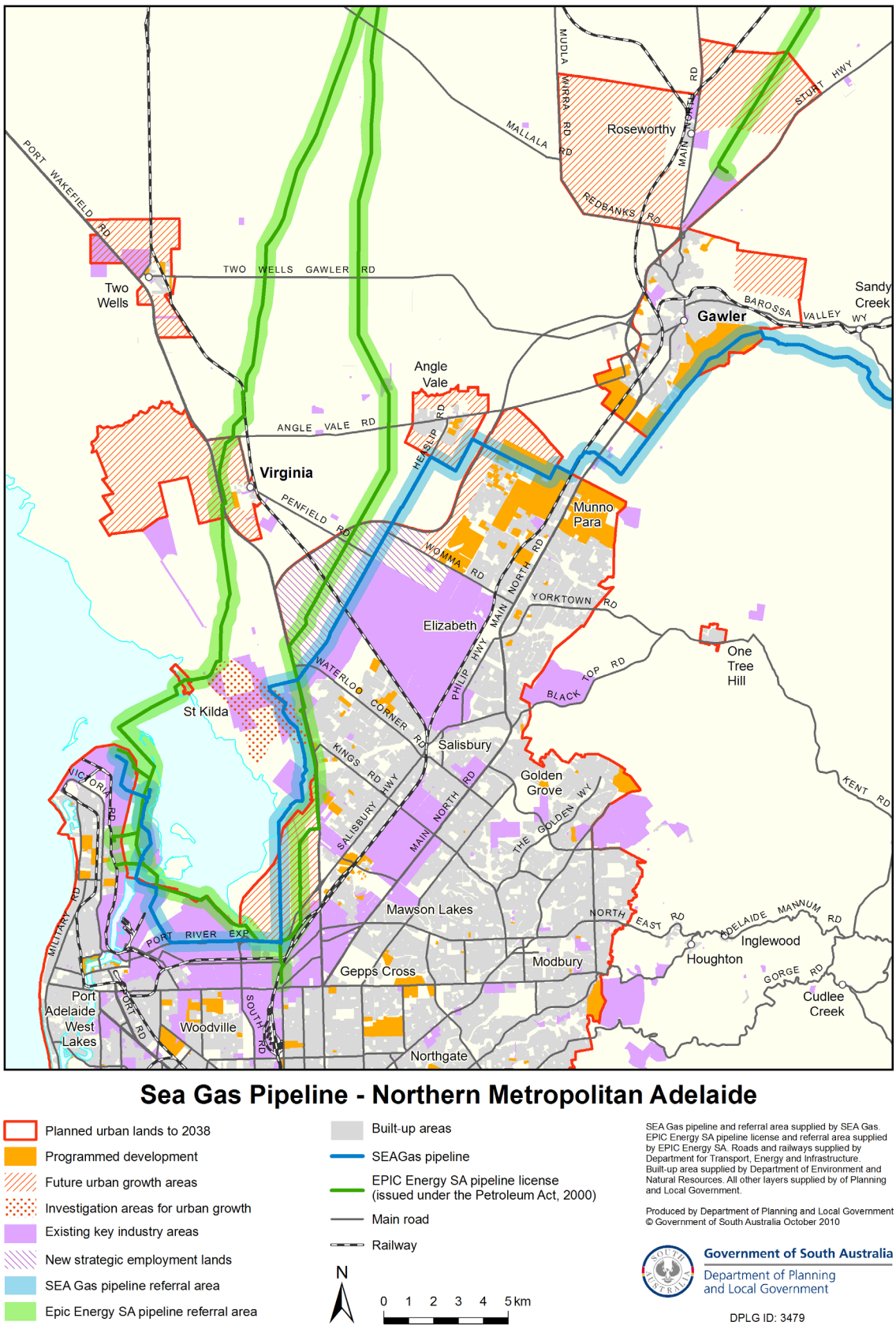
Notifications are not required in the following circumstances:

a) Planning or Developments outside of the Notification Area.

b) Incidental land use or development (ie land use or development associated with or attached to existing development and incidental to its main function) that **does not** change the location class under AS2885 and does not involve work within a High Pressure Pipeline easement.

c) Proposals that have previously been supported or approved by the Pipeline Operator based on former standards or assessment.

[1] The measurement length for the PCA has been reduced from 640m to 585m due a change in AS2885 that allows the lower heating value of the gas to be used in the relevant calculation,



Sea Gas Pipeline - Northern Metropolitan Adelaide

- Planned urban lands to 2038
- Programmed development
- Future urban growth areas
- Investigation areas for urban growth
- Existing key industry areas
- New strategic employment lands
- SEA Gas pipeline referral area
- Epic Energy SA pipeline referral area
- Built-up areas
- SEAGas pipeline
- EPIC Energy SA pipeline license (issued under the Petroleum Act, 2000)
- Main road
- Railway

N

0 1 2 3 4 5 km

SEA Gas pipeline and referral area supplied by SEA Gas. EPIC Energy SA pipeline license and referral area supplied by EPIC Energy SA. Roads and railways supplied by Department for Transport, Energy and Infrastructure. Built-up area supplied by Department of Environment and Natural Resources. All other layers supplied by of Planning and Local Government.

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Figure 2: Notification Areas for High Pressure Pipelines

5. Planning Considerations for High Pressure Pipelines

Planning and rezoning in the vicinity of a High Pressure Pipeline must include an assessment of the compatibility of the existing pipeline design with the proposed changes in land use. Changes to land zoning, either through a planning proposal or a development proposal, where a High Pressure Pipeline already exists can result in significant risk to the pipeline by increasing the likelihood of failure (as a result of increased activity in the vicinity of the pipeline), and the consequence of the failure (as a result of the increased population density, or increase in built assets). Some High Pressure Pipelines were designed many years ago in predominately rural and rural residential land. The threats considered in the design were very different from those encountered in an urban development. Without additional protection measures there is likely to be an unacceptable risk both to and from the pipeline if the land use is changed.

Similar to other utility and service providers, Pipeline Operators need to be consulted before standard agency referrals and public consultation programs when planning documents are changed to determine the potential safety impacts and ensure that impacts on the pipeline are fully considered as part of the planning process. Every pipeline is different and the impact of proposed land use change must be considered on a case by case basis.

5.1 Planning Assessment within a Pipeline Notification Area

The following process should be followed to ensure that High Pressure Pipelines are adequately considered in the early stages of strategic planning:

- The centreline and the Notification Area of each licensed pipeline should be provided to land planning authorities as coordinated GIS themes.
- When preparing a structure plan, development plan or development plan amendment the Authority should overlay the proposal on the Authority's GIS and if it overlaps a Notification Area, should notify the Pipeline Operator.
- The planning authority and Pipeline Operator will assess the possible impact on pipeline safety.
- Considerations that should be discussed with Pipeline Operators are;
  - Compatible land use within the Notification Area.
  - Potential noise and other impacts from High Pressure Pipeline above ground facilities.
  - Proximity of other utilities and services, including roads and railways.
  - Future High Pressure Pipeline requirements ie. protection of future corridors suitable for High Pressure Pipelines to service new development areas.
- If required the planning authority and Pipeline Operator will carry out a SMS in accordance with Section 7.4 of this guideline and identify changes to the plan or the pipeline that would be required to manage the pipeline safety.
- After negotiation between the Planning Authority and the Pipeline Operator there may be covenants imposed on subsequent developments to address pipeline safety.

6. Development Considerations for High Pressure Pipelines

Proponents of developments within a Notification Area should discuss their plans with Pipeline Operators at an early stage and prior to the lodgment of a Development Application. Compliance with AS 2885 must be demonstrated for developments within a pipeline Notification Area, which requires development of a pipeline SMS, as described in Section 7 of this guideline.

Developers must continue to liaise with the Pipeline Operator leading up to site works and construction to review the SMS and agree a pipeline protection plan for construction in conjunction with the Pipeline Operator. Developers should consider the costs of these processes when planning a development. Early involvement of Pipeline Operators will lead to the lowest cost outcomes for the development. Physical protection measures such as concrete barriers or pipeline relocation are very expensive and time consuming if developments fail to account and plan effectively for High Pressure Pipelines.

6.1 Development Assessment within a Pipeline Notification Area

Assessment of Development Proposals under the *Development Act 1993* does not specifically require referral to Pipeline Operators, as the Act requires referral to electricity, water and sewage operators. Without referral to the Pipeline Operator mandated under the Development Act it is incumbent on the approval authority to consider the impact of developments on High Pressure Pipelines. This is best achieved by contacting the Pipeline Operator to ensure that the developer has considered this critical infrastructure in their development planning. The requirement of a SMS should be viewed as a minimum to determine the potential impact and safety issues are sufficiently addressed. The following steps should be followed to ensure that High Pressure Pipelines are adequately considered in an assessment:

- The centreline and the Notification Area of each licensed pipeline has been provided to land planning authorities as coordinated GIS themes.
- On receipt of a subdivision or development application, the Authority should overlay the proposal on the Authority's GIS and if it overlaps a Notification Area, should notify the developer and Pipeline Operator.
- The developer and Pipeline Operator will assess the possible impact on pipeline safety.
- If required the developer and Pipeline Operator will carry out a SMS in accordance with Section 7.4 of this guideline and identify changes to the development and / or the pipeline that would be required to manage the pipeline safety.
- Assuming the SMS shows that the changes will manage pipeline safety, the Pipeline Operator will approve the SMS and agree to the development proceeding, and will initiate processes to manage risk through the development construction.

6.2 Development restrictions on Pipeline Easements

Easement agreements vary to cater for local conditions and requirements. Standard clauses are normally included in High Pressure Pipeline easements to address operational requirements. The following development restrictions may apply within a pipeline easement;

1. Land use must be compatible with the conditions of pipeline easements. The pipeline easement should be used as public open space wherever practicable. On a pipeline easement, landscaping will typically be restricted to grasses, groundcovers and low shrubs in order to maintain line of sight along the pipeline. Any landscaping on the easement will require the written consent of the Pipeline Operator, and should be documented in a SMS.

2. Permanent structures of any kind including; buildings, swimming pools, artificial lakes, storm water compensating basins, explosives, inflammables and corrosives are not permitted on a pipeline easement. Exceptions must have the written approval of the Pipeline Operator and should be documented in a pipeline SMS.

3. Any further easement over the existing pipeline easement requires the written consent of the Pipeline Operator. This may be subject to a further agreement with the Pipeline Operator to protect all interests.

4. Activities over the pipeline easement may require approval from the Pipeline Operator and can only be performed under the Pipeline Operator's work permit system, which may require a job hazard analysis to be completed.

The Pipeline Operator should be contacted to confirm easement conditions.

7. Safety Management Studies

7.1 Introduction

This section provides guidance on Safety Management Studies and pipeline risk assessments for a proposed development within the Notification Area of a High Pressure Pipeline based on the requirements of AS2885. The information provided is indicative and needs to be validated by a pipeline specific SMS.

Australian Standard 2885 Pipelines - Gas and liquid petroleum (AS2885) is the Australian Standard recognised by the Council of Australian Governments (COAG) for High Pressure Pipelines designed, constructed and operated throughout Australia. Rather than mandate design requirements for safety, AS 2885 requires the Pipeline Operator to be responsible for safety, by designing and managing the pipeline to protect it from identified threats, using a combination of physical and procedural controls, in addition to basic design controls. The identified threats and the controls are required to be documented in a SMS, and the study is required to be validated by a formal Workshop of Stakeholders.

The SMS requires a metre by metre qualitative analysis to identify each threat to pipeline integrity. This is then followed by a defined process to manage each threat by; eliminating it through external interference protection, or design processes, or by development of management procedures to reduce the risk to negligible, low or in the event that the risk is intermediate, to as low as reasonably practicable (ALARP). Pipeline Operators must also operate and maintain pipelines consistent with any additional requirements of their licence.

Acceptable levels of risk to a High Pressure Pipelines are determined by conducting a qualitative risk assessment as part of the SMS, using a suitably qualified SMS facilitator. Achieving an acceptable risk level of negligible, low or ALARP may require changes to the planning proposal, changes to the operational characteristics of the pipeline or installation of additional safety measures such as concrete barriers, additional coverage and/or training of the construction crew involved in any site works adjacent to the pipeline.

For areas deemed to be “high consequence” under AS2885, which include residential (T1), high density (T2) and sensitive land uses (S), a detailed study demonstrating risk is ALARP needs to be conducted (even if residual risk is assessed to be low or negligible) for all credible threats that can produce holes in the pipeline that are of sufficient size to lead to full bore rupture, or that could lead to the energy release rate thresholds of AS2885 being exceeded. The requirements of the ALARP study under AS2885 are very stringent to ensure consequences of a pipeline failure in residential, sensitive or high density areas are avoided, even if such a failure is very unlikely.

Relocation of the pipeline is a very involved and complicated outcome which is rarely economically justified for the developer. It is, therefore, important for the developer to liaise with the Pipeline Operator prior to lodgement of a Development Application in order to reach agreement on the mitigation measures that a SMS identifies and to factor the costs of these measures into the project. It is important to remember that Pipeline Operators are often able to provide assistance in working through compatible designs and developments that will minimise issues that may arise later in the development approval or project implementation. The Pipeline Operator is responsible for pipeline safety and if the SMS proposes solutions that do not meet the Pipeline Operators requirements then they may reject the finding.

7.2 Threats to be considered

As High Pressure Pipelines are well maintained and are monitored on a regular basis, the major potential cause of pipeline failure is impact on the pipeline by external factors such as an excavator or drill penetrating the pipeline. Where, due to a land use change, the pipeline has not been designed to mitigate the threat from third party activities, there is a risk of a major catastrophe through the penetration and/or potential rupture of the pipeline. Subdivision and development works around pipelines can increase excavation and boring work in the vicinity of the pipeline, and hence the risk of such interference.

There are typically two phases of threats to a High Pressure Pipeline that need to be managed for the duration of a land development project. They are:

(a) Specific threats from the construction activity associated with a development such as:

- excavation for road construction or service installation;
- vertical augers used for the installation of poles and posts;
- directional drills used to install new services;
- vibrating compaction over the pipeline;
- heavy vehicles crossing the pipeline, at other than designated locations, resulting in elevated stresses on the pipeline;
- damage to the protective coating of the pipeline;
- excessive additional cover resulting in uneven external loading on the pipeline; and
- removal of cover increasing the likelihood of third party damage.

(b) Threats that remain throughout the life of a High Pressure Pipeline or have the potential to interfere with maintenance of a pipeline;

- excavation activity for maintenance of roads, services or other infrastructure;
- vertical augers for fencing or post installation;
- directional drilling to install new services under roads;
- electrical hazards (induced current) from adjacent High Voltage Power lines or substations;
- AC corrosion from adjacent power lines;
- interference with the pipeline cathodic protection system from adjacent electrified railway or tram line;
- interference with the pipeline cathodic protection system from installed cathodic protection systems on third party services;
- noise from pressure regulation, compressor and vent stations impacting on residential developments; and
- some landscaping which may be deep rooted or limit “line of sight” between pipeline identification markers.

7.3 Measures that may reduce risk within the Notification Area

7.3.1 Risk factors

The major factor influencing risk is the potential for the pipeline to fail and the extent of the resultant loss of containment (gas escaping under pressure).

The important factors that can impact on the probability of failure of a pipeline and hence the level of risk include:

- Physical Measures, such as pipe wall thickness or how deep it is buried; and
- Procedural measures.

The Pipeline Operator will be able to provide further information on how these factors impact on risk.

7.3.2 Physical measures to reduce risk

The purpose of physical protective measures is to prevent loss of pipeline integrity resulting from an identified third party interference event by either physically preventing contact with the pipe, or by providing adequate resistance to penetration of the pipe itself.

Protective measures include (but are not limited to):

- Increased wall thickness (normally not practicable for an operating pipeline as it requires pipe replacement);
- Increased depth of cover (noting that there are practical depth of cover limitations in order to ensure maintainability);
- Buried concrete or other hard cover above or adjacent to a pipeline (this has been shown by studies to significantly reduces the potential for failure);
- Restriction of access via bollards, fencing etc.**;**
- A reduction in pipeline Maximum Allowable Operating Pressure can reduce the consequence of a pipeline failure or rupture. However, this approach is generally not practicable, as it will also reduce the capacity of the pipeline and may impact gas supplies; and
- Pipeline relocation to a location where the consequence is reduced (potentially at significant cost and risk to gas supply). This option should not be considered without examining other alternatives.

In considering the alternatives, the applicant should consult with the Pipeline Operator on the cost and suitability of the measures. To ensure reduction of the risk to an acceptable level, it will usually be necessary to apply the mitigation measures to the affected area and the adjoining land along the pipeline for the radial distance defined in Table 2. Permission from the adjoining landowner(s) will need to be sought by the applicant to enable installation and ongoing maintenance of the required mitigation measures.

7.3.3 Procedural measures to reduce risk

Pipeline Operators have a number of procedural measures in place to reduce or remove the risk of pipeline damage. These include the following:

- Pipeline patrols to identify encroachment and related excavation activities adjacent to the pipeline;
- Pipeline marker signs and marker tape to indicate the presence of a pipeline;
- Landowner and stakeholder liaison to raise awareness of pipelines;
- 'Dial Before You Dig' (tel: 1100 or www.1100.com.au), a free service which enables parties to obtain information on below ground services, including the location of gas pipelines;
- Management of construction activities in the vicinity of the pipeline to ensure:
    - the location of the pipeline is physically proven by hand excavation;
    - equipment is sized so that it cannot rupture the pipeline;
    - a third party performing work is made aware of the pipeline location and the possible consequences of damaging the pipeline; and
    - supervision by the Pipeline Operator of third party activity which has the potential to damage a pipeline.

7.4 Preparing a pipeline Safety Management Study (including a risk assessment)

The Pipeline Operator is required to operate and maintain the High Pressure Pipeline consistent with the requirements of the PGE Act and the specific pipeline licences, regulated by DEM. This involves the assessment and management of all risks to the pipeline in a manner consistent with the requirements of AS2885, which should establish that the level of risk should be low, negligible or ALARP.

The process for preparing a pipeline SMS is:

a) The applicant (Developer or Planner) should contact the Pipeline Operator as early as possible regarding the proposal to define the scope of the SMS. The SMS must consider the qualitative risk assessment of the subject proposal or application, and potential risk mitigation measures to facilitate the proposed development within the vicinity of the pipeline. The Pipeline Operator and the applicant should reach agreement at this stage on an appropriately qualified person to facilitate the SMS, the process, information to be supplied by the Pipeline Operator and the developer or planner and outcomes required to facilitate and ensure a comprehensive study in a timely manner. SMSs for small developments may be undertaken by the Pipeline Operator. Larger proposals will require an independent consultant to facilitate the study to verify risks to public, property and environment have been adequately managed.

b) Where land use has changed since a pipeline was constructed, the responsibility to prepare the SMS and undertake the risk assessment lies with the developer, although the Pipeline Operator will be able to provide guidance and actively participate throughout the process.

c) Where an independent facilitator is engaged to run an SMS, the Pipeline Operator will provide the with information and access to relevant data necessary to complete the study and risk assessment.

d) Any information in relation to future developments will be handled by the Pipeline Operator in the strictest confidence; information will only be used to work with planners/developers to mitigate risk to the pipeline and effectively plan development.

e) The SMS will determine which (combination) of the selected mitigation measures will reduce the level of risk to negligible, low or ALARP to meet the requirements of AS2885. The findings of the study and the selected mitigation measures should be presented in a clear, concise and unambiguously worded report.

f) The applicant should discuss the recommendations of the report with the Pipeline Operator and document the agreed mitigation measures and their area of application in a safety management plan. As a minimum the plan should document:
   - the mitigation measures;
   - the timing and responsibility for the installation of the mitigation measures;
   - any ongoing management measures;
   - the cost of implementing the mitigation measures, both initial costs of construction and ongoing maintenance cost; and
   - responsibility for these costs.

g) Following endorsement by the Pipeline Operator the applicant should then forward the SMS, as part of the development application to the relevant planning authority. This will ensure that the planning and development approval authorities know that the development has appropriately addressed pipeline safety.

8. Relevant authorities, agencies and organisations

Where appropriate, planning proposals and applications should be referred to the following authorities, agencies and organisations:

- Pipeline Operators
- Energy Resources Division, Resources and Energy Group, Department of Energy and Mining (DEM)

To determine the appropriate Pipeline Operator contact DEM or the APGA or refer to easement documentation.

For further information regarding the information in this guideline and statutory planning proposals and applications in the vicinity of High Pressure Pipelines, contact:

Pipeline operators
South East Australia Gas Pty Ltd (SEA Gas)
Port Campbell to Adelaide Pipeline
Website: www.seagas.com.au
Tel: (08) 8236 6800

Epic Energy
Moomba to Adelaide Pipeline
Website: www.epicenergy.com.au
Tel: (08) 8343 8100

APA Group/AGN
Riverland Pipeline, Berri to Mildura Pipeline, SESA Pipeline and Distribution Network
Website: www.apa.com.au
Tel: (08) 8159 1661

Santos Ltd
Moomba – Port Bonython Liquid Hydrocarbon Pipeline.
Website: www.santos.com
Tel: 61 8 8116 5000

Pipeline licence regulator
Energy Resources Division
Resources Energy Group
Department of Energy and Mining
Website: www.energymining.sa.gov.au/petroleum
email: DEM.petroleum@sa.gov.au
Tel: 08 8463 3000

Australian Pipelines and Gas Association
Website: www.apga.org.au
Tel: (02) 6273 0577
Email: apga@apga.asn.au