Attachment 8.13

Response to Draft Decision: AGN's Safety, Reliability, Maintenance and Technical Management Plan

2016/17 to 2020/21 Access Arrangement Information Response to Draft Decision

Australian Gas Networks

SAFETY, RELIABILITY, MAINTENANCE AND TECHNICAL MANAGEMENT PLAN

SOUTH AUSTRALIAN NATURAL GAS DISTRIBUTION NETWORK

August 2015

DOCUMENT APPROVAL

This Safety, Reliability, Maintenance and Technical Management Plan has been reviewed and approved electronically by the following Australian Gas Networks and APA Group personnel.

[redacted]
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DOCUMENT CHANGE RECORD

Current Revision REV4-A-28082015
Superseded Revision REV3-A-29082014

Version	
REV1-A-15082012	☐
REV2-A-30082013	☐
REV3-A-29082014	☐
REV4-A-28082015	☒
REV1-B-ddmmyyyy	☐

Date of change	Section	Page No.	Details of change
31/07/2002	ALL	ALL	A full revision of the SRMTMP was completed.
15/08/2007	ALL	ALL	A full revision of the SRMTMP was completed.
19/08/2008	Figure 2	12	Updated: SA Networks Organisation Chart.
20/8/2008	Appendix 4	40	Updated: Condition and size of network.
26/08/2008	Appendix 5	41	Updated: Regulator Summary.
	Appendix 6	42	Updated: Gas Quality Characteristics.
	Appendix 7	43	Updated: APA Risk Matrix.
	Appendix 8	44	Updated: HSE Policy.
19/06/2009	1.6	12	Updated: Changed contact person for correspondence.
4/07/2009	Table 5	34-37	Updated: Description and response to leak reports and repair.
4/07/2009	Table 6	37-38	Updated: Survey Frequency table.
5/07/2009	Figure 2	12	Updated: SA Networks Organisation Chart.
9/07/2009	Appendix 4	49	Updated: Condition and size of network.
20/07/2009	Appendix 6	51-52	Updated: Gas Quality Characteristics.
24/07/2009	Appendix 5	50	Updated: Regulator Summary.
14/08/2009	ALL	ALL	A full revision of the SRMTMP was completed.
06/2010	4.5.10	33-34	Updated: Reference to Policy and Procedures.
	Table 5	34-37	Updated: Description and response to leak reports and repair.
07/2010	1.1	10	Updated: Added text reference to SA Gas Act and Regulations.
	Figure 1	11	Updated: Envestra Organisation Structure.
	Figure 2	12	Updated: APA SA Networks Management Organisation Structure.
	Figure 3	12	Updated: Inserted new Figure 3. APA Networks National Management Organisation Structure.
	1.7	13	Updated: Added text reference to AER.
	1.8	13	Updated: Added text reference to OTR.
	2.2.5	16	Updated: Number of regulators.
	3.2	18-19	Updated: Added text updated name and number of APA Business Groups.
	3.3.1	19	Updated: Amended table to include odorisation as a key risk.
	3.3.2	20	Updated: Added text and updated section to include Asset Management Plan and Distribution System Performance Plan.
	4.5.7	33	Updated: Added reference.
	4.5.10	34	Updated: Leakage Management: added text and description of Mains Replacement Plan.
		38	Updated: Inserted APA Leak Response and Repair Organisational Structure.
	4.10.1	44-45	Updated: Audits - revised and updated section.

Date of change	Section	Page No.	Details of change
	App 4	51	Updated: Condition and size of network.
	App 5	52	Updated: Regulator Summary.
	App 6	53-54	Updated: Gas Quality Characteristics.
07/2011	Figure 2	12	Updated: APA SA Networks Management Organisation Structure.
07/2011	Figure 3	13	Updated: Figure 3 - APA Networks National Management Organisation Structure – includes Mains Replacement Program Manager.
	Tables 1 & 2	14	Updated: Deleted Tables 1 and 2 and inserted new Appendix 4 – Gate Stations and Farm Taps.
	ALL	ALL	Updated: References to current APA procedures, work instructions and Australian Standards where applicable.
	3.3	20	Updated: Note regarding APA SA Networks risk assessment added.
	4.4.3.1	25	Updated: Revised in line with current I&C connection process.
	4.5.8	34	Updated: Changed reference to updated Odorising Management System document.
	4.7	43-44	Updated: Inserted comment re APA new Learning Management System.
	Appendices	50	Updated: Inserted new Appendix (see tables 1 and 2 above) and renumbered Appendices.
08/2012	ALL	ALL	A full revision of the SRMTMP was completed.
08/2012	-	-	Updated: Changed naming convention – is now REV + the number of the current revision (major updates every 5 years) + letter (starting with A as first new revision) + date of revision (ddmmyyyy).
30/08/2013	ALL	ALL	A full revision of the SRMTMP was undertaken.
29/08/2014	ALL	ALL	A full revision of the SRMTMP was undertaken.
28/08/2015	ALL	ALL	A full revision of the SRMTMP was undertaken.
	2.1, 2.3	9	Updated: Reflect changes from Envestra to AGN
	3.2.4	13	Addition of Odorising Facilities section
	4.5.8	28	Relocated some of the details into section 3.2.4
	4.5.11	29	Added additional details
	4.6.1, 4.6.2, 4.7, 4.10	30, 34	Reworded and aligned with current practices/procedures
	5.3.238	38	Updated: Reflects APA Risk Management Framework and process
	Appendix 6,7,8	51, 53, 54	Updated: New details
	Appendix 9	56	Updated: Newer revision added
	Appendix 10	57	Updated: Documents

Note: References to procedures, work instructions and Australian Standards in this document are correct at the time of writing.

TABLE OF CONTENTS

1.1 INTRODUCTION

1.2 PURPOSE

This Safety, Reliability, Maintenance and Technical Management Plan ("Safety Plan") has been prepared in accordance with section 26(1)(b) of the *Gas Act 1997* (SA) and Regulation 49(2) of the *Gas Regulations 2012* (SA) and demonstrates how Australian Gas Networks Limited (ACN 078 551 685) ("AGN") and its contracted network operator, APT O&M Services Pty Ltd (ACN 112 358 586) ("APA"), continues to design, construct, operate and maintain the South Australian Natural Gas Distribution Network ("the distribution network") in a safe and efficient manner.

This Safety Plan is periodically reviewed in accordance with section 26(1)(b)(i) of the Act which provides the basis upon which AGN can assess compliance and effectiveness of the plan.

1.3 SCOPE

This Safety Plan applies to the South Australian distribution network, a detailed description of which is provided in Section 3.

1.4 OBJECTIVES

This Safety Plan is part of an overall approach to system management and follows a continuous improvement cycle of Commit, Plan, Do, Check and Act.

The objectives of this Safety Plan are to ensure that:

- A strong focus on safety and reliability is maintained in relation to the operation and management of the distribution network in South Australia;
- Suitable safety management systems are in place and operating to ensure that the risks relating to the operation of the distribution network are effectively managed to keep risks as low as reasonably practicable; and
- All relevant information related to the safe and reliable operation of the distribution network is communicated to those who require such information.

1.5 STRUCTURE

This Safety Plan comprises 4 sections:

1. Background;
2. Distribution Network Description;
3. Provisions for Safe Network Management; and
4. Formal Safety Assessment.

This Safety Plan has been prepared with the aid of Australian Standard 4568-2005 "Preparation of a Safety and Operating Plan for Gas Networks", however it has been prepared to meet the specific requirements set out in Regulation 49(2) of the *Gas Regulations 2012* (SA).

2 BACKGROUND

2.1 AUSTRALIAN GAS NETWORKS LIMITED

Envestra Limited changed its name to Australian Gas Networks Limited ("AGN") following the move to full ownership of Envestra by the Cheung Kong Consortium, and the subsequent delisting of Envestra from the Australian Securities Exchange on 17 October 2014. AGN is licensed by the Essential Services Commission of South Australia ("ESCOSA") to operate the natural gas distribution network in South Australia. AGN also has gas networks in Victoria, New South Wales, Queensland and the Northern Territory. AGN has an Operating and Maintenance Agreement with APA Group for each of its networks.

2.2 APA GROUP

APA Group's operations cover all mainland Australian States and the Northern Territory. APA Group's infrastructure management services include design, construction, operation and maintenance along with the management of associated commercial issues such as pricing and tariffs, marketing, regulation and contracts. Under a long term contract with AGN, APA Group manages and operates AGN's assets nationally with responsibility for the safe and reliable supply of natural gas to over one million consumers.

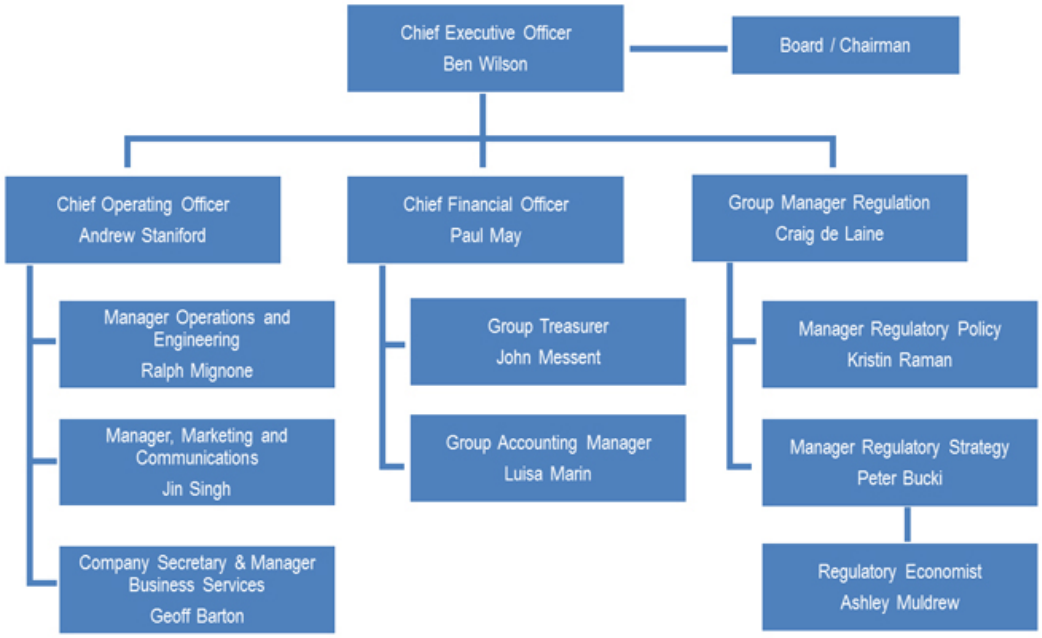
APT O&M Services Pty Ltd ("APA") is the entity responsible for operation and maintenance of the South Australian distribution, a wholly owned subsidiary of the Australian Pipeline Trust.

2.3 ORGANISATIONAL STRUCTURE

Australian Gas Networks Limited

AGN has overall responsibility for the assets it owns and must ensure that the safety and reliability of the distribution network is maintained. AGN's management structure and relevant personnel is shown in Figure 1.

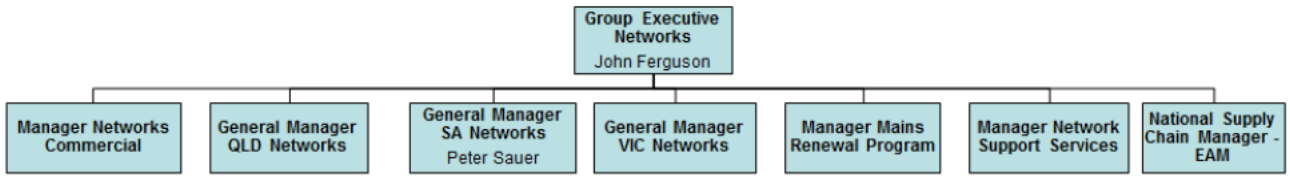
Figure 1.



APA

APA operates and manages the distribution network and is responsible for the safety, reliability and integrity of the network. APA's National Networks management structure is shown in Figure 2 and the key management personnel of the South Australian Networks team are shown in Figure 3.

Figure 2.



[redacted]

2.4 RESPONSIBILITY

This Safety Plan has been developed by APA on behalf of AGN. All correspondence relating to the Safety Plan should be addressed to:

[redacted]
APA Group
Supervisor Technical and Regulatory Compliance
330 Grange Road, Kidman Park SA 5025
Direct: (08) 8159 1633
[redacted]

Further contact details for AGN and APA are provided in Appendix 1.

2.5 CONSULTATION AND COMMUNICATION

This Safety Plan is communicated to all key stakeholders and personnel affected by the plan to the degree that is appropriate. Stakeholders receiving a copy of this plan include the:

- Essential Services Commission of South Australia ("ESCOSA"); and
- the Office of the Technical Regulator ("OTR").

2.6 REVISION OF THE DOCUMENT

The Safety Plan is considered a dynamic instrument. The plan is reviewed whenever there is a significant change to network activities and in any event on an annual basis.

As required by AGN's Gas Distribution Licence, an annual review of the Safety Plan is undertaken and the Safety Plan must be submitted to ESCOSA for approval.

Every 5 years the Safety Plan undergoes a full review.

3 DISTRIBUTION NETWORK DESCRIPTION

3.1 INTRODUCTION

This section of the Safety Plan describes the physical elements of the distribution system, its geographical location, the codes and standards used for design, construction, operation and maintenance, decommissioning, operating parameters, gas quality and the resources available to ensure network safety.

3.2 PHYSICAL DESCRIPTION

3.2.1 Gas Sources

The South Australia distribution network is supplied with natural gas from three sources.

1. Moomba to Adelaide Pipeline ("MAP")

   The MAP features 1,185 kilometres of high pressure gas pipelines (including 326 km of laterals). The MAP supplies gas to regional centres as well as to Adelaide. A pipeline lateral runs from the mainline to Port Pirie and Whyalla and a second pipeline lateral to Angaston delivers gas to industrial users and into AGN's Riverland Pipeline that, in turn, supplies gas users in Berri, Murray Bridge and Mildura.

   In addition to delivering gas from the Cooper Basin into the South Australian market, the MAP can receive gas from southeast Queensland through the APA Group owned 'QSN Link'.

   This pipeline is owned and operated by Epic Energy South Australia Pty Ltd ("Epic").

2. SEAGas Pipeline

   The SEAGas pipeline is a 680km, 455mm diameter pipeline which runs from Port Campbell in Victoria to Adelaide in South Australia. The SEAGas pipeline has off-takes located at Cavan, Torrens Island Power Station and Pelican Point Power Station and is developed, owned and operated by South East Australia Gas Pty Ltd (SEA Gas)("SEAGas") .

3. South East South Australia (SESA) Pipeline

   In May 2005 Origin Energy Retail Limited completed construction and commissioning of the South East South Australia ("SESA") Pipeline to provide a supply of SEAGas natural gas to customers in the South East region of South Australia, including those customers connected to AGN's Mount Gambier distribution network. When in operation, Katnook is a supplementary supply to the South East region, however has not been in operation since 5 October 2011. This pipeline is owned and operated by APA Group.

3.2.2 Gas Networks

The natural gas distribution networks in South Australia are identified as follows:

- Adelaide Metropolitan Area
- Whyalla
- Port Pirie
- Mount Gambier
- Peterborough
- Berri
- Murray Bridge
- Angaston
- Nuriootpa
- Tanunda
- Freeling
- Virginia
- Waterloo Corner
- Burra

The geographical locations of each of these networks and a map of the Adelaide Metropolitan Area Network are provided in Appendices 2 and 3.

3.2.3 Gate Stations

Each distribution network receives gas from at least one custody transfer gate station ("gate station"). The majority of gate stations are owned and operated by upstream parties. Appendix 4 summarises the locations of the gate stations.

3.2.4 Odorising Facilities

APA is responsible for ensuring natural gas is odorised in accordance with the Gas Regulations 2012, Part 9, Division 2 "Gas supply, quality etc". Clause 38.1.a.ii of the Regulations requires that a distribution system operator ensures that (the gas): *" ... contain sufficient odorant that it has a distinctive smell to a person with a normal sense of smell at one-fifth of the lower explosive limit in air "*

The objective of this is to provide natural gas with a distinctive odour that is recognisable at well below hazardous concentrations of natural gas in air.

Natural gas supplied from the MAP, as of June 2015, is odorised by Epic and whilst odorant is still currently injected by APA at gate stations where this gas enters the distribution network, this is being monitored and may result in reduction or cessation of odorant being injected by APA. Natural gas supplied by the SEAGas and SESA Pipelines, is odorised before the gate stations by SEAGas.

Odorant is injected by APA at the point where the gas enters the distribution network. In some cases this may be at a large gate station on the transmission main, where a large dosage pump odoriser is used. These odorisers require tight control on injection rates and utilise metering pumps. Where supply is feeding a small network or single industrial customer a small closed evaporative odoriser commonly called a farm tap odoriser is utilised.
Currently:

- There are 15 AGN owned odorising sites in South Australia
- The South Australian operations consist of 8 evaporative (Farm Tap) and 7 dosage pump odorisers (4 pneumatic and 3 electric)

SA Networks currently employs a system of bulk odorant storage across a number of odorising sites. Odorant transfer from the main bulk storage facility (located at Wasleys) is facilitated by the use a transfer trailer and transported to each odorising site, in most cases on an annual basis.

APA validates that the appropriate rate of odorant is injected into the network through odorant sampling points around the network. This is conducted by both "sniff" testing and sampling. Sniff testing is conducted on all pressure mains whilst sampling is taken from medium, high and transmission pressure mains.

Sniff tests are conducted by APA personnel using an odorometer and the human nose to measure the smell intensity of the odorant in the natural gas. Sampling comprises taking of natural gas samples from the network and transporting the samples in a canister to APA's Gas Chemistry laboratory at Kidman Park where they are analysed using a chromatograph. Results from all tests are recorded and reviewed and where necessary adjustments to odorising injection rates are carried out.

Sampling points are selected on the basis that they are at the most outer points of each network In the Adelaide network, strategic positions are selected to ensure that each of the four odorant injection points at the gate stations, three from Epic and one from SEAGas are sampled. Other central locations are also used for comparison purposes. Spot checks are also conducted following reports of low odorant from leakage crews during leak repair.

3.2.5 Farm Tap Pressure Regulating/Metering Station

Individual customer service connections directly from the transmission Pipeline in MAP, operating at higher than normal distribution pressures, require pressure regulation and/or pressure limiting devices before the customer can be supplied. Appendix 5 summarises the locations of the consumers and their associated farm taps.

Odorisation facilities are also installed at farm taps where injected gas from the Moomba to Adelaide Pipeline is odorised. Odorisation of the distribution network is being closely monitored with the introduction of odorised gas from the Moomba to Adelaide Pipeline in June 2015.

3.2.6 Pressure Regimes and Materials

The distribution network can be categorised into four distinct pressure regimes as defined in Appendix 6.

Networks are operated at pressures within nominated maximum and minimum operating pressures (MaxAOP and MinAOP). Emergency over pressure control is provided on all networks to ensure the nominated MaxAOP is not exceeded.

Each network has its own defined operating range depending on the network configuration and capacity requirements. Operating pressures may vary depending on seasonal load demand. Changes to operating pressures are managed through a formal change management process to ensure compliance within nominated limits.

Typically supply pressures within the distribution mains are set at 1.7kPa (Low Pressure), 80 kPa (Medium Pressure), 350 kPa (High Pressure) and 1750 kPa (Adelaide Metropolitan Transmission Pressure).

The distribution network consists of a variety of materials including poly-coated steel, bare steel, cast iron and polyethylene. A summary of the composition of the distribution network by pipe length and material type for each pressure regime is included in Appendix 6.

3.2.7 Pressure Control Systems

The following pressure reductions take place in the network:

- Transmission pressure to high or medium pressure;
- High pressure to medium or low pressure; and
- Medium pressure to low pressure.

There are 304 regulators in the distribution network. A summary of the regulators is provided in Appendix 7.

Overpressure protection where regulators reduce the pressure from transmission and high pressure is predominantly provided by an active-monitor design, whereby failure of the active regulator will result in the monitor regulator taking control. In circumstances where only an active regulator is fitted, overpressure protection is provided by an internal or external relief valve or alternatively a slam shut valve.

Pressure regulation from medium to low pressure is predominantly achieved with a single active regulator (district regulator). The inherent design of these regulators limits the downstream pressure to 4 kPa should failure occur. District regulators are no longer installed and are being replaced during normal maintenance schedules with active and/or monitor regulator(s) with an over pressure protection system.

Pressure regulators are also installed on the inlets of Industrial, Commercial and Domestic consumers where the inlet to the customer's meter is supplied from the medium or high-pressure networks. These regulators have an active regulator and overpressure protection.

3.2.8 Meters

A description of the number and type of meters in the distribution network is provided in AGN's Gas Measurement Management Plan.

3.3 LEGISLATION

In South Australia the key regulatory instruments related to the distribution of natural gas and with which AGN and APA comply are:

- Gas Distribution Licence (as granted by ESCOSA to AGN Limited);
- Gas Act and Regulations;
- National Energy Retail Law, Regulations and Rules;
- National Gas Law, Regulations and Rules;
- Work Health and Safety Act and Regulations
- Environment Protection Act and Regulations;
- Dangerous Substances Act and Regulations;
- ESCOSA Codes and Guidelines; and
- AER Retail Market Guidelines; and
- AEMO Retail Market Procedures.

3.4 CODES AND STANDARDS

In accordance with Regulation 37(1)(a) of the *Gas Regulations 2012* (SA) APA works to the applicable codes and standards when designing, installing, operating and maintaining gas infrastructure.

A list of all applicable codes and standards is set out in Appendix 10.

APA also maintains a set of internal procedures that cover the life cycle of distribution network assets. These are referred to in section 4 "Provision for Safe Network Management". APA is also an active member of technical and Australian Standards committees and provides input into the development of industry standards.

3.5 GAS QUALITY CHARACTERISTICS

Gas is sourced from two sources, Moomba and Victoria. No gas entered the network from Katnook during the period 1 July 2014 to 30 June 2015. The component analysis including odorant levels from each source are described in Appendix 8.

3.6 RESOURCES

AGN and APA (and its predecessor companies) have over 140 years of experience in natural gas distribution.

AGN and APA recognise and appreciate the inherent risks and safety issues associated with operating gas distribution networks and APA has a large and competent work force that manages and operates gas distribution networks. APA employees and its contractors have a broad range of expertise required to manage gas distribution infrastructure.

APA's activities in South Australia are also supported by a national gas infrastructure management operation, which provides further support to ensure that the safety and reliability of the distribution network is maintained.

4 PROVISIONS FOR SAFE NETWORK MANAGEMENT

4.1 INTRODUCTION

The following section describes the controls in place to ensure the safety and reliability of the network and to manage risk, with the key areas being:

- Design
- Material and Component Selection
- Construction, Commissioning and Decommissioning
- Network Operations and Maintenance
- Emergency Response
- Training and Competency
- Failure and Incident Investigation
- Monitoring and Reporting
- Audits and Reviews

APA's operational activities are underpinned by its Health, Safety and Environment (HSE) Management System "Safeguard", implemented to deliver on APA's HSE commitments, including providing a zero harm work environment. Safeguard provides a framework by which the processes relating to APA's HSE activities are written, approved, issued, communicated, implemented and controlled. Safeguard is arranged under 15 Elements, structured to reflect the Continuous Improvement cycle of Commit, Plan, Do, Check and Act.

The key objective of Safeguard is to assist the business in managing its HSE responsibilities and meet corporate policy commitments by:

- empowering all employees,
- reducing risk in operations,
- providing direction and assistance,
- ensuring continuous improvement,
- ensuring appropriate allocation of resources and
- demonstrating due diligence.

A copy of APA's Corporate HSE Policy is provided in Appendix 9.

4.2 DESIGN

4.2.1 General

AGN's gas infrastructure and associated plant and equipment are designed and constructed in accordance with documented design criteria and specifications, based on relevant Australian and International Standards.

Assurances for critical plant and equipment where potential significant hazards are identified (non-standard designs and operations) are subject to strict control and verification. Non-routine designs and operations are subjected to occasional audits for verification whereas standard designs and operations require appropriate care but without formal control and verification.

4.2.2 Design Inputs

Core policies, procedures, standards and specifications have been developed and are specified to ensure that a safe and reliable distribution network is built and maintained. Compliance to AS 2885 for transmission steel mains, AS/NZS 4645 for steel and polyethylene distribution mains and AS 4041 for above ground facilities form the basis of the operator's design, construction, maintenance and operation of gas networks.

Key inputs that are used for network design include:

- Documented customer requirements
- Defined network operating parameters
- Standard materials and component specifications
- Risk assessment for major works
- Strategic network planning requirements and feasibility studies
- Network capacity analysis
- Actual network performance parameters

4.2.3 Design Process Controls

Replacement, expansion and modification of gas networks are undertaken by competent staff with design approval carried out by authorised senior personnel from APA's Planning and Engineering Group. Where necessary a formal Hazard and Operability Review is carried out to ensure potential hazards and operational issues have been fully assessed prior to implementation. Complex capacity designs, network load impact assessments and network capacity analyses are managed by experienced operators using computer-based network modelling facilities.

To minimise the possibility and impact of a loss of supply, the following design and operation strategies are employed:

- Active monitoring/surveillance of the network
- Multiple feeds into the network where possible
- Loops and back feeds forming part of the pipe configuration where possible
- Real time pressure monitoring
- Response capabilities to all reported incidents
- Patrols of the principal pipeline routes to check for third party activity
- A Third Party notification system for asset locations (Dial Before You Dig ~DBYD)
- Cathodic Protection on steel transmission mains
- Robust planned maintenance regimes

A computer-based network analysis facility is used extensively for network design, modelling and validation. Network models are validated to field conditions on a regular basis to reflect actual demand scenarios.
A gas network Distribution System Performance Review covering the areas of system capacity, leakage management, system expansion and Unaccounted for Gas ("UAFG") is undertaken annually. This review provides feedback on the performance of the network, which in turn provides a basis for capacity and replacement strategies.

4.2.4 Design Outputs

All design outputs are checked and approved prior to issue for construction. The design outputs consist of a number of products including cadastral maps, configuration drawings, material specifications, test requirements, operating and maintenance procedures.

Detailed network design records, and drawings, are maintained. Transmission mains nearing the end of their anticipated original design life are subjected to an approved engineering investigation to determine the pipeline's fitness to continue service and expected life. A list of required actions together with due dates for completion of action items may be issued in order to grant an extended service life. The investigation also establishes the next review timetable for the transmission mains.

4.3 MATERIALS AND COMPONENTS

The management systems and procedures which control the materials and components used by the operator to repair, control, expand and operate the distribution system can be divided into the following areas:

- Specifications
- Purchasing
- Inspection
- Non-conforming Product

An overview of the management systems in place for each area is provided in the following sections.

4.3.1 Specifications

Written specifications referencing Australian Standards exist for major components and specialised items.

4.3.2 Purchasing

It is the role of APA's Procurement Department to source items that meet the required specification and liaise with suppliers where non-conformance occurs. Commonly used items are allocated part numbers together with short and long descriptions, stocked in an Operations Store and are automatically reordered as they are used. Unique and non-routine materials or components are ordered individually as per specification, and issued by the responsible department.

4.3.3 Inspection

Materials and components used in field operations are visually inspected in the field prior to and during construction. Pressure components are pressure tested for leak tightness and in some cases strength tested before commissioning.

4.3.4 Non-conforming Product

In the case of non-conforming products the Procurement Department negotiates with the supplier and operator to determine whether the product should be replaced or repaired.

4.4 CONSTRUCTION, COMMISSIONING AND DECOMMISSIONING

4.4.1 Construction

Each job is assigned to a Project Manager or Supervisor who is responsible for the construction and commissioning phase and handover to operations. Regulator stations and meter sets are the responsibility of separate specialised groups.

The Project Manager or Supervisor will order the pipe and components specified in the design and organise the tools, equipment and labour needed to complete the job. Contractors may carry out some or all of the work. The Project Manager

calls for tenders and issues contracts on large or complex projects, taking specific regard to the tenderer's skills and experience relevant to the project.

4.4.2 Testing and Inspection

All new mains and services are pressure tested before connection to gas to prove the leak tightness of the pipes and fittings except where practical limitation precludes, i.e. replacing a short section of main, in which case the pipe is inspected and checked for soundness under gas pressure. APA's Planning and Engineering Group produce inspection, test and commissioning plans that are required to be followed during the construction and commissioning of new trunk and transmission mains. Other tests that may be specified include radiographs of welds, strength testing, ultrasonic testing, coating integrity tests, and cathodic protection interference tests for steel pipes and bead bend tests for plastic pipe. Visual examinations of in-service welds are completed and documented for all welds on steel distribution mains, in accordance with APA's procedures. Where required, welding procedures and welder qualification tests are conducted before construction starts. Examples of when this would occur include:

- Where construction involves large diameter polyethylene pipe (110mm diameter and above);
- Where a new contractor welder is being used; or
- Where a welder is out of weld qualification.

4.4.3 Connection Process

Processes and systems are in place for the connection and commissioning of new industrial and commercial ("I&C") and residential customer connections.

4.4.3.1 Industrial and Commercial Connections

Generally I&C connections are initiated by developers, consulting engineers, plumbing contractors or consumers when a proposed consumer requires gas supply. Upon receipt of a new connection enquiry APA representatives will consult with the consumer and interested parties to identify all relevant information in terms of operating conditions, including providing advice regarding meter location. Depending on the proposed gas load a standard meter design will be specified where possible.

After all relevant information has been gathered, a 'Connection Enquiry Shipper' form is forwarded to APA's Planning and Engineering group for design, economic evaluation and coordination of supply. Where required an engineering review of meter selections and non-standard meter sets is undertaken to ensure the operating conditions specified on the shipper form are able to be met.

Once any required network extensions and meter stations have been designed, the connection proposal is evaluated for financial approval to proceed. After financial approval has been obtained the service connection request is processed. Following payment of any applicable fees/charges the gas inlet service will be installed.

Once requested by the consumer, the retailer subsequently issues a "meter fix" request to APA. Prior to completing the meter fix the consumer's licensed gasfitter issues a Certificate of Compliance (COC) to APA confirming that the consumer's gas installation is completed and that it complies with the relevant Australian Standards. Upon receipt of the gasfitter's COC, APA checks the outlet for soundness and fits the gas meter to complete the meter fix.

In situations where the requested gas pressure exceeds 7kPa or where a Type B appliance is installed, the gas meter will not be installed until approval has been received from the OTR.

Once the work is completed and the consumer connected, details of the job and main installation are provided to APA's Planning and Engineering group to ensure the updating of relevant field map records.

4.4.3.2 Existing Home Connections

New residential gas connections for existing homes can be initiated by the consumer or appliance retailer directly with APA or via a gas retailer. In order to proceed with a service connection, APA establishes details of the proposed connection including address, appliance combination and energy consumption. By the end of 2015, with cases where it is not possible for APA to agree an appropriate gas meter location in the initial contact an APA representative will visit the site and locate the optimal meter position for the connection, having regard to the requirement for access and the need for protection from vehicular or other obstructions. The connection request is processed once the information is received. Where a mains extension is required, this is costed and an economic evaluation undertaken.

Once evaluated and approved to proceed, a letter confirming the connection order, connection process and MIRN (a unique 'meter identification registration number' that identifies the consumer's property) is sent to the consumer. The letter also provides instruction to the consumer to contact their retailer to request the installation of a gas meter once their appliances and gas inlet service has been installed.

As soon as the meter position has been determined and any applicable connection fees paid, APA will install the gas inlet service. When requested by the consumer, the retailer subsequently issues a 'meter fix' request to APA. For existing homes, APA will check the installation for soundness and compliance according to the relevant Codes and Standards. If the installation complies and is of sound condition a gas meter will be fitted and any appliances installed will be commissioned by APA or its nominated contractor.

For new connections to houses where the distribution network operates at medium or high pressure, these connections will be supplied with natural gas regulated at 2.75 kPa. For new connections to houses where the distribution network operates at low pressure, these connections will be supplied with natural gas supplied at the pressure in the main (up to 1.7 kPa) normally 1.0 kPa.

For existing gas-connected homes where the distribution network operates at medium or high pressure, if the gas load requirement equals or exceeds 500MJ/hour, then by mutual agreement between the consumer and AGN, and subject to the existing gas outlet service being constructed of either copper tube or an approved composite pipe together with proof of a soundness test to 7kPa via a certificate of compliance by the consumer's gas fitter; the gas pressure may be increased to a regulated pressure of 2.75kPa in order to reduce the size and associated cost of the required consumer pipework.

4.4.3.3 New Home Connections

Residential gas connections for new homes can be initiated by the homeowner or new home builder directly with APA or a gas retailer. A service connection request is generated and APA establishes details of the proposed connection including address, gasfitter details, appliance combinations, and estimated expected energy consumption. Where a mains extension is required, this is costed and an economic evaluation undertaken. Following payment of any applicable fees/charges the gas inlet service will be installed, subject to site conditions.
Once evaluated and approved to proceed, a letter confirming the connection order, connection process and MIRN is sent to the builder or homeowner. The letter also provides instruction to contact their chosen retailer to request the installation of a gas meter when the house is ready to be occupied.

When requested by the consumer, the retailer subsequently issues a 'meter fix' request to APA. To ensure new home customers have gas available immediately at the time they take possession of the home, APA installs the gas meter in a new home where the outlet service is found to be sound and the installation compliant, prior to the installation of appliances. The gas meter is wadded and where necessary a blank leg and cap is installed for additional security. The inlet standpipe valve is left in the 'Off' position.

AGN has trained and accredited licensed gasfitters who work to APA's procedures and work instructions to then remove the wad (although already licensed to undertake the activity, the process also necessitates gasfitters to verify the installation's compliance with AS 5601 and commission the installed appliances). The AGN accreditation is valid for 3 years and is renewed based on the individual gasfitter's compliance and use of the accreditation.

Where a non AGN accredited gas fitter has been engaged by the builder, APA or its nominated contractor will perform a full meter fix including checking the installation for soundness and compliance with relevant Codes and Standards and commissioning any appliances installed.

For new connections to houses where the gas distribution network operates at medium or high pressure, the natural gas supply to the house is regulated at 2.75 kPa. For new connections to houses where the gas distribution network operates at low pressure, natural gas is supplied at 1.0kPa, although in practice the consumers meter and service run at the pressure in the main which can be up to 1.7 kPa.

4.4.3.4 Audit

A detailed audit program is in place with approximately 4% of new home wadded connections inspected to ensure the integrity of the process. Following endorsement by the OTR, a process of following up on non-conformances with the relevant gasfitter was implemented. This process ensures the responsible gasfitter is informed of the deficiencies left at the job and where necessary rectifies the non-conformances. Monthly audit reports are reviewed by APA's Compliance and Support department.

As a result of the detailed audit program, trends in activities of fitters can be recognised and opportunities to provide refresher or further training identified. If accredited fitters are found to not comply with the requirements of the AGN accreditation, AGN reserves the right to withdraw their accreditation to undertake this work.

4.4.4 Purging and Commissioning

A non-routine procedure system is used to review safety and approve the method to be used for purging and commissioning of large or complex mains jobs.

4.4.5 Records

"As-laid" drawings, pressure/hydrostatic testing and other information on mains laid are returned from the field to APA's Planning and Engineering Group to update asset records and filing in the hard copy record system.

4.4.6 Decommissioning

Permanent decommissioning or abandonment is required when mains are no longer needed or have been replaced with new pipes.

Before decommissioning major gas mains, network analysis is undertaken to ensure there will be no detrimental impact on the network as a result. Once this has been established, abandonment or temporary decommissioning work proceeds. Where necessary pipe that is abandoned is sealed to ensure no foreign material enters the pipe at a later stage.

APA's Planning and Engineering Group is notified of any decommissioned mains for recording purposes. APA undertakes decommissioning work and abandonment of mains guided by the procedures outlined in Appendix 10. Specific reference is also given to the prevention of possible contaminants leaking from an abandoned pipeline.

4.5 NETWORK OPERATIONS AND MAINTENANCE

4.5.1 General

APA operates and maintains the network systematically and rigorously to ensure safe and reliable gas supply to end users. With the help of the Asset Management System (AMS) APA achieves efficient planning, scheduling and tracking of all network operations and maintenance.

The AMS consists of a Works Management System (WMS-Maximo) integrated with a Geospatial Information System (Smallworld). These two applications assist in the control of network strategic planning and system modelling, creation, operation, maintenance, replacement activities, the management of emergencies, notifications to third parties and the production of maps.

WMS-Maximo

Maximo is an Asset Management/Works Management System and is used by APA to plan and manage scheduled and unscheduled field activities including preventative maintenance.

GIS – Smallworld

Smallworld is used for recording the spatial location of mains, services and meters. This system is used extensively for planning of new and replacement mains, managing "Dial Before You Dig" enquiries and capacity and emergency management.

Network changes are designed in Smallworld prior to issue to the field crews. These designs are updated from the field crew's as-built records.

The Smallworld application also provides Network "trace out" tools which identify natural and dynamic topologies on the gas infrastructure that are used for exporting of asset configuration into a computer based capacity modelling tool (Synergee). This feature is also used to assist in emergency response activities.

4.5.2 Mapping and Records of Asset Location

Primary and secondary products of the GIS are used for network operation and maintenance. The primary products include the Cadastral Base Maps and Asset Data Base (these two items are referred to as the 'base information' in this document). The secondary products include Proposed Mains Drawings, Mains Detail Drawings, Principal Mains Drawings and Valve Books. Short descriptions of these systems and their applications are given below.

Cadastral base maps

Electronic cadastral maps purchased from the Department of Environment, Water and Natural Resources form the primary map system. Information recorded on these maps include reticulation pipe size, location, and type, proximity to property boundaries, miscellaneous facilities and references to detailed information maintained in secondary systems. These maps are updated with proposed mains details pending final as built information being provided.

Asset data base

The asset data base resides within GIS. It is a computer mapping database of distribution system assets (pipes, valves and regulators). Details of material type, length, location, pressure, as well as property details are maintained in the database which interfaces with APA's operational works management system.

Proposed mains drawings

Mains drawings, show proposed extensions, alterations, and replacement of the distribution system. These drawings form the base information for field construction. The "as laid" mains details are marked on these drawings and returned for base information updates.

Mains detail drawings

Mains detail drawings, record pipe location details that cannot be displayed legibly on the cadastral base maps. A reference number on the base maps links mains detail drawings.

Principal mains drawings

Principal mains drawings, record details of major trunk mains including property boundaries, pipe offsets, depth, proximity to other services and major underground facilities. The level of detail for these mains is higher than for other mains because of the vital role these mains play in transporting gas through the distribution system.

Valve Location Sketches

Valve sketches contain specific details and locations of approximately 10,000 valves used for isolation and flow control purposes within the distribution system.

Mobile Mapping System

Laptop computers and tablet devices are used to provide field and first response personnel with immediate and up to date distribution system location information.

All network facility information contained in the above systems is maintained for the life of the asset. Whilst every reasonable attempt is made to ensure the accuracy of the maps and records, it is recognised that they are not and never will be totally accurate.

A number of mechanisms are in place to limit any error, some of these being:

- Training crews in the level of detail required to be brought back from the field and the requirement to provide feedback on any variations to documented network facility information as per Field Manual procedure.
- The taking/checking of field measurements by APA Planning staff as required.

4.5.3 Third Party Liaison

APA is a member of The Association of Australian Dial Before You Dig Services Limited, a non-profit body that is dedicated to helping protect Australia's underground networks. This service refers requests for underground network locations to the member owner of those assets who will respond with plans and information within three working days. Dial Before You Dig operates a free-call number 1100. Further information can be found at www.1100.com.au. Additionally enquiries can be made at APA's Kidman Park depot reception counter, enabling people to request additional information on the location of gas pipes.

Parties undertaking work near transmission mains and some high pressure mains are advised that APA require and will provide on-site location and standby when excavation is performed. Furthermore weekly patrols are undertaken by APA on a routine basis along the route of all transmission and high priority mains to maximise the possibility of detecting work being undertaken close to those mains without locations. This ensures excavation activities near the pipeline are checked to prevent and or identify damage to the pipeline and that these activities are recorded for future reference. Transmission mains are sign-posted to raise awareness for anyone working in the vicinity.

APA maintains a training programme known as "Gas Infrastructure Awareness" for councils, utilities and other civil contractors performing excavation work. The programme runs for over 1 hour and is primarily designed so that personnel are able to recognise gas infrastructure and know when the network operator's personnel are required to be on site. This combined with a description of the types of gas mains, how they are buried and some basic map reading assists persons excavating in the field to avoid damaging gas infrastructure.

4.5.4 System Maintenance

APA has a number of maintenance processes in place that vary depending upon the criticality of the pipe system to the distribution network.

Transmission Main processes include, but are not limited to:

- Weekly patrol surveys for third party activity in close proximity to the main;
- Leakage surveys every 5 years;
- Cathodic protection system – readings are taken regularly and recorded for future reference. Any faults identified are prioritised and programmed for action;
- Five-yearly above ground coating surveys – reports are reviewed and filed for future reference. Actions are prioritised and scheduled where necessary; and
- Survey of creek and bridge crossings, valve pits and above-ground pipe work.

Steel Main processes include, but are not limited to:

- Cathodic Protection systems – readings are taken regularly and recorded for future reference. Any faults identified are located and programmed for repair; and
- Leakage surveys – programmed on a maximum 5 year cycle, and special surveys when requested.

Polyethylene main processes include, but are not limited to:

- Leakage surveys – programmed on a maximum 5 year cycle, and programmed special surveys every 12 months; and
- Special surveys of High Density Polyethylene (HDPE).

Cast Iron processes include, but are not limited to:

- Leakage surveys – programmed on a maximum 5 year cycle; and programmed special surveys which are used to determine future plans of action for maintenance or replacement programs.

Additionally maintenance programs exist for network plant and equipment such as regulator stations, valves and valve pits.

Maintenance schedules for regulator stations vary according to their type, capacity and flow rate in the system; however regulator stations and associated equipment are completely overhauled every five years or ten years depending on the regulator type. Numbered valves are serviced every three years except for transmission system valves which are serviced every twelve months.

4.5.5 Change Management

The following activities trigger APA's change management process as they have the potential to affect the quality and/or safety of the distribution network.

- Permanent changes to the assets which deviate from industry/company standards, Safeguard Group Procedures, technical specifications or procedures, policies, etc.;
- Introduction of new piece of a facility, tooling and/or equipment;
- Introductions of new materials or substances;
- Introduction/modification of work processes;
- Upgrade of a fixed facility;
- Modifying piece of a facility, tooling and/or equipment;
- Changing landform structure or traffic routes;
- Modifying layout of yard and workshop;
- If permanent or long term operation of facility, station or equipment is outside its nominated control parameters;
- If there are changes to operating conditions of systems or equipment and these changes may have an impact;
- If there are deviations from standard piping and fitting sizes, ratings or configuration;
- If construction design plans, scope of work documents, or cost estimates need to be changed as proposed by the Contractor;
- Replacing equipment or components of one manufacturer with different equipment or components of another manufacturer not yet approved for use;
- Upgrading or downgrading a facility and equipment pressure rating or altering the integrity design;
- Removal of any barriers, guards or protective equipment for reasons other than routine maintenance;
- Change in relief settings which deviate from standards;
- Changing computer control, surveillance and SCADA systems which deviate from standards;
- Changes to fire or gas detection equipment which deviate from standards;
- Change in electrical classifications;
- Change in chemicals or handling and sampling procedures; and
- Permanently change alarm levels from those specified in documentation.

The following controls are used to minimise the possibility of risks being introduced unintentionally:

Procedures – changes to semi-routine or non-routine procedures must be authorised by the person nominated to authorise any changes. The only exception is for emergencies, in which case subsequent approval must be obtained as soon as practicable, or the situation rectified as soon as it is safe to do so.

Standards - changes to standards are not permitted unless authorised by the person nominated to authorise any changes.

Design - changes to design are not permitted unless authorised by the person nominated to authorise any changes.

Equipment - changes to equipment design require the approval of the person nominated to authorise any changes.

Components - changes to components require the approval of the person nominated to authorise any changes. For product/brand specific items, a change in supplier, or the supply of an alternative component when the original is unavailable, is not to occur without the Procurement Department consulting the user.

Tools/equipment – tools are mostly relevant to the safety of a process whilst it is being undertaken, rather than impacting on the longer-term risk. However, there are a small number of tools that can affect long-term integrity (e.g. the use of a chain sling on coated pipe instead of a web sling). Tools and equipment fall into two categories:

- Hand tools and manual equipment: where necessary, field trials of tools are undertaken to properly evaluate tools for safety and suitability.

- Capital equipment – these are usually larger, more expensive items, specialised for carrying out unique tasks. The fundamental operation of such an item is changed infrequently, and normally requires engineering evaluation before approval by the manager of the department responsible for that equipment.

- Certain hand tools and all capital equipment require assessment and approval by APA's engineering department prior to receiving purchase approval.

4.5.6 Documented Work Practices

Work practices and procedures fall into two categories, routine and non-routine.

Routine Procedures

Routine procedures and work instructions have been prepared for daily tasks that are essentially repeatable e.g. leak repairs, laying new services. These tasks are documented and conveyed to personnel via the APA Training Centre. A combination of theoretical and practical tuition ensures personnel are skilled to an appropriate safe standard. Supervisors observe employees in the field to ensure they are able to apply what they have learned. Successful completion of competency-based training is recorded in APA's Learning Management System ("LMS").

Non-Routine Procedures

These tasks cannot be documented because by nature each one is different and unique. In order to maintain safe work practices and minimise any associated risk with these tasks, a non-routine procedure form is used to plan these tasks.

This non-routine procedure form outlines the steps in carrying out the task, personnel and equipment requirements, and any special safety requirements. The task does not proceed unless this form has been approved by an authorised person.

4.5.7 Emergency Response

Emergencies can vary significantly depending on their degree of impact. The majority of situations are not classified as emergencies as they are usually small-scale incidents involving third party damage and are handled within normal operational procedures and normal operating hours. Outside of normal operating hours, sufficient personnel are rostered to maintain a 24-hour response to situations as they arise. This is the first and the most frequently occuring level of emergency response, generally to public reports concerning escapes or damage.

If an emergency is outside the scope of the normal day-to-day operations, the South Australian Emergency Response Plan ("ERP") is activated. This is the second level of emergency response. The plan details the responsibilities and duties of various personnel and departments involved in dealing with an emergency and covers both the metro and regional areas of the network. To ensure adequate and effective emergency response, a number of emergency response exercises are conducted every 12 months. These vary from "desk top" exercises to full involvement of field personnel and third parties.
The third and fourth levels of the emergency response structure are activated when the emergency is classified as a crisis. A crisis can include but is not limited to:

- An incident involving major injuries or fatality;
- Natural disasters causing widespread damage; or
- Upstream failure which may last for several days.

In upstream emergency situations the OTR has established a manual of Gas Emergency Procedures. APA is bound by ministerial directions arising out of activation of the Gas Emergency Procedures. In this instance this may result in the ERP being activated.

4.5.8 Gas Specification and Characteristics

Gas quality is to be kept within the specifications set out in the *Gas Regulations 2012* (SA) and AGN's applicable Haulage Agreements. Any excursions outside of these parameters are expected to be detected by the producers and then by the transmission pipeline operator. In the event of off-specification gas being input upstream at the production facility, a representative of the latter organisation would inform APA of the situation and a decision whether to accept or refuse the entry of this gas into the distribution systems would be made.
Refer also to section 1.1.2 in relation to Gas Odorising requirements and practises.

4.5.9 Emergency Load Management

Emergency load management is incorporated in the ERP. When necessary loads are managed by:

- Manual isolation and/or pressure control of affected areas;
- Reduction or turn-off of supply to interruptible customers;
- Turn-off of supply to large customers following consultation; and
- Turn-off of supply to all customers in affected areas.

Emergency Load Management is described in Section 9 of the ERP.

For large-scale emergencies the operator can monitor gas consumption of major users as well as pressures at various strategic points in the network. In relation to the possibility of supply problems upstream of the operator's network, the operator maintains contact with the upstream supplier for updates on upstream gas supply.

Not all incidents require implementation of the ERP, however the principles of emergency load management are also utilised in the handling of smaller scale outages and interruptions of supply.

4.5.10 Leakage Management

There are a number of strategies adopted to reduce the level of gas leakage in the distribution network to a level that is as low as is reasonably practicable. These are:

- A Mains Replacement Plan ("MRP");
- Regular reviews of the leakage history of mains to identify the optimal replacement versus repair action, so that prioritised replacement can be factored into the MRP where possible;
- Periodic leakage surveys of all mains;
- Operating the network at the lowest practicable operating pressures to minimise leakage (rate of leakage increases with the square of the pressure);
- Attendance within two hours of all publically reported leaks.

The MRP documents the plan for replacement of all of the aged pipework in the network. It examines the level of UAFG and associated degree of existing and projected leakage under the plan. The MRP envisages the replacement of all cast iron and unprotected steel mains by the 2019-20 FY.

In the meantime APA continues to place a high priority on its leakage management.

All leaks are classified and managed in accordance with AS/NZS 4645.1 and APA's Leakage Management Technical Policy and Leakage Management Procedure.

The majority of leaks are reported by the public. Once a leak is reported, a first response officer will attend the leak site within the specified time. Once on site the officer will assess the leak and classify it. The allowable time taken to repair the leak will depend on its class.

The normal survey frequency for high-risk locations is described in Appendix 12.

The entire distribution network is leak surveyed at least once over a five-year cycle. This survey generally does not include meters or inlet services or customer pipe work from the outlet of the meter.

Since the late 1980s details of all recorded and repaired leaks have been kept on a database.

[redacted]

4.6 PERMIT TO WORK SYSTEM

All persons directly or indirectly working in an operational area under the control of APA are required to operate in accordance with APA's Permit To Work System. The Permit To Work system delivers a mechanism whereby authorisation to proceed with a designated scope of work will only be provided when certain assessments, verifications and conditions have been met. The Permit to Work system is inclusive of:

- Job Hazard and Environmental Analysis and
- Hazardous Task Permit

A Job Hazard and Environmental Analysis is conducted on all work activities where specified or where extreme, high or medium risk is present. Work activities of known elevated levels of risk are further managed through the authorisation of a Hazardous Task Permit.

The Permit to Work system is designed to support the rigor and level of risk assessment necessary for safe work activities. Consistently, permit authorisation may only be approved by a competent person who is familiar with the work activity and the Permit to Work process.

4.6.1 Job Hazard and Environmental Analysis (JHEA)

A JHEA, is the principle risk assessment tool for all field staff and contactors. The JHEA guides a work party through the risk assessment process by applying Safe Work Method Statements (SWMS), identifying hazards and determining levels of risk, identifying and implementing appropriate controls and conducting and identifying the need for increased levels of permit authorisation. A JHEA is completed for all activities carried out on the distribution network.

Instruction and information to workers confirming the requirements of the JHEA are provided through training and tool box talks. Sign off by those conducting the work, acknowledge that they have been involved in the completion of the permit, provided with instruction as to the requirements and that it has been understood.

4.6.2 Hazardous Task Permit

A Hazardous Task Permit provides the authority to proceed with a work activity of known high risk. Historical work activities within the gas distribution environment warranting the issue of a Hazardous Task permit include:

- Hot work in a hazardous area or during a fire ban,
- Confined space entry,
- Hazardous Excavation, and
- Hot tap.

Hazardous Task Permits (APA-8183.F02) are only issued by authorised permit issuers. A list of the authorised permit issuers is maintained by APA and is stored in the APA Learning Management System (refer to section 4.7 for a description of this system).

4.7 TRAINING AND COMPETENCY

APA Group has a strong commitment towards training and developing its workforce and supporting the achievement of the organisation's mission, goals and objectives. Training and development is a key function within all business units in terms of regulation and compliance, the acquisition of technical procedure and process skills, leadership and adherence to health, safety and environmental goals.

Training and development at APA is underpinned by a consistent structure supporting the training and development requirements for each individual in the business. "The Cycle of Training Process" provides a systematic approach for training and competency management and includes the following key stages:

Stage 1 – Training Pathway
Identifies a training pathway for each position identified in the organisation to ensure the acquisition of required skills, knowledge, experience and behaviours to safely and effectively perform a given job. This analysis provides a comprehensive insight into the standards expected in achieving job outcomes.

Training pathways are:

- Aligned to job descriptions,
- Used for assessment,
- Used to identify skill gaps,
- The basis for training and development, and
- Used to support career development.

Managers create, in consultation with each employee, an individual training plan. The training plan includes all HSE related training and training necessary to effectively and efficiently perform the work. These training plans include training activities and/or competency assessments to be undertaken within a specific timeframe.

Stage 2 – Job Competency Recognition
Existing skills, experience and knowledge are acknowledged with respect to individual training plans. Training records, work achievements and experience help to determine the extent of training required and the residual training program requirements. Job competency recognition underpins individual training plans and priorities.

Stage 3 – Learning and Development
Training programs identified from the job competency recognition process are managed and scheduled according to training program availability and operational demand.

Stage 4 – Recording and Reporting
The APA Group Learning Managements System provides for continued data maintenance and reporting to facilitate training coordination, and is visible to all personnel for referencing individual training status including:

- Training library programs,
- Positional training pathways
- Individual training records

4.8 FAILURE AND INCIDENT INVESTIGATION

APA has structured and planned processes in place to manage operational failures and incidents from a single leak through to a crisis situation.

The types of incidents that are reportable within APA include:

- First aid, medical treatment, hospitalisation and fatality;
- Environmental impact requiring minor or significant remediation;
- Damage to property and assets;
- Incidents causing business interruption or reputational damage to APA/AGN;
- Statutory breaches; and
- Near misses.

Incidents are categorised by their consequence of risk, and the degree of impact on the business will determine the level of response. In determining the incident category, consideration is given to the potential consequence as well as the actual consequence of the incident.

APA's incident management system includes structured processes to enable it to:

- Appropriately respond and identify the root cause of an incident depending upon its severity;
- Report in accordance with agreed hierarchy in a timely fashion;
- Conduct adequate investigation;
- Complete the appropriate reports for internal and external parties;
- Populate data recording systems that facilitate trend analysis, progress tracking and statistical reporting; and
- Ensure all process improvements are implemented.

In addition to the incident management system, gas network related accidents (as defined in the *Gas Act 1997* (SA)) are documented and reported to the OTR:

- Death or injury - immediate notification;
- Gas fires/explosions – immediate notification;
- Gas incidents arising from network failure, involving Fire Brigade attendance and where the incident is considered by APA to represent a high risk of fire or explosion – within 1 month of the accident;
- Supply loss to 5 or more but less than 100 consumers – within 21 working days after calendar quarter;
- Supply loss to more than 100 consumers – within 2 working days after quarter;
- Gas entering buildings;
- Over-pressurisation/regulator failure;
- Near miss incidents;
- Material failure/component breakdown;
- Procedural non-conformances; and
- Property damage of more than $5,000 resulting from the accident - within 10 working days of the accident.

Reporting is completed by the Supervisor Technical and Regulatory Compliance and the information assists in the compilation of Key Performance Indicators, which are described in section 4.8.3 below.

4.9 MONITORING AND REPORTING

4.9.1 Network Performance Monitoring and Reporting

MARCIS

APA maintains a Management of Audits, Regulatory Compliance and Operational Incidents System ("MARCIS") which is a risk management system developed for use nationally throughout APA Group and consists of two components:

1. Action Tracking

   The system tracks actions arising from risk assessments, audits, management plans, inspections and incidents. Progress against the key actions held within the system is tracked on a monthly basis via the issuing of reports to all of the relevant actioners.

2. Regulatory Obligations

   MARCIS is a repository of regulatory obligations relating to reporting, audits and key documentation. Appropriate staff are assigned to action and/or approve the completion of regulatory obligations.

SAFEGUARD+

APA incident investigations are documented in Safeguard+. Actions arising from APA managed incident investigations are entered into Safeguard+ and monitored through to completion.

4.9.2 Reporting

APA reports to AGN monthly on the status of the distribution network assets and activities. These reports include safety issues and key statistics including outstanding leaks and UAFG. AGN senior management review these reports and key issues including safety are reviewed at Board level.

In addition an Annual Operational Information report is submitted to ESCOSA covering:

- The number of major unplanned interruptions.
- The quantity of gas entering the distribution system from each source;
- A summary of the results of testing of metering accuracy;
- The condition and composition of the distribution system;
- The quantity and type of gas distributed to small consumers and other consumers;
- The number of certificates of compliance received on connection of a gas installation to the distribution system;
- The number of small and other consumers connected to the distribution system;
- The number of connections and disconnections of consumers to or from the distribution system;
- The specifications of each type of gas entering the distribution system;
- The total estimated amount of unaccounted for gas lost from the distribution system;
- The number and type of complaints received in respect of lack of detectability of gas odour, poor supply pressure, etc.;
- Details of any failure to comply with the Act, Safety Plan or Gas Measurement Management Plan;
- Performance Indicators – these are described in Section 4.8.3.

4.9.3 Performance Measurement

The following Key Performance Indicators are reported internally (and to ESCOSA) on an annual basis and assist in determining the effectiveness of risk management.

The number of:

- Number of over-pressurisations;
- Instances of 3rd party damages (mains and services);
- Locations provided to third parties;
- Instances of mains or inlet leaks entering a building;
- Fires sourced by a gas leak from the network;
- Instances of out of specification gas entering the network;
- Number of public reported leaks (mains and inlets);
- Number of public reported leaks where no leak was found;
- Number of leaks detected by Leakage Surveys per km of surveyed mains per year;
- Number of regulator failures (including active) per year;
- Number of evacuations directly attributed to a gas leak from mains or inlet;
- Incidents involving attendance of the Fire Brigade related to a gas leak;
- Training hours per APA employee/contractor;
- Number of completed emergency response exercises;
- Number of incidents of stolen gas

4.10 AUDITS AND REVIEWS

4.10.1 Audits

APA maintains an audit program to assess compliance and effectiveness of controls associated with operation of the distribution network. The program is designed to ensure that work relating to the distribution network complies with procedures, codes, standards and relevant statutory requirements. In addition, triggered audits may be conducted on an adhoc basis, resulting from an occurrence, an identified risk or potential for non-conformance.

Audits are performed at various levels within the organisation to ensure that the system and procedural integrity is maintained and that continual improvement opportunities are identified.

Internal audits are conducted by trained and competent staff independent to the operating function.

External auditors are encouraged to consider the key risks and controls identified in risk assessments and management plans and confirm that the appropriate controls are in place and effective in mitigating those risks.

Field Assurance and Audit Program

1. Field Assurance

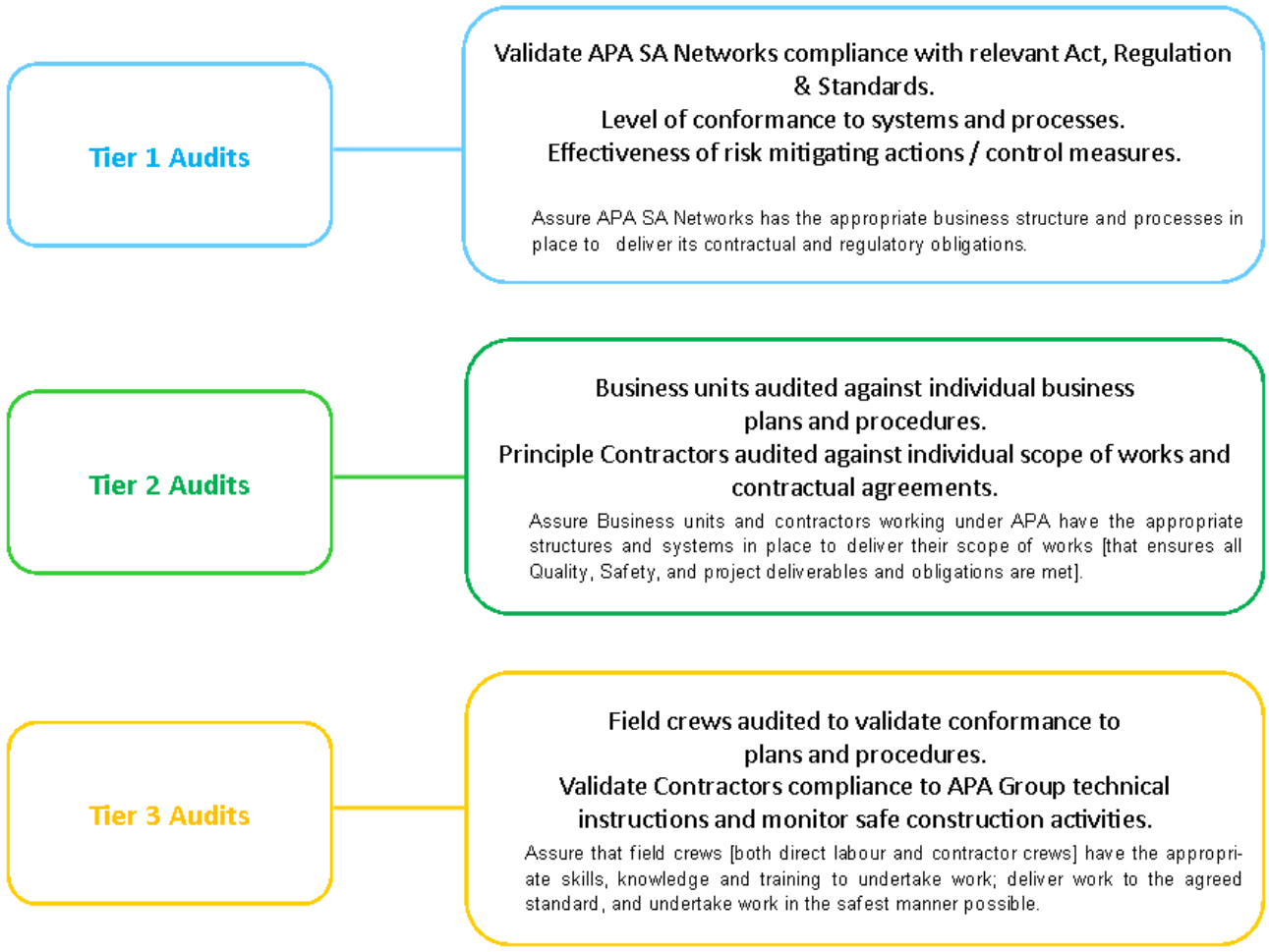
APA's field activities are inspected and assessed using a Process Verification and Inspection Program (PVIP). The PVIP consists of a series of modular process verification and inspection tools that are used by Field Supervisors to complete monthly field inspections. The PVIP enables Supervisors to focus on their core activity (supervision of field teams) and encompasses all relevant technical aspects of work processes being undertaken within one verification tool, including the core elements of APA Group's Safeguard Non-Negotiables and Fatal Risk Protocols. Results from the PVIP are captured, reviewed and discussed monthly by APA Management.

Key outcomes of the PVIP include:

- Assurance of compliance with procedural requirements across operational business activities;
- Formal verification and record of supervision and inspection activities undertaken;
- A level of assurance of operational process compliance;
- Validation of conformance to technical aspects;
- Understanding critical information and data (leading indicators) for the identification of key risk areas and continuous improvement initiatives (quality and safety);
- Reinforcement of procedural awareness and consistency through consolidated tools; and
- Increased knowledge, understanding and competency.

2. Audit Program

The audit program consists of audits conducted by APA's Risk and Compliance division. The audit program encompasses 3 tiers:



Key outcomes of the Audit Program include:

- Assurance of compliance with procedural requirements across business activities;
- Identification of issues within business level activities and planning of operations that may impact on operational activities and the delivery of product and service;
- Identification of risks and issues before they become operational non-conformances, injuries or regulatory breaches; and
- Continuous improvement and change through detailed analysis of observations and identified issues and implementation of corrective actions and controls

Business Risk Control Audits

An annual internal audit of identified key risk area/s of the business and the controls that mitigate those risks is conducted to ensure that risks are being managed to as low as reasonably practicable.

These planned audits are carried out to ensure the activity is performed in accordance with defined procedures and work instructions and the identified controls mitigating risk are in place and effective.

Audits are conducted across APA Networks on a national basis with the topics for the audit agreed in consultation with the General Manager in each state. The audit is usually completed by an external contractor.

Audit reports and any recommendations arising from audits are entered into MARCIS to ensure actions are tracked through to completion and are closed.

Technical Compliance Audits

In accordance with the requirements of AS 2885.3 technical compliance audits of AGN's transmission pressure pipelines in the metropolitan network are undertaken annually.

These audits ensure technical compliance with the requirements of the standard with respect to management system, processes, and facility integrity.

AGN Operational and Compliance Audits

AGN may conduct audits from time to time to assess APA's management systems, practices and controls, in meeting licence obligations.

Regulatory Compliance Audits

APA is subject to extensive annual audits conducted by the OTR to verify compliance to this Safety Plan.

These audits include a review and verification of the status of actions arising from any recommendations from the previous year's audit.

Compliance System Audit

An external compliance system audit is conducted annually to provide an independent review of the system to ensure accordance with the Australian Standard for Compliance Programs AS 3806.

5 FORMAL SAFETY ASSESSMENT

5.1 PURPOSE

APA operates the distribution network by undertaking all necessary activities to ensure the performance; safety and reliability of the system are delivered at a reasonable cost. The effective planning and management required to achieve this objective is based on a thorough understanding of the underlying hazards and managing the associated risks of the gas distribution network.

The risk management framework of APA is based on AS/NZS ISO 31000 Risk Management – Principles and Guidelines, and the requirements of AS 2885 Pipelines-Gas and Liquid Petroleum and AS/NZS 4645 Gas Distribution Network Management. The risk management framework is subject to continuing ongoing evaluation to respond to changing circumstances, opportunities and threats.

5.2 SCOPE

APA is comprised of 10 key business groups responsible for its design, growth, maintenance and operation. Each business group has a responsible manager who has overall accountability for the activities of their group.

The specific business groups that relate to this Safety Plan are:

- System Operations
- Field Operations
- Capital Projects
- Network Expansion
- Planning and Engineering
- Compliance and Support
- Asset Strategy and Planning (Division of a National Group)
- Mains Renewal (Division of a National Group)
- Networks Support Services (Division of a National Group)
- Workforce Development (Division of a National Group)

5.3 METHODOLOGY

Risk management is a continuous process conducted at all stages throughout the life cycle of the distribution network. The primary principle in managing risk is to achieve an acceptable risk level.

5.3.1 Hazard Identification

APA identifies hazards during the whole life cycle of the distribution network including:

- Network design
- Construction, testing & commissioning
- Operations
- Maintenance & repair
- Decommissioning

Hazards are formally identified and include but are not limited to those hazards associated with the following:

- Gas releases
- Fire and explosion
- Extreme environmental conditions
- Loss of structural integrity

Where a hazard is identified, the threat to the following is determined:

- Safety of the public (including consumers)
- Safety of personnel working on the distribution network
- Network integrity
- Environment
- Property

For each threat, the following is determined and documented:

- What is the threat to the gas distribution network?
- Where does it occur?
- Who is responsible for the activity leading to the threat?
- How does it occur?
- How often does it occur?

5.3.2 Risk Assessment

A qualitative risk assessment of threats is undertaken in accordance with AS/NZS ISO 31000-2009. For each threat, the consequence and likelihood of each outcome is considered.

Table 1 Impact (Consequence) Ratings

Consequence Categories	Insignificant	Minor	Medium	Significant	Major	Catastrophic
Health & Safety	First aid treatment only with the ability to return to work immediately	External medical treatment but excluding hospitalisation with the ability to return to work the next work day	Injury or illness requiring hospitalisation and resulting in the inability to return to work the next day (LTI)	Permanent partial disability	Fatality OR life threatening injuries OR permanent total disability	Multiple fatalities
Environmental	Limited impairment to minimal area of low significance	Short-term (less than 12 months) temporary impairment to the biological or physical environment of a very localised area (<0.1ha)	Prolonged (more than 12 months but less than 2 years) reversible impairment to the biological or physical environment of a localised area (<1ha) which is easily rectified and which does not affect ecosystem function	An uncontrolled off-site release or event resulting in reversible prolonged (more than 2 years but less than 5 years) impairment to the environment but which does not affect ecosystem function	An uncontrolled off-site release or event in wide area resulting in reversible long-term environmental impairment of ecosystem function.	Uncontained, long-term serious environmental degradation OR permanent impairment to ecosystem function or habitat
Operational	Temporary delay in service	Temporary delay to service with	An interruption of less than 7	An interruption of more than 7	An interruption of more than 1	An interruption of more than 1

	delivery with no material effect to operations	minimal effect to operations in which the business would return to normal almost immediately OR ☐ Loss or interruption to services to less than 100 tariff consumers/day OR parameters not met to 1 contract customer of the Networks Business OR ☐ Short-term (less than 12 months) temporary partial impairment to operational efficiencies	days and restriction of operations but with shortfall met from other sources OR ☐ Loss or interruption to services to more than 100 but less than 1,000 tariff consumers/day OR more than 1 but less than 5 contract customers of the Networks Business OR ☐ Prolonged (more than 12 months but less than 2 years) temporary partial impairment to operational efficiencies	days but less than 1 month and restriction of operations with shortfall substantially met from other sources OR ☐ Loss or interruption to services to more than 1,000 but less than 10,000 tariff consumers/day OR more than 5 but less than 10 contract customers of the Networks Business OR ☐ Permanent partial impairment to operational efficiencies	month but less than 1 year and restriction of operations with shortfall only partially met from other sources OR ☐ Loss or interruption to services to more than 10,000 but less than 100,000 tariff consumers/day OR with Network area growth Affected OR more than 10 but less than 20 contract customers of the Networks Business OR ☐ Permanent substantial impairment efficiencies.	year and restriction of operations with shortfall unable to be met from other sources OR ☐ Loss or interruption to services to more than 100,000 tariff consumers/day OR more than 20 contract customers of the Networks Business OR ☐ Permanent loss of operational efficiencies

The frequency of occurrence of each threat is assigned for each event where risk estimation is required, with the frequency of occurrence selected from Table 2.

Table 2 Frequency Classes

Frequency Class	Frequency Description
Frequent	Is currently occurring, or will almost definitely occur
likely	Can be expected to occur in most circumstances
Occasional	Can be expected to occur in certain circumstances
Possible	May occur in certain circumstances
Unlikely	Not expected to occur but may occur in abnormal circumstances
Rare	Conceivable but only in exceptional circumstances

The consequence and frequency analysis is combined using Table 3 to determine the risk rank. Risks determined to be low or negligible or demonstrated to be As Low as Reasonably Practicable (ALARP) are accepted risks.

Table 3 Risk Assessment and Control Tool

	Insignificant	Minor	Medium	Significant	Major	Catastrophic
Frequent	Low	Moderate	High	Extreme	Extreme	Extreme
Likely	Low	Moderate	High	High	Extreme	Extreme
Occasional	Low	Low	Moderate	High	High	Extreme
Possible	Negligible	Low	Moderate	High	High	High
Unlikely	Negligible	Low	Moderate	Moderate	High	High
Rare	Negligible	Negligible	Low	Moderate	Moderate	High

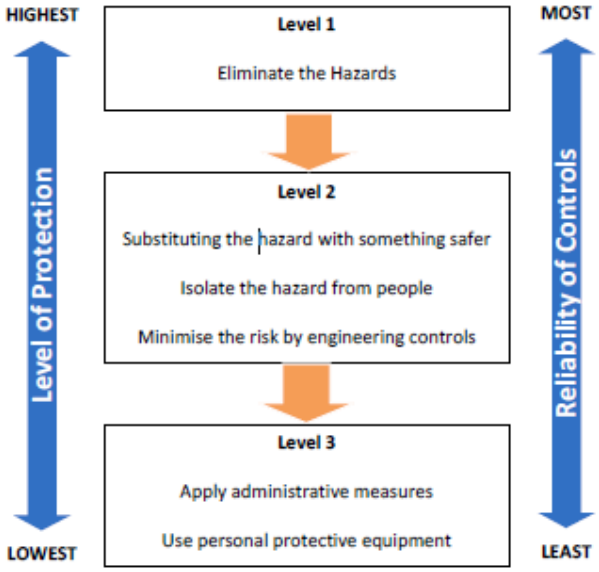
5.3.3 Risk Treatment

Table 4 is used to determine the key actions required to be taken in order to reduce the risk based on the risk rank from Table 3. The action taken and its effect on risk management is then documented and approved.

Table 4 Risk Management Action Descriptions

Risk Level	Key Actions
Extreme	Do not proceed with work. Immediate action required to mitigate or reduce risk to ALARP. If not reasonably practicable to do so all appropriate control measures must be applied and risk escalated to Executive Group Manager of the relevant business for resolution before work starts. Monitor changes which could affect the risk classification.
High	Do not proceed with work without management approval. Immediate action required to mitigate or reduce risk to ALARP. If not reasonably practicable to do so all appropriate control measures must be applied and risk escalated to General Manager of the relevant business for approval to proceed and/or resolution before work starts. Monitor changes which could affect the risk classification.
Moderate	Work can proceed once supervisor has confirmed process has been adequately followed and risk controls identified and implemented. Management instructions must be specified before work commences and must be followed. Proper diligence must be exercised and reasonable steps / precautions must be taken to ensure the risk level is controlled to as low as reasonably practicable. Periodic monitoring required.
Low	Manage by routine plans and procedures. Proper diligence must be exercised and reasonable steps / precautions must be taken to ensure the risk level is controlled to as low as reasonably practicable. Monitor changes which could affect the risk classification.
Negligible	

To manage exposure to risks, the appropriateness of controls are considered in the order shown in this diagram:



Controls are selected on the basis of the most effective control(s) that eliminate the hazard or minimise the risk. This may involve a single control measure or a combination of different controls that together provide the highest level of protection that will mitigate the risk to As Low As Reasonably Practical (ALARP).

5.3.4 ALARP

For any risk to be ALARP, it must be possible to demonstrate that the costs involved with reducing the risk further would be grossly disproportionate to the benefit gained.

A risk cannot be designated as ALARP until the following has been completed:

1. Analysis of the means of further reducing the risk, including an analysis of various options;
2. Review as to the reasons why these further means have not been adopted; and
3. Substantiation that the cost of further risk reduction measures is grossly disproportionate to the benefit gained from the reduced risk that would result.

Options that will be considered include:

- Relocation of the network components;
- Modification of the design of network components;
- Review of pressure levels;
- Modification or enhancement of specific operations or maintenance procedures;
- Modification to gas distribution network marking; and
- Threat treatment for operating gas distribution networks shall consider interim control measures (e.g. reduction in operating pressure, access restrictions) to allow time for the implementation of permanent control measures (e.g. repair).

The further risk reduction measures considered and the reasons they have not been adopted are then documented.

5.3.5 Types of Hazards

APA has identified the following hazards and threats for the distribution network.

- Pipeline leak or rupture (without ignition)
    - Third party damage
    - Over-pressure
    - Fabrication, construction or repair faults
    - Material or component defects
    - Operational or maintenance non-conformance
    - Venting or purging
    - Corrosion
    - Materials or components degradation (age influence)
    - Damage during construction, maintenance, etc.
    - Natural forces
    - External loads/forces
    - Vibration
    - Design or engineering faults
- Gas fires or explosions
    - Immediate ignition (within or in vicinity of gas hazardous area)
    - Delayed ignition (outside of gas hazardous area)
    - Air/gas mixing in network
- Gas personnel safety hazards
    - Fatal risks
    - Chemicals and other substances
    - Construction operation maintenance and related activities
    - Plant equipment tools and facilities
    - Work environment and related activities
    - Other
- Supply reliability and safety hazards
    - Gas composition (quality)
    - Response systems and procedures
    - Supply interruption
    - Pressure reduction
    - Miscellaneous
- Hazards affecting third party safety, property etc.
    - Threats from design, fabrication, construction, operations, maintenance or repair activities
    - Threats from testing, commissioning or decommissioning activities

- Electrical and lightning safety hazards (affecting consumers and public members)
- Decommissioned pipeline hazards
    - Explosion
    - Ground subsidence
    - Water flood / damage
    - Residual pollutants
    - Conduit for hazardous materials
- Resource management hazards
    - Training, skills, availability etc.
    - Information systems

If and when a new or increased hazard arises, APA will conduct a separate risk assessment.

5.4 CONTROLS

Measures to reduce the risks associated with the hazards outlined in section 5.3.5 above include (but are not limited to) the following.

- Excavation Awareness
- Work Permit System
- Location Advice/Standby Supervision
- Dial-Before-You-Dig Program
- Records
- Maintenance Program
- Network Design
- Fit for Purpose Equipment
- Gas Quality System
- Material Design
- Network Modelling
- Skilled and Competent Workforce
- Work Procedures/SWMS/JHEA's
- Supervision
- Site and Equipment Inspections
- Use of Approved Suppliers
- Audits
- Change Management Procedures
- Compliance with Australian Standards
- Consultation with External Stakeholders
- Housekeeping
- Capacity Upgrade Programs
- Checking and Approvals Process
- Manufacturer's Storage & Handling Recommendations
- Materials Committee
- Cathodic Protection Systems
- Quality Systems

- Certification of Materials
- Coating Systems
- Asset Replacement Programs
- Electrical Isolation Systems
- Peak Demand Monitoring
- Compliance Program

A review of risks and mitigations is completed monthly by APA with the risk register updated as necessary.

APPENDIX 1 – Operations Centres

AGN

Australia Gas Networks Head Office is located at:

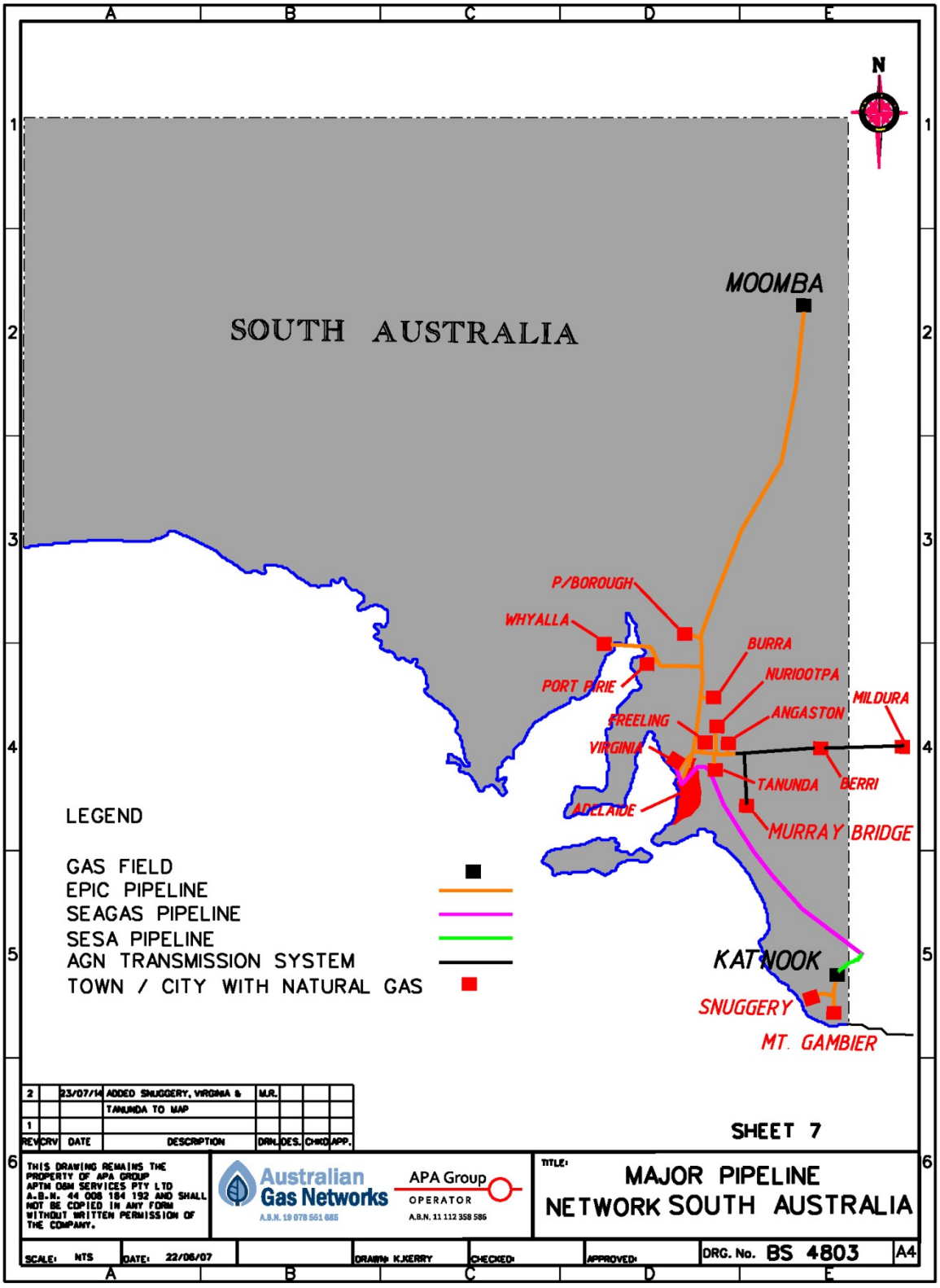
400 King William Street
ADELAIDE SA 5000
Telephone: (08) 8227 1500
Facsimile: (08) 8227 1511
Web Site: www.australiangasnetworks.com.au

APA

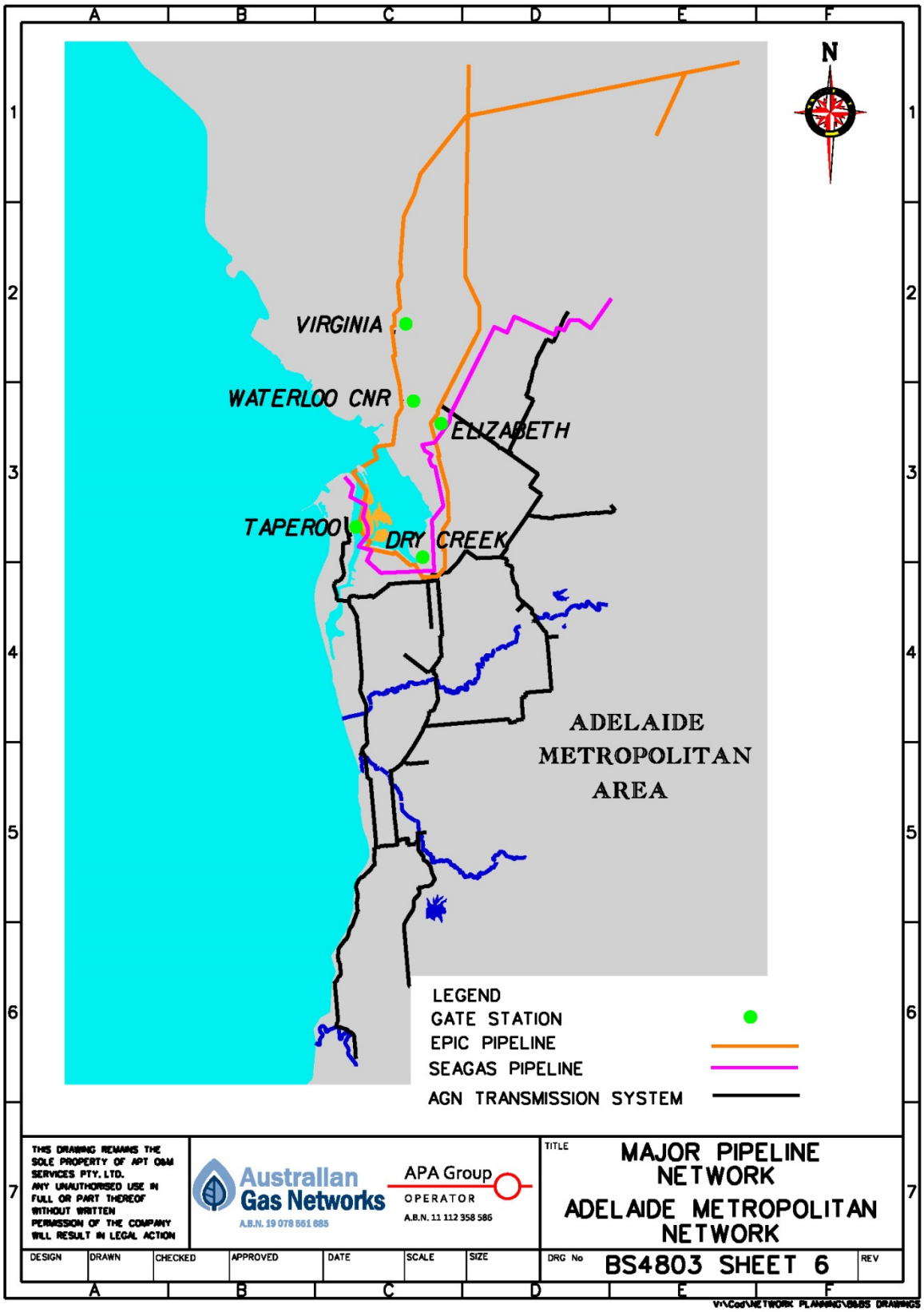
The following is a list of the various APA sites, where direct employees or contractors of APA are stationed:

- Sydney Head Office – Level 19, 580 George Street, Sydney NSW 2000
- Adelaide CBD Office – 400 King William Street, Street, Adelaide SA 5000
- Kidman Park Operations Depot – 330 Grange Road, Kidman Park SA 5025
- Mount Gambier Operations Depot 3 Pyne Close, Mount Gambier SA 5290
- Port Pirie Operations Depot – 152 Kingston Road, Port Pirie SA 5540

APPENDIX 2 – Location of Distribution Networks in South Australia



APPENDIX 3 – Location of Networks in Adelaide Metropolitan Area



[redacted]

12	River and Pipeline (Murray Bridge Lateral)	AGN	Murray Bridge	Lagoon Rd, Murray Bridge	AGN	TR Meat, National Foods and Murray Bridge Township	Wasleys Odoriser Station	Pump Liquid Injection
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

APPENDIX 5 – Farm Taps in South Australia

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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[redacted]	[redacted]	[redacted]			
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[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

APPENDIX 6 – Composition and Locations of SA Distribution Networks

Pressure Regimes

Pressure	Definition
Transmission Pressure (TP)	Networks with a MAOP between 1050 kPa and 1750 kPa
High Pressure (HP)	Networks with a MAOP between 250 kPa and 1049 kPa
Medium Pressure (MP)	Networks with a MAOP between 7 kPa and 249 kPa
Low Pressure (LP)	Networks with a MAOP between 0 kPa and 6 kPa

Composition as at 30 June 2015

The condition of the distribution network varies, predominantly in accordance with age. Where the condition of part of the network is such that it requires repair or replacement, action is taken to undertake repairs or schedule replacement as required in accordance with good industry practice.

Composition of the Distribution Network

	Length (km)			
Pressure	**Cast Iron**	**Polyethylene/Plastic**	**Steel**	**Copper**
Low	628	372	97	0.1
Medium	59	2,221	496	1
High	0	2,823	1,135	0.1
Transmission	0	0	209.3	0
Sub-total	687	5,416	1,937.3	1.2
GRAND TOTAL	**8,041.5**			

Size of Each Separate Distribution Network

	Length of Mains (km)		
	Distribution Mains	TP Mains	Total
Metropolitan (includes Waterloo Corner, Two Wells and Virginia)	7,269.2	190	7,459.2
Mount Gambier	213	0	213
Murray Bridge	31	2	33
Angaston	13	0	13
Nuriootpa	31	0.6	31.6
Tanunda	22	0.7	22.7
Berri	9	10	19
Freeling	9	0	9
Port Pirie	125	5	130
Whyalla	105	0	105
Peterborough	5	0	5
Snuggery	0	1	1
Grand Total	**7,832.2**	**209.3**	**8,041.5**

APPENDIX 7 – Regulator Summary SA Distribution Networks

As at 30 June 2015

Pressure Regulation	Total Number of Regulators
T - H	61
T - M	28
T - L	1
H - H	3
H - M	50
H - L	59
M - M	2
M - L	100
Total	304

Legend

T-H	Pressure regulated from transmission pressure to high pressure
T-M	Pressure regulated from transmission pressure to medium pressure
T-L	Pressure regulated from transmission pressure to low pressure
H-H	Pressure regulated within the same high pressure range
H-M	Pressure regulated from high pressure to medium pressure
H-L	Pressure regulated from high pressure to low pressure
M-M	Pressure regulated within the same medium pressure range
M-L	Pressure regulated from medium pressure to low pressure

APPENDIX 8 – Gas Quality Characteristics

For the period 1 July 2014 to 30 June 2015.

Ranges of composition by component and key gas characteristic data based on regular spot analyses of natural gas from SEAGas, Co-mingled and Moomba gas. Gas Characteristics measured at Metric Standard Conditions dry (15°C and 101.325 kPa).

MOOMBA NATURAL GAS										
Component	**CH_4**	**C_2H_6**	**C_3H_8**	**i-C_4H_{10}**	**n-C_4H_{10}**	**i-C_5H_{12}**	**n-C_5H_{12}**	**C_6H_{14}+**	**N_2**	**CO_2**
Minimum	86.44	0.37	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.74	0.18
Maximum	98.29	6.19	1.53	0.10	0.13	<0.01	0.03	0.01	5.00	4.16
Average	96.57	1.16	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	1.26	0.93
SEA GAS										
Component	**CH_4**	**C_2H_6**	**C_3H_8**	**i-C_4H_{10}**	**n-C_4H_{10}**	**i-C_5H_{12}**	**n-C_5H_{12}**	**C_6H_{14}+**	**N_2**	**CO_2**
Minimum	86.69	4.48	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	1.53	3.72
Maximum	89.53	6.35	1.18	0.08	0.07	0.01	0.01	<0.01	1.80	4.76
Average	88.16	5.72	0.18	0.02	0.02	<0.01	<0.01	<0.01	1.66	4.24
CO-MINGLED NATURAL GAS AT METROPOLITAN REGION										
Component	**CH_4**	**C_2H_6**	**C_3H_8**	**i-C_4H_{10}**	**n-C_4H_{10}**	**i-C_5H_{12}**	**n-C_5H_{12}**	**C_6H_{14}+**	**N_2**	**CO_2**
Minimum	87.83	0.25	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	1.03	0.25
Maximum	98.06	6.24	1.04	0.15	0.19	0.05	0.04	0.01	2.42	4.17
Average	93.30	2.97	0.17	0.02	0.02	0.01	<0.01	<0.01	1.45	2.06

Adelaide Metropolitan Region and the Riverland

Characteristic	Moomba Natural Gas	SEA Gas Natural Gas	Co-mingled Natural Gas at Metropolitan Region
Average Gross Heating Value (MJ/m³ dry)	37.33	37.31	37.44
Minimum Gross Heating Value (MJ/m³ dry)	36.81	36.98	36.83
Maximum Gross Heating Value (MJ/m³ dry)	38.43	38.14	38.29
Average Specific Gravity (Air = 1.00)	0.58	0.63	0.60
Minimum Specific Gravity (Air = 1.00)	0.56	0.62	0.56
Maximum Specific Gravity (Air = 1.00)	0.65	0.65	0.64
Average Wobbe Index	49.21	46.90	48.45
Minimum Wobbe Index	46.69	46.48	46.99
Maximum Wobbe Index	50.16	47.46	49.83
Average* detectability level of odour (expressed as definite %L.E.L.)	8.41	13.02	9.46
Lowest* detectability of odour (expressed as definite %L.E.L.)	26.30	25.90	23.60
Highest* detectability of odour (expressed as definite %L.E.L.)	0.50	1.80	0.80

South East South Australia

Characteristic	SEA Gas Natural Gas	Katnook Gas	Co-mingled Natural Gas At Limestone Region
Average Gross Heating Value (MJ/m^3 dry)	37.31	N/A	37.36
Minimum Gross Heating Value (MJ/m^3 dry)	36.98	N/A	36.95
Maximum Gross Heating Value (MJ/m^3 dry)	38.14	N/A	37.69
Average Specific Gravity (Air = 1.00)	0.63	N/A	0.63
Minimum Specific Gravity (Air = 1.00)	0.62	N/A	0.62
Maximum Specific Gravity (Air = 1.00)	0.65	N/A	0.64
Average Wobbe Index	46.90	N/A	47.15
Minimum Wobbe Index	46.48	N/A	46.34
Maximum Wobbe Index	47.46	N/A	47.79
Average* detectability level of odour (expressed as definite %L.E.L.)	13.02	N/A	17.39
Lowest* detectability of odour (expressed as definite %L.E.L.)	25.90	N/A	25.90
Highest* detectability of odour (expressed as definite %L.E.L.)	1.80	N/A	4.60

Gas Characteristics measured at Metric Standard Conditions dry (15^{o}C and 101.325 kPa) and measured odour intensities. (Data is sourced from spot analyses of gas samples taken from the network by Network Maintenance, System Operations)

*The definite %L.E.L (lower explosive limit) measure is the proportion of gas in air as measured using a gas/air diluter called an odorimeter or equivalent apparatus. The lower the intensity of the odour in the gas, the higher the %L.E.L level (higher concentrations) of gas in air required to detect the gas by odour.

APPENDIX 9 – APA Group Health, Safety and Environment (HSE) Policy

APA Group

Health, Safety and Environment (HSE) Policy

At APA we aspire to provide a zero harm work environment. We are committed to the effective implementation of our HSE Policy and to the continual improvement in our HSE performance.

To achieve this APA Group will:

- Provide leadership and direction to drive accountability for our HSE performance.
- Document, implement and maintain an appropriate HSE Management System.
- Comply with applicable HSE legislation and best practice requirements to which APA Group subscribes.
- Establish and regularly monitor measurable objectives and targets to ensure continued improvement against established standards.
- Communicate HSE commitments and information to employees, contractors and other relevant stakeholders.
- Proactively seek to identify hazards and reduce the risk of injury and environmental harm by investigating all reported accidents, incidents and near misses promptly and taking appropriate actions to prevent a reoccurrence.
- Provide appropriate training, supervision, specialist support and other resources to HSE matters.
- Consult and engage with our employees and other stakeholders to build relationships based on our values for meeting the goals of our HSE Policy.
- Partner with companies having similar HSE standards and values as APA Group.
- Ensure processes are in place to protect the environment from harm.

General Responsibilities for Health, Safety & Environment

Every employee has an obligation to look after their own health and safety and the safety of those who may be affected by their acts or omissions. They must comply with APA Group's HSE policies and procedures, including safe work procedures and directions about safety. They must report all accidents, incidents and near misses.

All managers and supervisors are responsible for managing HSE in accordance with the Group Policy and our HSE Management System as an integral and mandatory duty of their position.

Contractors and sub-contractors have an obligation to look after their own health and safety and the safety of those who may be affected by their acts or omissions. They must have a system that complies with all applicable health, safety and environmental legislation and local site rules or with the APA Group HSE policies and procedures.

Mick McCormack – Managing Director / CEO

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APPENDIX 10 – Relevant Documentation

Australian Standards

AS 2832.1-2015	Cathodic Protection of Metals - Pipes and Cables
AS 2885.0-2008	Pipelines – Gas and liquid petroleum – General requirements
AS 2885.1-2012	Pipelines – Gas and liquid petroleum – Design and construction
AS 2885.2-2007	Pipelines – Gas and liquid petroleum – Welding
AS 2885.3-2012	Pipelines – Gas and liquid petroleum – Operation and Maintenance
AS 3806-2006	Compliance Programs
AS 4041-2006	Pressure Piping
AS 4568-2005	Preparation of a Safety and Operating Plan for Gas Networks
AS/NZS 2885.5-2012	Pipelines – Gas and liquid petroleum – Field Pressure Testing
AS/NZS 4130-2009	Polyethylene (PE) Pipes for Pressure Applications
AS/NZS 4645.1-2008	Gas Distribution Networks – Network Management
AS/ NZS 4645.2-2008	Gas Distribution Networks – Steel Pipe Systems
AS/NZS 4645.3-2008	Gas Distribution Networks – Plastic Pipe Systems
AS/NZS 5601.1-2013	Gas Installations – General installations
AS/NZS ISO 31000:2009	Risk Management – Principles and Guidelines

APA Work Procedures (by Category)

Asset Protection

- Coatings
- Pipeline Patrols
- Leak Management
- Cathodic Protection and Earthing
- DCVG Surveys

Gas Fitting and First Response

- Meter Maintenance
- Gas Investigations
- First on Site Response

Gas Mains and Services

- General
- Safety
- Environment
    - 5304 Mains Dust and Syphon Water *(Decommissioning and Mains Abandonment Procedure)*
- Administration
- Main-laying
- Inlet Service
- Drilling, Tapping and Stop Off
- Repair and Maintain
- Excavation, Boring and Trenching
- Plant and Equipment
- Tools and Instruments
- Field Measurement

- 6203S Field Measurement Symbols *(Decommissioning and Mains Abandonment Procedure)*

Transmission Pipelines

- Transmission Pipeline Management
- Operations and Maintenance Schedules
- Scheduled Maintenance
- General Maintenance
  - 9064 Blowdown of Pipeline Sections *(Decommissioning and Mains Abandonment Procedure)*
  - 9065 Purging of Pipeline Sections *(Decommissioning and Mains Abandonment Procedure)*
- Pipeline Repair
- Emergency Management
- Risk Management
- Environmental Management
- Records

Pressure Control and Metering

- Metering, Pressure Control and Compressing Station Maintenance
- Pressure Vessels
- Pressure Regulator and Control Valves
- Relief Valves
- Over Pressure Protection Equipment
- Heaters
- Filters and Separators
- Metering
- Isolation Valves

Odorising

- Odorising Management Manual

APPENDIX 11 – Planned Periodic Surveys

Network Location	Areas (Include but not limited to)	Survey Type	Survey Frequency
CBD	Identified areas within state capital cities which contain a high population density due to concentration of office and retail activities.	Survey of mains only.	6 Monthly
High Risk Locations	Meters in shops where the regulator is not vented outside the building.	Meter room/installations survey.	12 Monthly
	Basement and Cellars with primary meters.	Meter room/installations survey.	
	All Schools in proximity of a gas main.	Leak survey mains adjacent to assembly points and on opposite side of the road, except where the risk from a main on the opposite side of the road has been assessed, documented and determined to be low. Leak survey of services (where accessible) and meter(s). Condition assessment of above ground services (where applicable).	
	All Hospitals in proximity of a gas main.		
	All Tunnels in proximity of a gas main.		
	Other known places of major public assembly where more than 500 people can gather e.g. stadiums, shopping centres, factories, churches and high rise unit developments.		
	Places of increased likelihood of failure e.g. exposed gas mains.	Leak survey and condition assessment.	
	Industrial and Commercial sites with inlet services operating at 3kPa or above and where gas meters are installed inside a building.	Leak survey and condition assessment.	
	Areas with high density polyethylene gas mains designated as higher risk are surveyed more frequently.	Leak survey	Monthly
			6 Monthly
			12 Monthly
Other Locations	All other areas not identified as either an extreme or high risk area.	Survey of mains only.	5 Yearly