



# Jemena Asset Management Pty Ltd

## Options Analysis

Mascot PRS - Facilities Obsolescence

GAS-1530-RP-IN-002



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# 1. Executive Summary

## 1.1 Project and Key Drivers

This document provides options for the refurbishment of the Mascot Pressure Regulating Station (**PRS**) and associated Automatic Line Break Valve (**ALBV**). Identifying the prudent option to address the obsolescence of crucial equipment in the Mascot PRS will mitigate key operational and safety issues, ensuring compliance with regulatory obligations are met and optimises long-run operational costs.

Mascot PRS is a high-pressure gas facility owned and operated by JGN. It is located along located on Coleman Street, a cul-de-sac street in a local business area, Mascot, NSW. The function of the PRS is to reduce the pressure of natural gas received from the Sydney Primary Main (MAOP 3,500kPag) and distributing it to Mascot and the surrounding secondary networks (MAOP 1,050kPag). Mascot PRS supplies to approximately 104,000 customers.

This document provides options for addressing the obsolescence issues at Mascot PRS, identifying the most prudent option to address the key issues required to maintain facility operations and ensure compliance with regulatory obligations.

The key problem statement associated with the Mascot PRS facility is obsolescence of pressure control configuration:

- The assets associated with pressure control at Mascot PRS are obsolete and are operating well beyond their design lives making it challenging to find spare parts and perform maintenance. The pressure control valve regulators have been in operation for 48 years and have had their lives extended through periodic refurbishment (machining to specification) to ensure valves operate in accordance with functional specifications. These valves can no longer be machined back into specification as the valves will no longer hold gas and will functionally fail.

In conjunction with the above problem statement, is the opportunity to address further issues and risks associated with the facility, those being:

- Safety - Operating a pneumatic control valve with instrument natural gas as power supply creates a safety risk in the operation of the facility.
- Compliance – Mascot high-pressure facility was installed and commissioned 35 years ago, and adhered to the standards at the time of installation. Current Australian Standards, Regulations and Acts, in particular, with regard to electrical equipment in hazardous areas and electrical earthing have evolved. The current configuration of the station does not align with respect to these evolved standards. This has implications for personnel safety by not addressing these risks.
- Integrity and Reliability – a significant portion of the E&I equipment and its systems at Mascot PRS facility are past their design life, obsolete and difficult to maintain. This includes the instrumentations, remote telemetry units, communication equipment, panels, wiring and distribution boards.

Three options have been assessed in this document to address the issues and risks thus ensuring the most effective solution is selected to maintain safe operation, compliance and reliability of the asset. Without an adequate solution, there is an untreated risk rating of “HIGH”, which is above Jemena’s risk threshold in accordance with the Group Risk Management Manual<sup>1</sup>.

<sup>1</sup> JAA MA 0050 Group Risk Management Manual [Risk - Group RM Manual JAA MA0050.pdf](#)

## 1.2 Credible Options and Recommendations

The credible options and associated estimated costs for this project are presented below.

**Table 1-1: Option for the Project**

Option	Option Name	Description	CAPEX (\$000's, Real 2023)
1	Maintain Status Quo	No mechanical or E&I equipment are replaced , as a result all risks continue to increase.	\$0.00M
2	Replace Like for Like	Replace pneumatic control valves, instrument gas power system, earthing and E&I equipment maintaining Like-for-like configuration.	\$5.97M
3	Simplify facility operating configuration	This option simplifies and modernises facility operation by replacing the existing pneumatic control valves with Gorter-type slam-shut valves and regulators. All electrical and instrumentation systems, wiring, earthing, and all associated systems are replaced bringing the facility to international industry convention.	\$5.67M

Option 3 is the recommended option.

- This option addresses the key problem statement of obsolescence and delivers additional opportunities for improvement, by simplifying the facility operating configuration. Removing the pneumatic control valves and bringing E&I equipment to current-day standards, addresses the integrity, reliability, safety and compliance secondary drivers of this project.

The estimate Gate 1 cost of undertaking the works identified in Option 3 is \$5.67M and is planned for practical delivery in CY26. There can be slight variations of the options, but these will be addressed following the project management methodology lifecycle through the next Gates.

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## 2. Introduction

### 2.1 Purpose

The purpose of this document is to describe credible options and identify the prudent option to address obsolescence issues at the Mascot high pressure facility.

### 2.2 Objectives

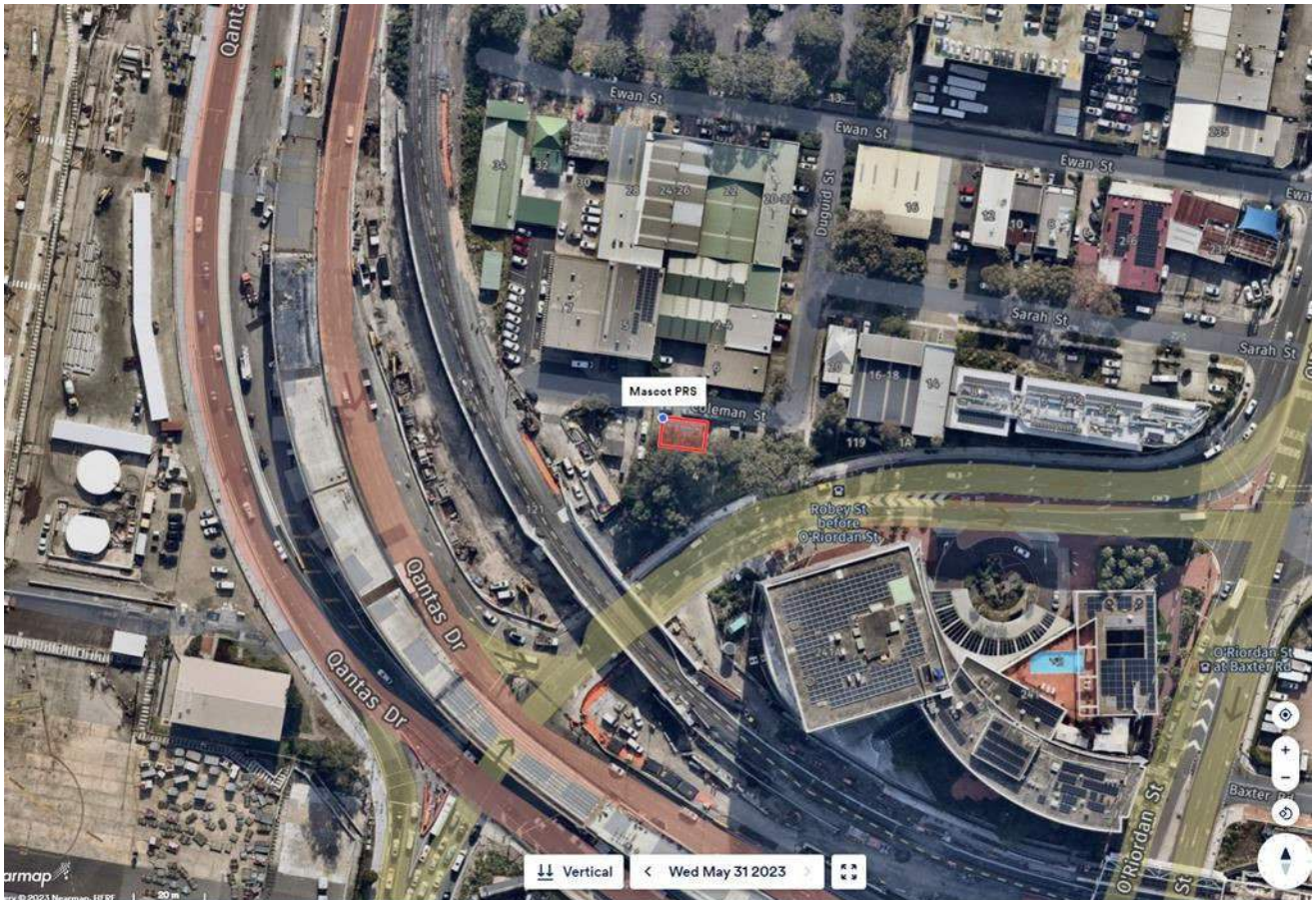
The objectives of this investment are to:

- (i) Remove obsolete assets associated with pneumatic pressure control.
- (ii) Maintain the safe operation of the high pressure facility.
- (iii) Maintain technical compliance of the facility E&I and earthing systems to Standards, Codes and Regulations
- (iv) Maintain the integrity and reliability of the high pressure facility equipment.
- (v) Align to international industry convention for high pressure facilities, as stated in the Asset Class Strategy, to optimise maintenance and other operational activities.
- (vi) Prudent expenditure of TOTEX.

## 3. Project Description

### 3.1 Project Background

Mascot PRS, commissioned in 1976 is a high pressure gas facility owned and operated by JGN. It is located along Coleman Street, a cul-de-sac street, NSW (see Figure 1). The function of the PRS is to reduce the pressure of natural gas received from the Sydney Primary Main (MAOP 3,500kPag) and distributing it to Mascot and the surrounding secondary networks (MAOP 1,050kPag). Mascot PRS supplies approximately 104,000 customers.



**Figure 3-1: Mascot PRS Site Location**

Mascot PRS is fitted with two operating runs, a duty and standby. The equipment configuration in each operating run is Meter – Passive Monitor – Active control valves. Instrument Air/Gas power systems are used to power the control valves. Safety override and shutdown sequence are as follows:

- Active fail – Pressure rise to monitor setting – Monitor override takes over
- Monitor fail – Pressure rise to **PSH (Pressure Switch High)** setting – Shut Active valve
- Further pressure rise to **PSHH (Pressure Switch High High)** – Shut Monitor valve

Jemena Asset Management has identified Mascot PRS a high-pressure facility that requires obsolescence of crucial equipment to be addressed.



## 3.2 Principal Needs

The key problem statement associated with the Mascot PRS facility is obsolescence of the instrument air/gas power systems and the inability to further maintain the pressure control valves, crucial equipment that allows the facility to regulate the gas pressure to the downstream network. As a result, JGN's ability to maintain facility operation is at risk.

### 3.2.1 Pressure control functionality

The pressure control valves at Mascot PRS were installed in 1990's and are obsolete, operating well beyond their design lives making it challenging to find spare parts and perform maintenance. Over the 48 years of operation, these pressure control valve regulators have had their lives extended through periodic refurbishment (machining to specification) to ensure valves operate in accordance with functional specifications.

The pressure control valves can no longer be machined back into specification, and thus the valves will functionally fail, as they will not be able to regulate the pressure within the required limits.

## 3.3 Secondary Considerations

In addition to the above there is a requirement to address further issues and risks associated with the facility, those being:

### 3.3.1 Compliance & Safety

Australian Standards, Regulations and Acts, have evolved since the facility was commissioned. Specifically, Australian Standards for Hazardous Areas (**HZ**) - AS60079 and the Electrical wiring rules - AS3000. The current configuration of the station does not align with respect to these evolved standards. This has implications for personnel safety by:

- Current electrical switch boards do not have a Residual Current Device (**RCD**) to switch off the supply of electricity immediately when electricity is leaking to earth, which potentially could harm personnel.
- The earthing systems installed on site pose a safety risk to personnel and equipment. For example the ALBV has no Insulating Joint (**IJ**) between the pipe and valve, therefore, to achieve Cathodic Protection (**CP**), the earthing has been removed. Technicians working on the valve may receive an electric shock from any current surge on the pipe. To date, administrative controls are being relied upon to prevent technicians being exposed to this safety risk of an electric shock.

### 3.3.2 Integrity

A significant portion of the E&I equipment and systems at Mascot PRS facility are past their design life and are also obsolete. This includes the instrumentations, remote telemetry units, communication systems, panels, wiring, distribution boards and system earthing.

## 3.4 Assumptions

Assumptions that are applicable to this project are outlined in Table 3-1. All assumptions where possible are to be verified prior to proceeding with the works described in this options analysis.

**Table 3-1: Assumptions and Implications**

No.	Description	Implication	Criticality
1	The Mascot PRS Facility does not require shutdown for any period to perform the works.	If the recommendation is to shut down Mascot PRS to enable this project, this would cause a constraint in the supply of gas to the downstream secondary networks and would require an alternative implementation strategy potentially incurring in additional costs.	High
2	The capital program has funds available for the scope of this project's preferred option.	If there is not sufficient funds for this project, the status quo facility operating configuration and its associated risks will remain in the business.	High
3	The Project will utilise competent resources.	The availability of competent resources would impact the project timeline, and/or cost to acquire competent resources.	High
4	All estimated costs including Opex and Capex are at the desktop level using historical costs with other similar projects as the basis	Costs can vary depending on the detailed scope of works, resourcing, and contractor costs until financial investment decision costs are available.	Medium



## 4. Credible Options

The following options were identified:

- Option 1: Maintain Status Quo
- Option 2: Replace Like for Like
- Option 3: Simplify facility operating configuration

All options are explained in detail below.

### 4.1 Option 1: Maintain Status Quo

#### 4.1.1 Scope

Maintains the 48 year old operating configuration. No mechanical or E&I equipment are replaced, as a result all risks continue to increase.

#### 4.1.2 Benefits

This option incurs no additional CAPEX.

#### 4.1.3 Limitations

This option does not address any of the project drivers:

- Control valve regulators obsolescence poses facility performance and reliability issues, and inhibits maintenance.
- Continued degradation of earthing poses worker safety risk as electrical system faults will not be diverted to ground.
- Use of natural gas as power system to control valves is dated technology that was available at the time of station construction. It results in continuous emissions of methane to atmosphere, which in turn increases the risk of ignition. The system is an archaic design and is no longer aligned with Jemena's emissions reduction strategy.
- E&I equipment obsolescence increasing maintenance difficulty.
- Long-run operating costs will continue to increase through escalating corrective maintenance.

#### 4.1.4 Summary

No mechanical or E&I equipment are replaced, as a result all risks continue to increase. A number of critical systems are outdated and no longer readily available in the market, either as OEM (Original Equipment Manufacturer) parts or generic alternatives. Given the difficulty to source replacement parts, it is becoming increasingly challenging to maintain the facility's integrity and reliability.

The overall risk rating will remain at **"HIGH"**.

## 4.2 Option 2: Replace Like for Like

### 4.2.1 Scope

This option replaces the pneumatic control valves, instrument air/gas power system, earthing and E&I equipment maintaining like for like configuration.

The mechanical scope includes the following:

- On each run,
  - Remove the two control valves and all piping components.
  - Replace the two control valves with like for like equipment.
  - Remove instrument air/gas power system.
  - Replace instrument air/gas power system with like for like equipment.

All E&I equipment are replaced to meet current standards and specifications, including:

- Electrical & Control Cabinets
- Process Instrumentation equipment.
- Electrical Cables and accessories.
- AC & DC systems.
- Earthing system upgrade.
- Relevant Facility Dossier and documentation updated accordingly.
- Replace instrument air/gas power system with same type 100% duty cycle.
- Replace equipment associated with instrument gas system such as dryer/filters, conditioning system etc.

### 4.2.2 Benefits

This option addresses all of the project drivers:

- Addresses facility obsolescence and maintains functional operability.
- Employs engineering controls to manage the threat to personnel and public safety as opposed to administrative controls.
- Maintain technical compliance of the facility to the evolved Standards, Codes and Regulations including AS 60079, AS3000 thus compliant with the Electricity (Consumer Safety) Act 2004 and the Electricity (Consumer Safety) Regulation 2006.

- All E&I defects and obsolescence will be mitigated, with no escalation in OPEX to maintain acceptable risk level.

### 4.2.3 Limitations

The limitations of this option are:

- Maintains current facility complexity with the existing design and operating configuration.
- Retains current maintenance schedule and costs associated with operating configuration.
- Highest upfront capital cost option.
- Does not align to the current strategic design objectives in simplifying the operation of the facility.

### 4.2.4 Summary

Although this option addresses most of the project drivers, it is not preferred as facility operations will continue to be complex, whilst compliant and safe. This option will require the most capital as compared to the other options.

This option reduces the overall risk rating from **HIGH to MODERATE**.

## 4.3 Option 3: Simplify facility operating configuration

### 4.3.1 Scope

This option simplifies and modernises facility operation by replacing the existing pneumatic control valves with 'Gorter' type slam shut valves and regulators and replaces all electrical and Instrumentation systems, including earthing, bringing the facility to JGN standards.

The mechanical scope includes the following:

- On each run,
  - Remove the two control valves and all piping components.
  - Remove all control systems and equipment associated with the control valves, including the instrument gas system.
  - Install two Gorter type slam shut valves and a Gorter type regulator. New pipe spools will be sized accordingly. Sizes of the slam shut valves, regulator and pipe spools will be determined during detailed design.
  - If existing pipe support is unsuitable for the new installations, new pipe supports will be designed and installed.

The E&I scope includes the following:

- Design and Rebuild A/C and D/C distribution systems.
- Design and Rebuild the whole earthing system.
- Design and rebuild new electrical and control cabinets as per AS3000:2018 and AS60079:2022.

- Replace all remote telemetry units and communication systems.
- Design and build a new Hazardous Area dossier according to the new design.
- All design and build will be in compliance with AS3000:2018 and AS60079:2022.

### 4.3.2 Benefits

This option addresses all the project drivers:

- Removal of the existing control valves will address pressure control equipment's obsolescence and reduce future non-compliance exposure due to limited E&I equipment.
- Addresses facility obsolescence and maintains functional operability.
- Employs engineering controls to manage the threat to personnel and public safety as opposed to administrative controls
- Maintain technical compliance of the facility to the evolved Standards, Codes and Regulations including AS60079, and AS3000 thus compliant with the Electricity (Consumer Safety) Act 2004 and the Electricity (Consumer Safety) Regulation 2006.
- All E&I defects and obsolescence will be mitigated, with no escalation in OPEX to maintain an acceptable risk level.
- The System Used Gas (SUG) and gas emissions are reduced by removing the equipment (pneumatically activated controllers and control valves) that continuously vent to the atmosphere as part of its normal operation.
- Meeting all the project objectives and streamlining the facility's operations will elevate it to the current industry convention. By eliminating the instrument power gas system, this approach significantly simplifies facility management and reduces methane emissions, thereby enhancing safety, optimising long-run operational expenses (OPEX) and improving environment performance in line with Jemena's strategy to meet our emission reduction targets.

### 4.3.3 Limitations

The limitations of this option is that it also requires material CAPEX investment, although less than Option 2.

### 4.3.4 Summary

This option will address all project drivers including facility function operation requirements, hazardous area and electrical safety concerns. It also optimises the operation of the facility and minimises the long-run OPEX.

This option reduces the overall risk rating from **HIGH to MODERATE**.

## 4.4 Comparison of Options

Table 4-1: Options Summary Table

Criteria	Option 1	Option 2	Option 3
<b>Option</b>	Maintain Status Quo	Replace Like for Like	Simplify facility operating configuration
<b>Description</b>	No mechanical or E&I equipment is replaced, as a result all risks continue to increase.	Replace pneumatic control valves, instrument gas power system, earthing and E&I equipment maintaining like for like configuration.	This option simplifies and modernises facility operation by replacing the existing pneumatic control valves with Gorter type slam shut valves and regulators. And replaces all electrical and Instrumentation systems, including earthing, bringing the facility to international industry conventions
<b>Benefits</b>	<ul style="list-style-type: none"> <li>Nil CAPEX</li> </ul>	<ul style="list-style-type: none"> <li>Maintain the safe operation of the high pressure facility.</li> <li>Maintain the reliability of the high pressure facility.</li> <li>Maintain technical compliance of the facility to Standards, Codes and Regulations</li> <li>Maintain ongoing OPEX at historical levels.</li> </ul>	<ul style="list-style-type: none"> <li>Maintain the safe operation of the high pressure facility.</li> <li>Maintain the reliability of the high pressure facility.</li> <li>Maintain technical compliance of the facility to Standards, Codes and Regulations</li> <li>Alignment with international industry convention for high pressure facilities to optimise maintenance and other operational activities.</li> <li>Pneumatic control system removed, reduced complexity.</li> <li>Maintain ongoing OPEX at historical levels.</li> <li>Aligns with emissions reduction strategy.</li> </ul>
<b>Limitations</b>	<ul style="list-style-type: none"> <li>Control valves obsolescence poses facility performance and reliability issues, and inhibits maintenance.</li> <li>Personnel safety risks maintain with use of natural gas as power system to control valves.</li> <li>E&amp;I equipment obsolescence increasing maintenance difficulty.</li> <li>Escalating OPEX activities over time</li> <li>Personnel safety risks remain.</li> </ul>	<ul style="list-style-type: none"> <li>Maintains current facility complexity with the existing design and operating philosophy.</li> <li>Retains current maintenance schedule and costs associated with operating philosophy and unavailability of spare parts.</li> <li>Misalignment with international industry convention for high pressure facilities.</li> <li>Highest CAPEX</li> </ul>	<ul style="list-style-type: none"> <li>High CAPEX investment, although less than Option 2.</li> </ul>
<b>Treated Risk Rating</b>	HIGH	MODERATE	MODERATE
<b>CAPEX Cost Estimate<sup>2</sup></b>	\$0	\$5.97M	\$5.67M
<b>OPEX Estimate<sup>3</sup></b>	\$142k per year average OPEX	\$105k per year OPEX	\$96k per year OPEX
<b>TOTEX Estimate (per 10 years)</b>	\$1.42M	\$7.02M	\$6.63M
<b>Recommended Order of Preference</b>	3 Unacceptable (Risk remains high, ongoing safety & reliability issues)	2 Not Recommended	1 <b>Recommended/Preferred Option</b>

<sup>2</sup> Gate 1 PEM Estimate for both options. Instrument Air compressor upgrade estimate taken from the Horsley Park project.

<sup>3</sup> Actual Opex estimate for the Mascot facility for the year RY23.

## 5. Recommendation

### 5.1 Recommended Solution

The recommended solution is Option 3 – Simplify facility operating configuration at a current CAPEX cost of \$5.67M at Gate 1.

This option targets all the objectives of the project by primarily simplifying the facility design and operation by replacing the control valves with Gorter type regulators and removing associated obsolete and redundant equipment including most of the E&I equipment and Earthing system.

Practical completion of this project is targeted for CY26.

### 5.2 Overall Benefits of Option 3

This option addresses all the project drivers:

- Removal of the existing control valves will address the obsolescence of pressure control equipment.
- Simplification of the facility configuration minimises E&I equipment and complexity of the facility.
- This option will eliminate obsolete equipment like instrument air/gas compressor power system, thereby reducing long-run OPEX costs through reduction in maintaining such equipment.
- Reduces complexity to ensure the facility remains compliant with the *Electricity (Consumer Safety) Act 2004* and the *Electricity (Consumer Safety) Regulation 2006*.

This option reduces the overall risk rating from **HIGH** to **MODERATE**.

### 5.3 Cost Breakdown

Item	Project Estimate (\$M)
Labour	\$0.87M
Material	\$0.45M
Subcontractor	\$1.91M
Risk	\$0.79M
Overheads	\$1.65M
<b>Total</b>	<b>\$5.67M</b>

## Appendix A – Reference Documents

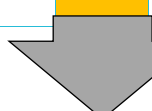
Document number	Title
13-JGN-MASC-PID-001	MASCOT PRS RUN1 P&ID
13-JGN-MASC-PID-002	MASCOT PRS RUN2 STANDBY P&ID
GAS-1530-DW-JJ-005	MASCOT PRS INSTRUMENT LAYOUT
7938-E-1502_3	24VDC SINGLE LINE DRAWING
7938-G-1501	MASCOT PRS-1530- SITE LAYOUT PLAN



## Appendix B – Risk Assessment

A risk assessment was conducted to determine the level of risk severity of the untreated risk. The table below shows the summary of results and then the treated risk summary for each option. The risk assessment was undertaken in accordance with the Group Risk Manual JAA MA 0050 Revision 10 (06/06/2023).

UNTREATED IMPACT / CONSEQUENCES						UNTREATED RISK SUMMARY		
Contributing Factors/ Scenario	Financial	Safety	Operational	Regulatory & Compliance	Comments	Consequence (Highest Impact)	Likelihood	Risk Level
<ul style="list-style-type: none"> <li>• Obsolescence of pressure control configuration could lead to failure of the pressure control and potential over pressurisation downstream</li> <li>• Using instrument gas as power supply to control valves creates a safety risk to personnel</li> <li>• E&amp;I and earthing systems obsolescence lead to personnel safety risk</li> </ul>	Serious	Severe	Severe	Severe	<ul style="list-style-type: none"> <li>• The assets are obsolete and operating well beyond their design lives making it challenging to find spare parts and perform maintenance.</li> <li>• The instrument gas power continues venting gas creating a hazardous area for personnel operating the facility.</li> <li>• Without an adequate solution, there are untreated risks of adequate earthing and bonding; and E&amp;I installations. These may cause personnel issues.</li> </ul>	Severe	Likely	High



<b>PREFERRED OPTION – Risk assessment summary</b>	<b>TREATED RISK SUMMARY</b>
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Preferred Option/Treated risk	Cost	Benefit	Key Mitigations	Consequence	Likelihood	Risk Level
<b>Option 3</b>	<b>\$ 5.67M</b>	<ul style="list-style-type: none"> <li>Maintain the safe operation of the high pressure facility.</li> <li>Maintain the reliability of the high pressure facility.</li> <li>Maintain technical compliance of the facility to Standards, Codes and Regulations</li> <li>Align to JGN standardisation for high pressure facilities to optimise maintenance and other operational activities.</li> </ul>	<ul style="list-style-type: none"> <li>Mitigates over pressurisation risk to downstream of the facility.</li> <li>Eliminate personnel safety risks due to earthing systems and use of instrument gas for control valve regulators.</li> <li>Aligns facility configuration to JGN standard.</li> <li>Maintains compliance of all Electrical and Instrumentation equipment in hazardous areas.</li> </ul>	Severe	Rare	Moderate

## Appendix C – National Gas Rules

Option 3: “Simplify facility operating configuration” has been chosen as the recommended option to fulfil the objectives of this project.

The implementation of this project complies with the new capital expenditure criteria rules 79 (1) and 79(2)(c)(i)-(iii).

The proposed solution is consistent with rule 79(1) of the National Gas Rules by being:

- Prudent – Three options have been considered and the selected option reduces the overall risk associated with the obsolescence of pneumatic pressure control equipment at the facility to an acceptable level in the long term. This is consistent with what would be expected of a prudent operator.
- Efficient – The cost estimates for this project were developed from actual costs of a similar project that followed the Jemena Procurement Policy.
- Consistent with accepted industry practice – The proposed solution aligns with industry standards and it is required to maintain compliance with regulatory obligations and personnel safety.

The project is also consistent with rule 79 (2)(c), because it is necessary to:

- Maintain the safety of services (79(2)(c)(i)) by mitigating the risk level of obsolete equipment on high pressure facilities from “High” to “Moderate”
- Maintain the integrity of service (79(2)(c)(ii)) by improving the facility functionality and maintaining compliance.
- Maintain compliance with a regulatory obligation (79(2)(c)(iii)) - Jemena is required by the *Electricity (Consumer Safety) Act 2004* – Section 31 and the *Electricity (Consumer Safety) Regulation 2006*, to comply with AS/NZS3000 and AS/NZS60079.