Jemena Asset Management Pty Ltd

Options Analysis

Facilities - Water Ingress Projects

GAS-1275-RP-FA-002

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1. Executive Summary

1.1 Project and Key Drivers

This document presents options for addressing the water ingress into the Automatic Line Break Valves **(ALBV)** pits in four (4) existing ALBV's owned and operated by Jemena Gas Networks (JGN).

In the event of heavy rain, ALBV underground pits have been subject to flooding due to groundwater and above ground water ingress, where all the equipment within the pit becomes submerged. The main pits which contain duty and standby runs are located in elevated grounds and do not have any evidence of water ingress to cause any damage to electrical and mechanical devices.

The facilities water ingress projects encompass three (3) projects in the regulatory period CY2025 -2030 covering four (4) existing ALBV Facilities, located on the JGN Sydney Primary Trunk Pipeline and include;

- Tempe ALBV
- Mascot ALBV
- Wetherill Park ALBV
- Lidcombe ALBV

ALBVs are high-pressure gas facilities owned and operated by JGN. The function of these high pressure facilities is to isolate sections of pipeline in cases of emergency as required by AS2885.1.

The key problem statement associated with these projects is:

- Reliability of ALBVs: The existing equipment within the ALBV pits are not designed or intended to withstand submersion in water. This can lead to damage of equipment (if water logged), requiring replacement. Additionally, ongoing flooding will accelerate corrosion and concrete deterioration of the pit walls. Of particular concern is the 240V light lamps, which, if exposed to water, could lead to a short circuit, resulting in equipment failure or loss of power supply.

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

- Personnel safety: Currently, when a high-water alarm is received, field personnel are dispatched to site to manually pump water out of the pits. There are also 240V lamps within the pits and if failure occurs (short circuit), will make the pit water "live" posing a significant risk to field personnel. Additionally, water in the pits and surrounding areas create slippery hazards for personnel.
- Maintenance and operational costs: Personnel need to remove the water in the pits, delaying other planned activities. The operational and maintenance costs at the ALBV facilities are notably high, primarily attributed to the frequent call outs required to respond to water-ingress issues on the facilities. During the years 2021 and 2022, there were 66 instances of call outs specifically to address this matter at different facilities. Dealing with water ingress necessitates the presence of heavy vehicles on site to pump out the water, which contributes to increased expenses.

Three options have been assessed in this document to address the risks thus ensuring the most effective solution is selected to maintain reliability, safety and operability of the assets. 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[1].

1.2 Credible Options and Recommendations

The credible options and associated estimated costs for these projects are presented below.

Table 1-1: Option for the Project

Option	Option Name	Description	CAPEX ($ Real 2023)
1	Maintain Status Quo	Do nothing, and continue mitigating the water ingress in to the ALBV pits manually by personnel.	$0
2	Option 2: Installation of controlled water pump.	This option includes the installation of an automated water pump system integrated into SCADA for monitoring purposes, and a corresponding water tank at an appropriate location.	$782K
3	Installation of pits bunds and controlled water pumps.	This option includes an extensive individual facility site assessment for the installation of ALBV pit bunds, drainage systems or other site remediation strategies aimed at diverting and/or stopping the water from entering the pits. In addition, it includes the installation of an automated pit pump system integrated into SCADA for water level monitoring purposes, and a corresponding water tank at an appropriate location.	$971K

Option 3 is the recommended option.

- This option addresses the key problem statement of reliability of the ALBVs and addresses the safety and operational secondary drivers of this project by providing an effective solution for the management of the water ingress in to the ALBV pits.

[1] JAA MA 0050 Group Risk Management Manual Risk - Group RM Manual JAA MA0050.pdf

2. Introduction

2.1 Purpose

The purpose of this document is to describe the drivers for the facility water ingress projects to be delivered in the regulatory period of 2026-2030.

2.2 Scope

This document describes the options assessed to mitigate the risks due to water ingress within the ALBV pits of the high pressure facilities of the Jemena Gas Networks.

2.3 Definitions

Name	Description
ALBV	Automatic Line Break Valve
AS	Australian Standard
CAPEX	Capital Expenditure
JGN	Jemena Gas Networks
MAOP	Maximum Allowable Operating Pressure
OPEX	Operational Expenditure
PRS	Pressure Reduction Stations
RY	Regulatory Year
SCADA	Supervisory Control and Data Acquisition
SPM	Sydney Primary Main
SPL	Sydney Primary Loop
TOTEX	Total Expenditure

3. Project description

3.1 Background

Mascot ,Tempe, Wetherill Park and Lidcombe contain Automatic Line Break Valves (ALBV) which are safety devices installed on the Sydney Primary Main (SPM) to automatically stop gas flow when a rapid change in pressure is detected. The ALBVs serve to isolate sections of pipeline in cases of emergency as required by AS2885.1.

ALBVs have an automatic line break function in the event of pipeline rupture, but can also be operated:

a) Automatically in the event of a significant pressure drop along the pipeline;

b) Remotely by control room operators; and

c) Manually by on-site field technicians.

In the event of heavy rain, ALBV underground pits have been subject to flooding due to groundwater and above ground water ingress, where all the equipment within the pit becomes submerged.

The main pits which contain duty and standby runs are located in elevated grounds and do not have any evidence of water ingress to cause any damage to electrical and mechanical devices.

The existing equipment within the ALBV pits, including mechanical and electrical components, are not designed or intended to withstand submersion in water. Also during heavy rain, the surrounding site conditions become hazardous to personnel posing a significant safety threat and inability to maintain a duty of care to its employees.

ALBVs are operated remotely from SCADA and any damage to the controls is a safety issue. Earthing system inside these ALBV pits are not integral and it is often compromised in an event of flooding in these pits.

It is imperative for the facilities to implement proper control systems in a holistic approach to effectively manage water ingress, ensuring the safety and reliability of assets. Addressing these concerns will enhance the overall safety of the facility and protect both personnel and equipment from water-related hazards.

3.2 Facilities Addressed

3.2.1 Mascot ALBV

Mascot PRS and ALBV, commissioned in 1976, are high pressure gas facilities owned and operated by JGN. They are located on Coleman Street, a cul-de-sac street in a local business area, Mascot, NSW.

The Mascot high pressure gas facility is positioned in an underground pit. The function of the PRS is to reduce the pressure of natural gas received from the Sydney Primary Main (MAOP 3,500kPag) and distribute it to Mascot and the surrounding secondary networks (MAOP 1,050kPag). Mascot PRS supplies approximately 104,000 customers.

The Mascot facility was commissioned in 1976 and consists of two (2) regulating runs (a duty and standby run), an instrument air power system, a pit venting system and various integrated ancillary equipment including electrical and instrumentation, all mostly located below ground.

Figure 1 below shows the Mascot facility compound and corresponding proposed works.

Figure 1: Mascot ALBV facility

3.2.2 Tempe ALBV

The Tempe high pressure gas facility, commissioned in 1976, is situated in a cycleway reserve adjacent to Mackey Park on the shores of Cooks River in the Sydney suburb of Marrickville. The primary function of this facility is to reduce the pressure of natural gas received from the Sydney Primary Main (MAOP 3,500kPag) and supplying to the local secondary network (MAOP 1,050kPag) feeding Kogarah, Sutherland, Kurnell and surrounds. The Tempe high pressure gas facility supplies approximately 44,000 customers.

The facility consists of Primary Regulating Station (PRS) with two regulating runs (a duty and a standby run), an automatic line break valve (ALBV), an instrument air power system, a pit venting system and various integrated ancillary equipment including electrical and instrumentation, all mostly located in belowground pits.

Figure 2: Tempe ALBV facility

3.2.3 Wetherill Park & Lidcombe ALBV

The Lidcombe ALBV is located off the East Street near the Rockwood Cemetery, Lidcombe while the Wetherill Park ALBV is located off the Victoria Street near Hassall Street, Smithfield. Both the ALBVs are installed on the SPM of the JGN and are positioned in underground pits. Both the ALBV sites are not fenced, located on the common pathways and accessed off-the street. Downstream of the ALBVs, are multiple facilities on the SPM that distribute gas to JGN customers. Disruption in operation in any of these ALBVs can cause the downstream network to temporarily run on the single source gas supply through Sydney Primary Loop (SPL)

Both facilities were commissioned in 1976 and each of them consists of a pit containing the main line valve, a pit venting system, gas detectors and alarms and various integrated ancillary equipment including electrical and instrumentation. Control unit for each pit is installed above ground, adjacent to the pits. See Fig3 & Fig 4.

Figure 3: Lidcombe ALBV facility

Figure 4: Wetherill Park ALBV Facility

Relocating the high pressure facilities described in this project is not a feasible solution as these are high density areas with limited availability of space at a reasonable cost for Jemena. The main reason of water ingress in the ALBV pits is the rundown of rain water from upper grounds. The stations require effective control measures for the management of the water ingress into the ALBV pits.

3.3 Key Drivers

The key drivers of the projects addressing water ingress in the ALBV pits are:

- Reliability of ALBVs: The existing equipment within the ALBV pits are not designed or intended to withstand submersion in water. This can lead to damage of equipment (if water logged), requiring replacement. Additionally, ongoing flooding will accelerate corrosion and concrete deterioration of the pit walls. Of particular concern is the 240V light lamps, which, if exposed to water, could lead to a short circuit, resulting in equipment failure or loss of power supply.
- Personnel safety: Currently, when a high-water alarm is received, field personnel are dispatched to site to manually pump water out of the pits. There are also 240V lamps within the pits and if failure occurs (short circuit), will make the pit water “live” posing a significant risk to field personnel. Additionally, water in the pits and surrounding areas create slippery hazards for personnel.
- Maintenance and operational costs: Personnel need to remove the water in the pits, delaying other planned activities. The operational and maintenance costs at the ALBV facilities are notably high, primarily attributed to the frequent call outs required to respond to water-ingress issues on the facilities. During the years 2021 and 2022, there were 66 instances of call outs specifically to address this matter at different facilities. Dealing with water ingress necessitates the presence of heavy vehicles on site to pump out the water, which contributes to increased expenses.

3.4 Objectives

The objectives of these projects are to :

(i) Implement effective control measures for the management of water accumulation from below and above the ALBV’s pits.

(ii) Maintain the reliability of the ALBVs.

(iii) Maintain the electrical and mechanical integrity of the facilities.

(iv) Adhere to all environmental requirements and obligations during the life of the facility (i.e: disposal of contaminated water within the pits).

4. Credible Options

The following options were identified:

- Option 1: Maintain Status Quo.
- Option 2: Installation of controlled water pump.
- Option 3: Installation of pits bunds and controlled water pumps.

All options are explained in detail below.

4.1 Option 1: Maintain Status Quo

4.1.1 Scope

Do nothing, and continue mitigating the water ingress in to the ALBV pits manually by personnel.

4.1.2 Benefits

This option incurs no additional CAPEX.

4.1.3 Limitations

This option does not address any of the project drivers / risks in regard to safety, reliability and operational costs.

- The equipment within the pit, once submerged, poses a significant risk to both facility operability and personnel safety with electrocution.
- The equipment integrity is compromised and can become water logged, requiring replacement.
- The operating cost of the station remains relatively high due to increase in responding to the water ingress. This includes technicians having to fully inspect the equipment after a rain event.

4.1.4 Summary

Maintaining status quo is not an acceptable option as water will continue to enter the pits, affecting the ALBV functionality and reliability.

4.2 Option 2: Installation of controlled water pumps

4.2.1 Scope

This option includes the installation of an automated water pump system integrated into SCADA for monitoring purposes, and a corresponding water tank at an appropriate location.

4.2.2 Benefits

- The automated pump with tank will provide response relief to field personnel during heavy rain.
- Reduces the prolonged periods of equipment being submerged within the pit.

4.2.3 Limitations

- Due to multiple configurations and limitations of the sites, this option may only partially stop the water ingress into the pits. The surroundings would potentially remain hazardous to personnel.
- Pumping of water directly from the pits to stormwater may not be feasible due to environmental controls for contaminated water. The feasibility of this option would need to be assessed.
- The feasibility of onsite detention (water tank), either above or below ground, will need to be accessed due to space limitations and negotiations with local council and/or the landowner of the site.

4.2.4 Summary

This option addresses some of the project drivers required by managing the water ingress to the pits. It could be considered a short term solution or first stage while site remediation activities are completed.

4.3 Option 3: Installation of pits bund and controlled pumps

4.3.1 Scope

This option includes an extensive individual facility site assessment for the installation of ALBV pit bunds, drainage systems or other site remediation strategies aimed at diverting and/or stopping the water from entering the pits. In addition, it includes the installation of an automated pit pump system integrated into SCADA for water level monitoring purposes, and a corresponding water tank at an appropriate location.

4.3.2 Benefits

- Creates a physical barrier to avoid water ingress to the ALBV pits in the facilities.
- Improves operational response via an automated pumping system of the pits, integrated with SCADA.
- Incorporates new designs for drainage or site remediation in a holistic approach.
- The automated pump with tank will provide response relief to field personnel during heavy rain.
- Reduces the prolonged periods of equipment being submerged within the pit.
- Significantly reduces the water ingress into the pits and surroundings.
- Reduction in maintenance expenditure.

4.3.3 Limitations

- Pumping of water directly from the pits to stormwater may not be feasible due to environmental controls for contaminated water. The feasibility of this option would need to be assessed.

The feasibility of onsite detention (water tank), either above or below ground, will need to be accessed due to space limitations and negotiations with local council and/or the landowner of the site.

- High CAPEX investment.

4.3.4 Summary

This option will fully address all the issues and risks and significantly reduces the water ingress into the ALBV pits, hence improving the safe operation and reliability of the high pressure facilities. Option 3 is the preferred solution.

4.4 Comparison of Options

Table 4-1: Options Summary Table

Criteria	Option 1	Option 2	Option 3
Option	Maintain Status Quo	Installation of controlled water pumps	Installation of pits bunds and controlled water pumps.
Description	Do nothing, and continue mitigating the water ingress in to the ALBV pits manually by personnel.	This option includes the installation of an automated water pump system integrated into SCADA for monitoring purposes, and a corresponding water tank at an appropriate location.	This option includes an extensive individual facility site assessment for the installation of ALBV pit bunds, drainage systems and other site remediation strategies aimed at diverting and/or stopping the water from entering the pits. In addition, it includes the installation of an automated pit pump system integrated into SCADA for water level monitoring purposes, and a corresponding water tank at an appropriate location.
Benefits	Nil CAPEX	• The automated pump with tank will provide response relief to field personnel during heavy rain. • Reduces the prolonged periods of equipment being submerged within the pit.	• The automated pump with tank will provide response relief to field personnel during heavy rain. • Reduces the prolonged periods of equipment being submerged within the pit. • Significantly reduce the water ingress into the pits and surroundings.
Limitations	• The ALBV equipment within the pits, once submerged, pose a significant risk to both facility operability and personnel safety with electrocution. • The operating cost of the stations remains relatively high due to increase in responding to the water ingress. This includes technicians having to fully inspect the equipment after a rain event.	• Due to the configuration of the sites, this option may not fully stop the water ingress into the pits and the pits are likely to remain hazardous • Pumping of water directly from the pits to stormwater may not be feasible due to environmental controls for contaminated water. The feasibility of this option would need to be assessed. • The feasibility of onsite detention (water tank), either above or below ground, will need to be accessed due to space limitations and negotiations with local council and/or the landowner of the site	• High CAPEX investment. • Pumping of water directly from the pits to stormwater may not be feasible due to environmental controls for contaminated water. The feasibility of this option would need to be assessed.
Treated Risk Rating	HIGH	MODERATE	MODERATE
CAPEX Cost Estimate[2]	$0	$782K	Up to $971K
Recommended Order of Preference	3 Unacceptable	2 Not Recommended	**1** **Preferred Option**

5. Recommendation

5.1 Recommended Solution

Option number 3 is the preferred option, by addressing all key drivers of the projects. This option incurs in $961K per project to be delivered between CY27 and CY29. See all projects lit, timing and cost below.

Project WBS	Project Name	Cost ($)	Year
BAB-RFP-000038	Facility Water Ingress - Wetherill & Lidcombe PRS	961 K	RY28
BAB-RFP-000040	Facility Water Ingress - Mascot PRS	870 K	RY27
BAB-RFP-000041	Facility Water Ingress - Tempe PRS	971 K	RY28

6. National Gas Rules

Option 3: “Installation of pits bunds and controlled water pumps” 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:

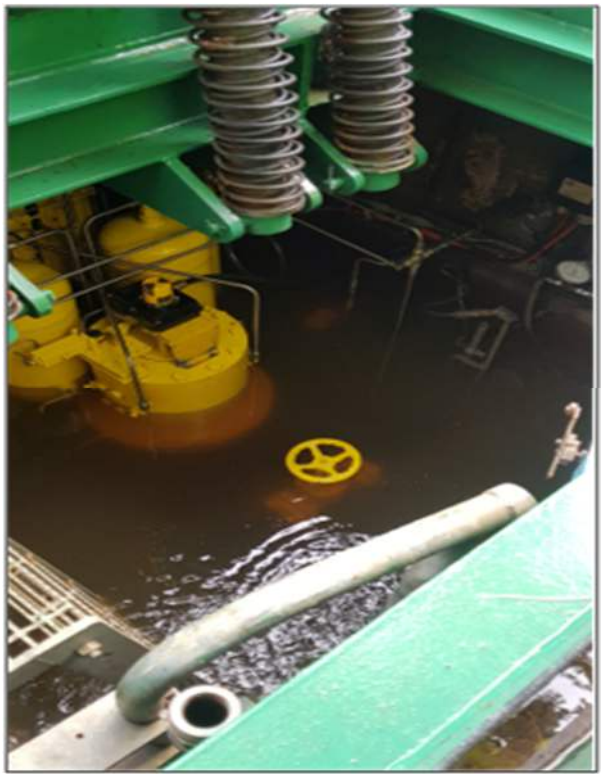
- Prudent – Three options have been considered and the selected option reduces the overall risk associated with water ingress within to the ALBV pits. This is consistent with what would be expected of a prudent operator.
- Efficient – The cost estimates for this project were developed from actual costs of a similar project that followed the Jemena Procurement Policy.
- Consistent with accepted and good 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 reducing the risk of water ingress in to high pressure facilities from “High” to “Moderate”.
- Maintain the integrity of service (79(2)(c)(ii)) by managing the water ingress affecting equipment functionality.

Appendix A – ALBV pits flooded events

Fig 3: Wetherill Park ALBV Flooded with water

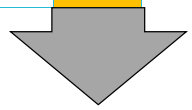


4: Lidcombe ALBV Flooded with water

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. 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
• Reliability of ALBVs • Personnel safety • Operational costs	Serious	Severe	Severe	Severe	• The existing equipment with the ALBV pits is not designed or intended to withstand prolonged submersion in water. This can lead to damage of equipment (if water logged), requiring replacement and ongoing flooding will accelerate corrosion and concrete deterioration of the pit walls. • Currently, when a high-water alarm is received, field personnel are dispatched to site to manually pump water out of the pits. Usually with these pits flooding and no automatic pump, resourcing and site safety is a risk. There are also 240V lamps within the pits and if failure occurs (short circuit), will make the pit water “live” posing a significant risk to field personnel. • Personnel needs to remove the water in the pits delaying other planned activities. The operational and maintenance costs at the ALBV facilities are notably high, primarily attributed to the frequent call outs required to respond to water-ingress issues on the facility.	Severe	Likely	High



PREFERRED OPTION – Risk assessment summary				TREATED RISK SUMMARY		
Preferred Option/Treated risk	**Cost**	**Benefit**	**Key Mitigations**	**Consequence**	**Likelihood**	**Risk Level**
Option 3	**$ 967K (per project)**	• The automated pump with tank will provide response relief to field personnel during heavy rain. • Reduces the prolonged periods of equipment being submerged within the pit. • Significantly reduce the water ingress into the pits and surroundings. • Reduction in maintenance expenditure due to pit flooding.	• Implements the effective control measures for the management of water accumulation from below and above the facilities ALBV's pits. • Maintains the reliability of the ALBVs. • Maintains the electrical and mechanical integrity of the facilities. • Site assessments will adheres to all environmental requirements and obligations during the life of the facility (i.e.: disposal of contaminated water within the pits	Severe	Rare	Moderate