REPORT

OPTIONS ANALYSIS: FLEMINGTON PRS WATER INGRESS PROJECT

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DOCUMENT HISTORY

Revision	Date	Author	Description of Changes
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OWNING FUNCTIONAL GROUP AND DEPARTMENT / TEAM

Gas Distribution : Facilities Engineering Support

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EXECUTIVE SUMMARY

This document provides options for Jemena in addressing the water ingress and site safety issues at the Flemington high pressure facility and identify the most prudent option to address the key issues.

The Flemington high pressure gas facility was commissioned in 1976 and is located in an underground pit, supplying approximately 80,000 customers. The facility 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 (refer to Figure 2).

In the event of heavy rain, the Flemington PRS site is regularly subject to flooding due to groundwater and above ground water ingress where all the equipment within the pit becomes submerged. This existing equipment within the pit 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.

There are three (3) key drivers associated with the project are :

1) Safety – During flooding the 240V & 415V electrical switches could fail and make the water within the pit "live" posing a significant risk to field personnel. The driveway, access and gates around the facility are hazardous, posing a significant risk to field personnel and their vehicles.
2) Reliability – The electrical switches could also cause loss of power supply and the ongoing flooding will accelerate corrosion, concrete deterioration of the pit walls and damage to equipment.
3) Cost – The operational and maintenance costs are relatively high due to the ongoing response to water ingress issues during after a weather event.

Four (4) options have been assessed to address the issues and risks identified in accordance with the Group Risk Management Manual[1], ensuring the most effective solution is selected to ensure safe operation and reliability of the asset. Without an adequate solution, there is an untreated risk rating of "High", which is above Jemena's risk threshold.

The four (4) options are :

- Option 1 – Maintain Status Quo & Accept the Associated Risks.
- Option 2 – Install Controlled Pit Pump, Minor Site Works & Design.
- Option 3 – Install Controlled Pit Pump, Full Site Remediation & Design.
- Option 4 – Install Controlled Pit Pump, Full Site Remediation (including Looped Driveway) & Design

Option 4 has been identified as the most effective solution in targeting all the project drivers to maintain a duty of care, maintain safe operation and reliability of the asset. The estimate Gate 1 cost in undertaking the works identified in Option 4 is $1.65M and planned for practical delivery in CY25. There can be slight variations of the details within these options but these will be addressed following the project management methodology lifecycle through the next Gate.

[1] JAA MA 0050 – Group Risk Management Manual Revision 10 : 22/05/2023

1. INTRODUCTION

1.1 PURPOSE

The purpose of this document is to summarise the available options in addressing the water ingress and site safety issues at the Flemington high pressure facility and identify the most prudent option to address the key issues required to improve safety and reliability obligations.

1.2 OBJECTIVES

The objectives of this project are to :

(i) Minimise the quantity of water accumulation below and above the facility pits, via site remediation.

(ii) Improve operational response via an automated pumping system of the pits, integrated with SCADA.

(iii) Ensure the electrical, instrumentation and mechanical integrity is maintained.

(iv) Provide adequate and safe entry and exit points for personnel, light and high load vehicles required during maintenance or emergency response activities.

(v) Incorporate any new designs for drainage, driveways or site remediation in a holistic approach to address the overarching issues for the entire facility and its surroundings.

(vi) Ensure all environmental requirements and obligations are adhered during the life of the facility (ie: disposal of contaminated water within the pits).

2. PROJECT DETAILS

2.1 PROJECT BACKGROUND

The Flemington high pressure gas facility is located in an underground pit, situated between Parramatta Road, Homebush West to the South and the M4 motorway to the North. The facility is supplied gas via the Jemena Gas Networks (**JGN**) Primary pipeline (*Horsley Park to Mortlake section*) with an operating pressure of 3500kPa and in turn regulates gas into the Flemington secondary distribution network (1050kPa) supplying approximately 80,000 customers.

The Flemington 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 Flemington facility compound and corresponding proposed works.

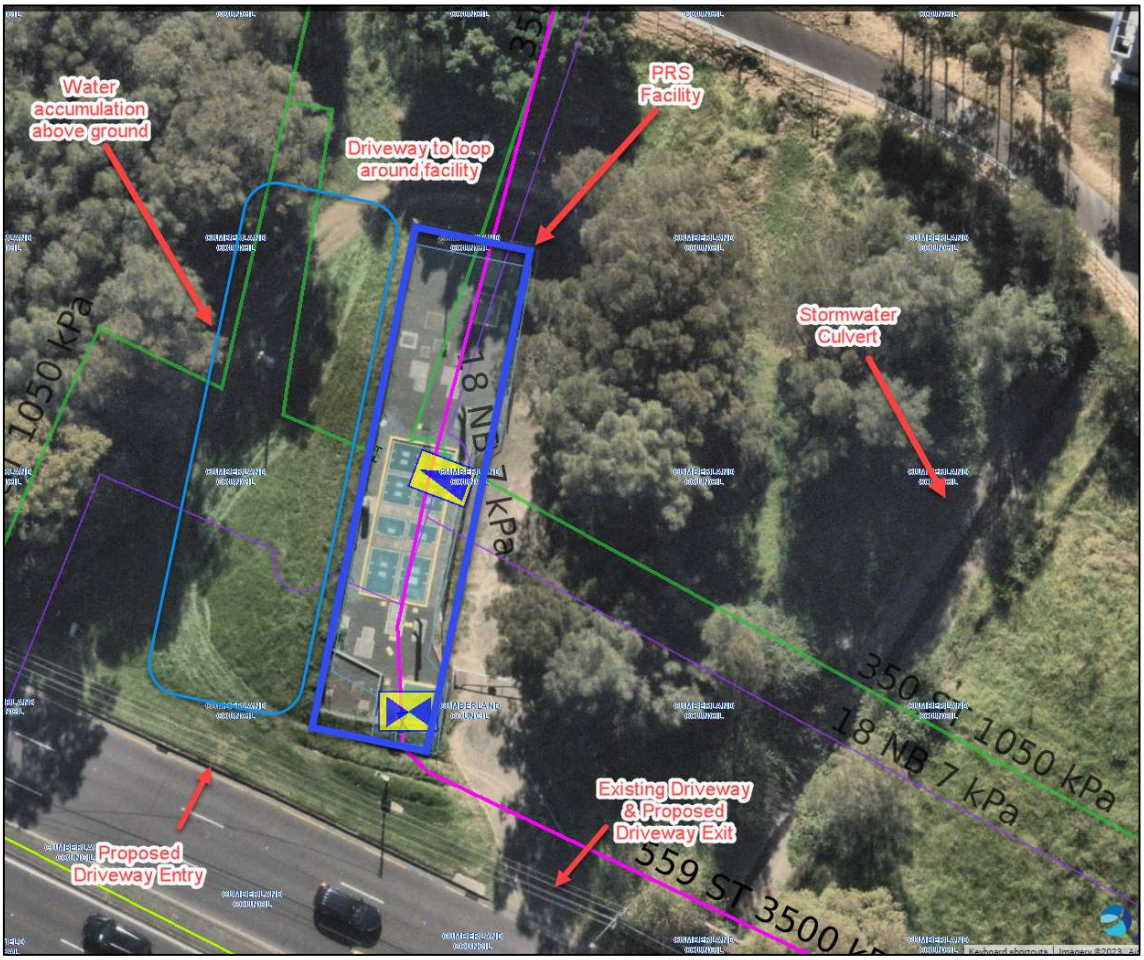

Figure 1: Below ground Flemington high pressure facility

In the event of heavy rain, the Flemington PRS site is regularly subject to flooding due to groundwater and above ground water ingress where all the equipment within the pit becomes submerged. This existing equipment within

the pit 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.

The only access to the site is via Parramatta Road to the South and a non-compliant driveway entry is at approximately 70 degrees requiring field personnel to slow down significantly and taking up to 2 lanes of traffic to enter. The entry and exit points are the same location and minimal parking space exists making it difficult to manoeuvre multiple maintenance vehicles. This is especially difficult during heavy rain events where vehicles have become bogged.

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

2.2 KEY DRIVERS

There are three (3) Key Drivers associated with this project:

2.2.1 SAFETY

Currently, when a high water alarm is received, field personnel are dispatched to site to manually pump water out of the pits, pending they can get to site if the surroundings are also compromised. Usually with multiple pits flooding and no automatic pump, resourcing and site safety is a risk. There are also 240V & 415V electrical switches within the pits and if failure occurs (short circuit), will make the pit water “live” posing a significant risk to field personnel.

Additionally, the drive-way access / gates into the facility pose safety concerns when field personnel need to access the site for maintenance or when heavy vehicles are required.

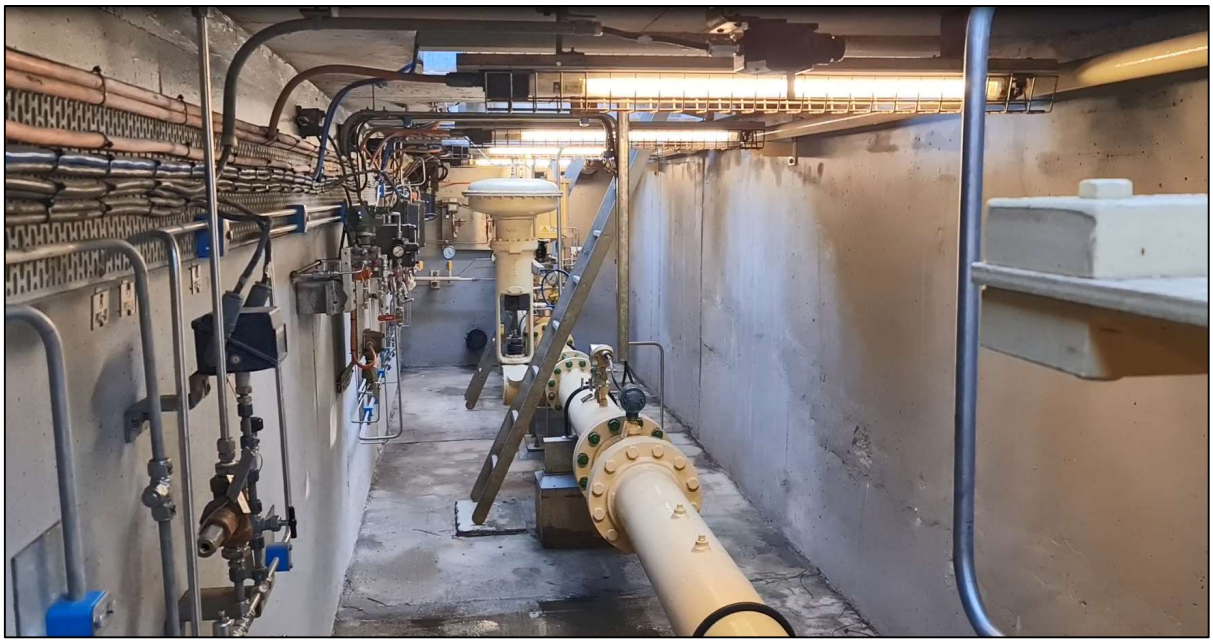

Figure 2 : Duty Run of Flemington PRS within a dry pit.

Figure 3 : Pit flooded during call out

Figure 4 : Entrance to site at 70 degrees

Figure 5 : Site vehicle path to exit site after rain event

2.2.2 RELIABILITY

The existing equipment within the Flemington pits is not designed or intended to withstand submersion in water. This can lead to damage of equipment (if water logged), requiring replacement. Ongoing flooding will accelerate corrosion and concrete deterioration of the pit walls. Of particular concern is the 240V electrical switch, which, if exposed to water, could lead to a short circuit, resulting in on-site equipment failure or loss of power supply.

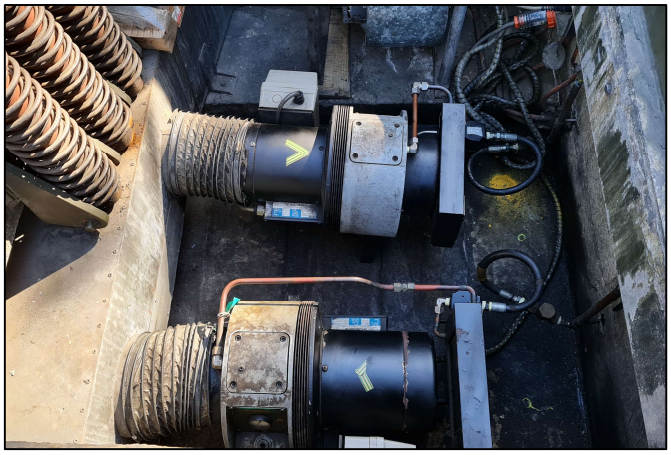

Figure 6 : Pit flooded during call out

Figure 7 : Pit flooded during call out

Figure 8 : Control Valve Regulator

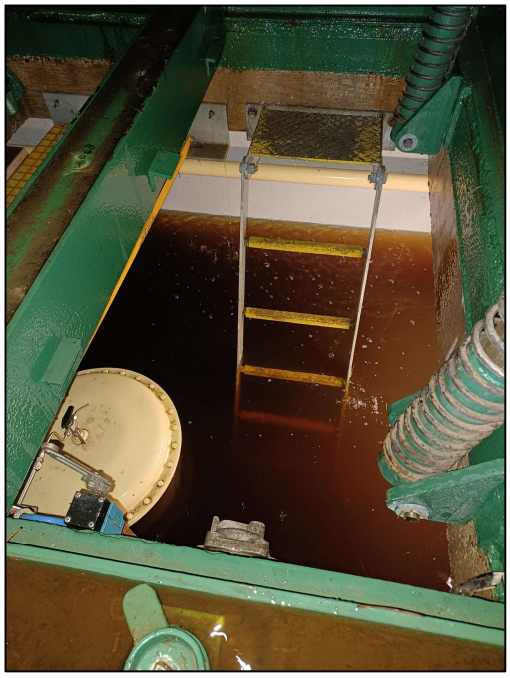

Figure 9 : Pit flooded to the top of the regulator

2.2.3 COST

The operational and maintenance costs at Flemington PRS are notably high, primarily attributed to the frequent call outs required to respond to water-ingress issues on the facility. During the years 2021 and 2022, there were 66 instances of call outs specifically to address this matter. Dealing with water ingress necessitates the presence of heavy vehicles on site to pump out the water, which contributes to increased expenses.

3. CREDIBLE OPTIONS

The upgrade of the Flemington high pressure gas facility to address water ingress issues was investigated in this report, and the following four (4) options were identified and evaluated:

- Option 1: Maintain Status Quo & Accept the Associated Risks
- Option 2: Install Controlled Pit Pump, Minor Site Works & Design
- Option 3: Install Controlled Pit Pump, Full Site Remediation & Design
- Option 4: Install Controlled Pit Pump, Full Site Remediation (including Looped Driveway) & Design

The mentioned options are considered to address the issues identified ensuring the most effective solution is selected to maintain a duty of care, maintain safe operation and reliability of the asset.

3.1 OPTION 1: MAINTAIN STATUS QUO & ACCEPT THE ASSOCIATED RISKS

3.1.1 SCOPE

In this option, the water ingress issues remain including the safety risks with personnel and the asset.

3.1.2 BENEFITS

- This option incurs no additional CAPEX.

3.1.3 LIMITATIONS

This option does not address any of the project drivers / risks in regards to safety, reliability and maintenance 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 surrounding area around the site remains hazardous to personnel due to flooding and vehicle access design. This includes the issues with the entry and exit points to the site.
- The operating cost of the station remains relatively high due to increase in responding to the water ingress. This includes technicians having to full inspect the equipment after a rain event.

3.1.4 SUMMARY

This option is unacceptable due to the risk ranking remaining “High” and limitations with this option described above.

3.2 OPTION 2: INSTALL CONTROLLED PIT PUMP, MINOR SITE WORKS & DESIGN

3.2.1 SCOPE

This option includes the installation of an automated pit pump system integrated into SCADA and a corresponding water tank within the fenced compound. Some minor site works such as drainage are included in the scope.

3.2.2 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.
- Minor site works around the facility should divert some of the water ingress into the pit.
- This option is the lowest CAPEX option.

3.2.3 LIMITATIONS

- Due to the configuration of the site, this option may not stop the water ingress into the pit and the surroundings are likely to remain hazardous to personnel.
- The entry and exit points to site will remain a concern for personnel and vehicles.
- Maintenance costs may only slightly decrease as the pits may still become flooded and require post-flooding inspections.

3.2.4 SUMMARY

This option will not fully address all the issues / risks required to ensure future water ingress to the site is subdued. May only provide minor relief during these events.

3.3 OPTION 3: INSTALL CONTROLLED PIT PUMP, FULL SITE REMEDIATION & DESIGN

3.3.1 SCOPE

This option includes the installation of an automated pit pump system integrated into SCADA and a corresponding water tank within the fenced compound. A full site remediation of the site is aimed at diverting the water away from the pits but also ensuring vehicle manoeuvrability is suitable.

3.3.2 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.
- Significantly reduce the water ingress into the pits and surroundings.
- Reduction in maintenance expenditure.
- Should provide some relief with vehicle bogging.

3.3.3 LIMITATIONS

- The entry and exit points to site will remain a concern for personnel and vehicles.

3.3.4 SUMMARY

This option will significantly reduce the future water ingress to the site, however, maintenance vehicles will still have issues with safety, entering and exiting the site.

3.4 OPTION 4: INSTALL CONTROLLED PIT PUMP, FULL SITE REMEDIATION (INCLUDING LOOPED DRIVEWAY) & DESIGN

3.4.1 SCOPE

This option includes the installation of an automated pit pump system integrated into SCADA and a corresponding water tank within the fenced compound. A full site remediation of the site is aimed at diverting the water away from the pits but also ensuring vehicle manoeuvrability. The addition of a looped concrete driveway and new compliant entry is also included in this option.

3.4.2 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.
- Significantly reduce the water ingress into the pits and surroundings.
- Reduction in maintenance expenditure.
- Provides Jemena personnel and vehicles the necessary safe access and manoeuvrability in and around the site.

3.4.3 LIMITATIONS

- This is the highest CAPEX option but provides the largest benefit.

3.4.4 SUMMARY

This option will significantly reduce the future water ingress to the site and will address the relevant personnel / vehicle safety risks with a new entry and looped concrete driveway. The looped driveway will provide additional benefit with water being able to be diverted from the pits.

3.5 COMPARISON OF OPTIONS

Criteria	Option 1	Option 2	Option 3	Option 4
Option Description	**Maintain Status Quo & Accept the Associated Risks**	**Install Controlled Pit Pump, Minor Site Works & Design**	**Install Controlled Pit Pump, Full Site Remediation & Design**	**Install Controlled Pit Pump, Full Site Remediation (including Looped Driveway) & Design**
Benefits	* No additional CAPEX Cost.	* 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. * Minor site works around the facility should divert some of the water ingress into the pit. * Lowest CAPEX option.	* 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. * Should provide some relief with vehicle bogging.	* 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. * Provides Jemena personnel and vehicles the necessary safe access and manoeuvrability in and around the site. * The design of the looped driveway will provide additional benefits of water diversion.

Criteria	Option 1	Option 2	Option 3	Option 4
Limitations	* The equipment within the pit, once submerged, poses a significant risk to both facility operability and personnel safety with electrocution. * The surrounding area around the site remains hazardous to personnel due to flooding and vehicle access design. This includes the issues with the entry and exit points to the site. * The operating cost of the station remains relatively high due to increase in responding to the water ingress. This includes technicians having to full inspect the equipment after a rain event.	* Due to the configuration of the site, this option may not stop the water ingress into the pit and the surroundings are likely to remain hazardous to personnel. * The entry and exit points to site will remain a concern for personnel and vehicles. * Maintenance costs may only slightly decrease as the pits may still become flooded and require post-flooding inspections.	* The entry and exit points to site will remain a safety concern for personnel and vehicles.	* High upfront CAPEX cost.
CAPEX Cost	Nil	$0.782M	$0.929M	$1.65M
Treated Risk Ranking	**“HIGH”**	**“SIGINFICANT”**	**“SIGNIFICANT”**	**“LOW”**
Recommendation Ranking	4 Unacceptable as risk remains “High”	3 Not Recommended as option will not fully address the water ingress and safety issues.	2 Acceptable but will not completely remove the personnel safety risk.	**1** **Recommended / Preferred Option**

4. RECOMMENDATION

4.1 RECOMMENDED SOLUTION

The recommended solution is Option 4, which is to provide full site remediation, new looped driveway and automated pit pump with storage tank at a current CAPEX cost of $1.65M at Gate 1. This upgrade with the different elements working holistically will address the multiple drivers of safety, integrity and cost at the Flemington facility. Practical completion of this project in targeted for CY25.

Figure 10 shows the proposed high level works to be carried on site, pending certified design of the site remediation and driveway. Currently, the Gate 1 cost is at a high level and detailed scopes can be confirmed during the next phase of the project to Gate 2.

Figure 10 : Overhead view of proposed driveway, tank and drainage at Flemington PRS

APPENDIX A : GENERAL ARRANGEMENT VIEW OF FLEMINGTON PRS

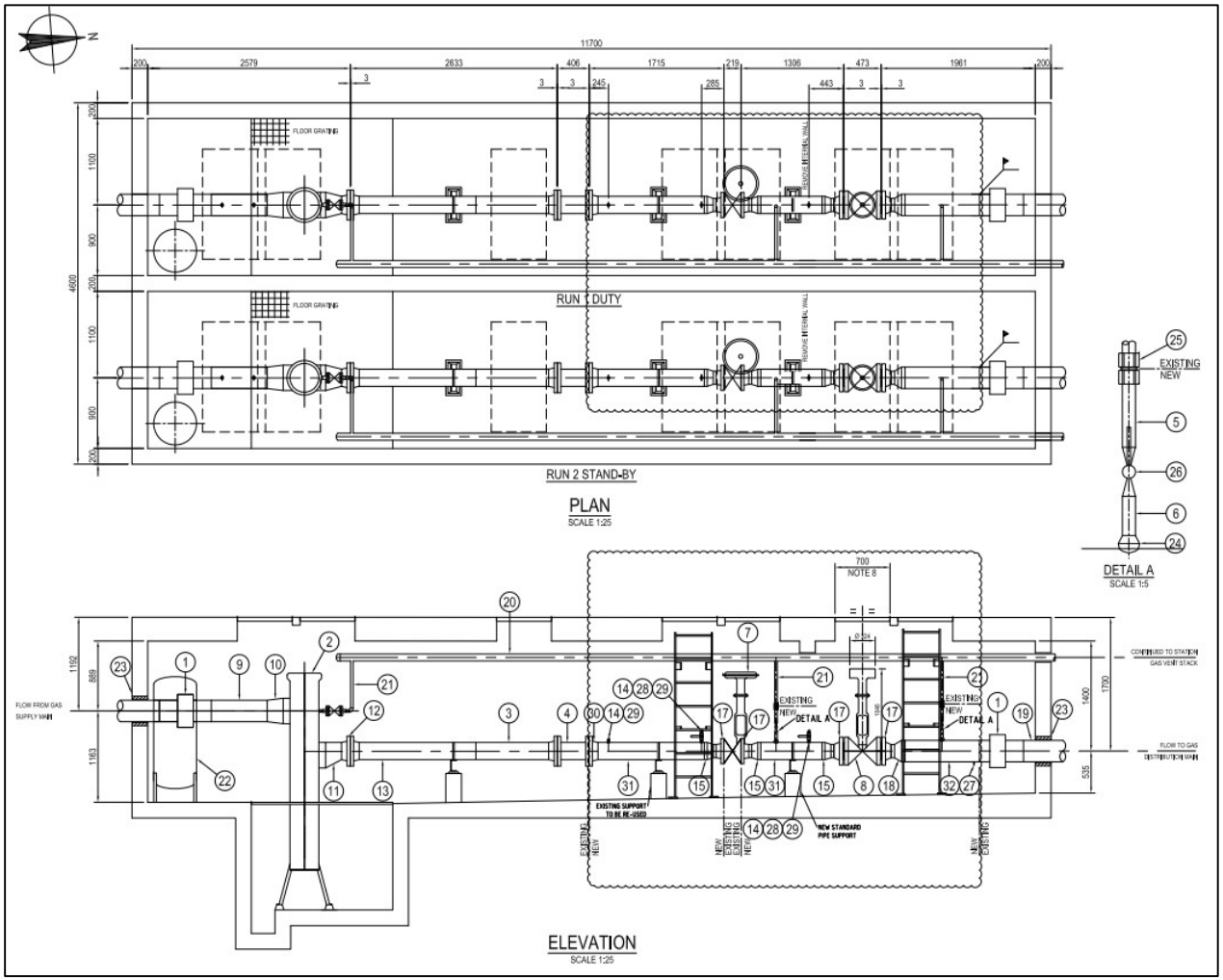

Figure A1 : Overhead and Side View Schematic of Flemington PRS Pit.