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Gas Network

Network Planning Report – Ballarat
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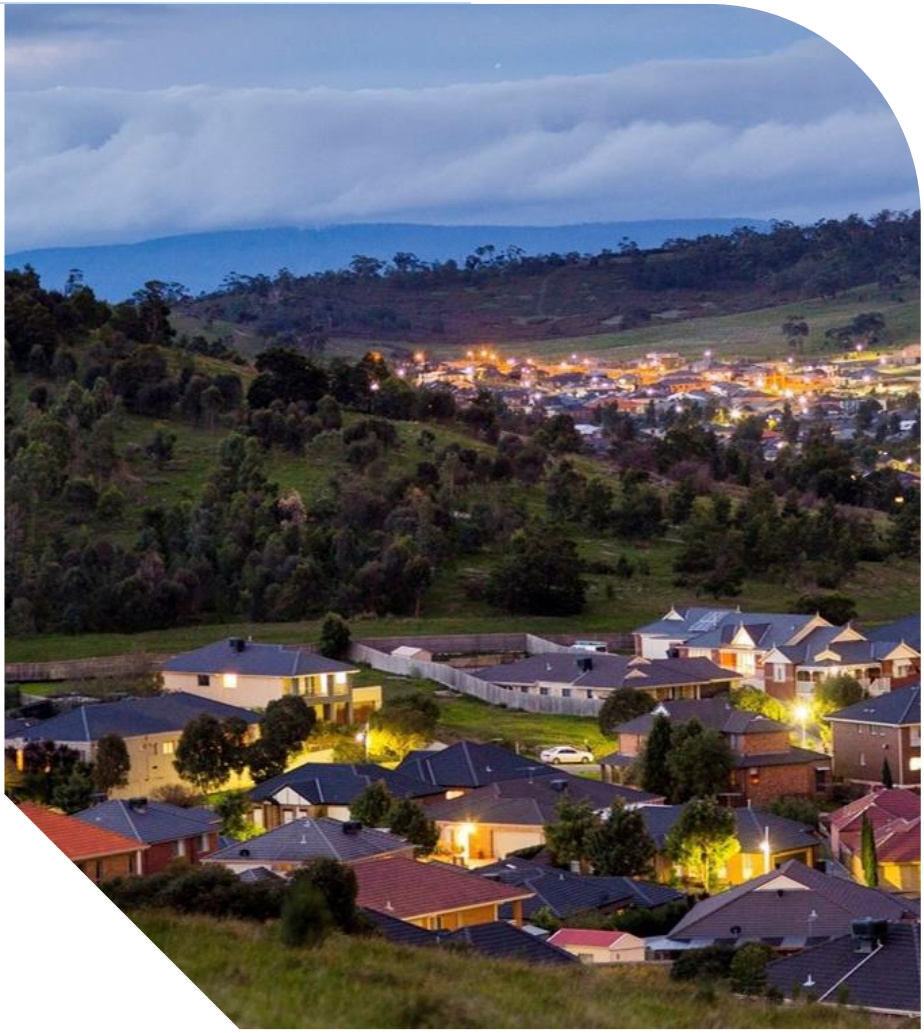

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Executive Summary

The Ballarat gas network will be unable to support projected strong gas consumption growth in the South-Western growth corridor and would require a network reinforcement by FY2025/26 to boost network capacity in affected areas to maintain adequate minimum network pressure and complying with Gas distribution code.

Recommendation - FY25/26

- Pipe looping of approximately [C.I.C] of 300mm Steel from existing Ballarat's City Gate
- Construction of [C.I.C] of 200mm steel pipe from the outlet of "Winter St" regulator along Russell St, Ballarat to tie-in to existing network.

1. Network Overview

The Ballarat gas network is one of AusNet Services' largest regional High Pressure (HP1) network. It is currently being supplied by Ballarat City Gate and a lateral transmission pipeline with MAOP of 1,900kPa supplying a series of HP1 field regulators operating at 450kPa and a HP2 regulator currently operating at 900kPa for the entire Ballarat gas distribution network.

The current series of regulators supplying the Ballarat high pressure network comprise of five Field Regulators located to the far east of the network and a single regulator at Ballarat central area suppling by the newly constructed HP2 pipeline. The City of Ballarat has a developing Employment Precinct to the West and North that is shifting capacity from the outer network fringes. As a result, Ballarat has been experiencing an increasing number of low supply pressure instances where delivery pressures fall below minimum obligated pressures.

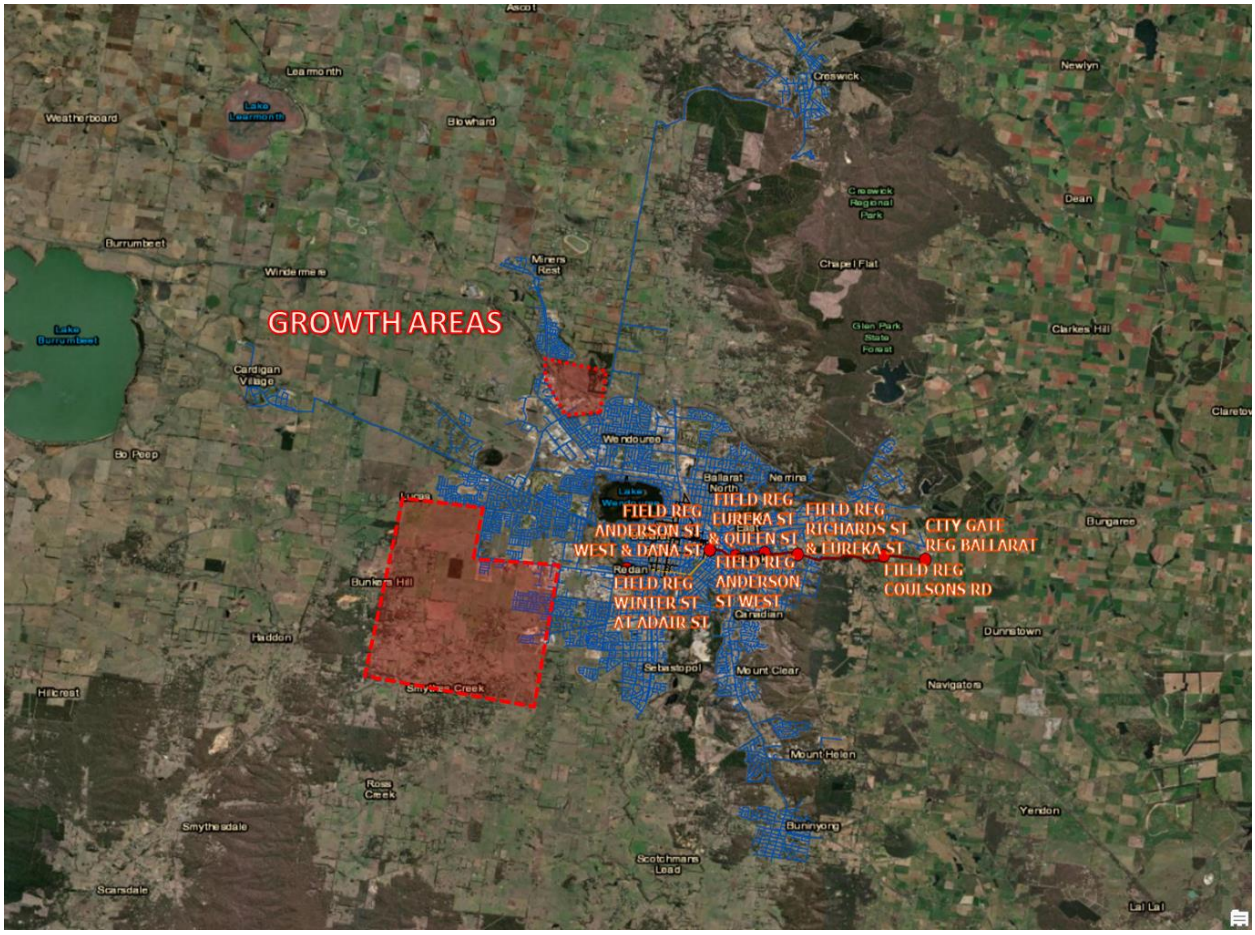


Figure 1: Ballarat gas distribution network overview

2. Network Performance

A recent reinforcement was completed with the installation of 2 new fields regulators in 2018 to boost supply to Ballarat's growth corridor concentrated in the Western side of the network. However, with continued growth in Ballarat West, the existing lateral transmission pipeline has seen a continued increase in demand resulting in a fall in inlet pressure to downstream regulators, with the most impacted HP1 field regulator at "Anderson West" and HP2 regulator "Dana St", during peak demand periods. This significantly impacts field regulator performance and reduces regulator outlet pressures, with the "Dana St" HP2 field regulator outlet pressure operates at 700kPa (from 900kPa set pressure), and "Winter St" HP1 field regulator operates at 400kPa (from 450kPa set pressure) during periods of peak demand. Falling field regulator outlet pressures resulting in delivery pressures failing below minimum obligated pressures.

The chart below details the instances of low network pressure events experienced in the Ballarat downstream regulators in recent years during winter periods as of August 2020.

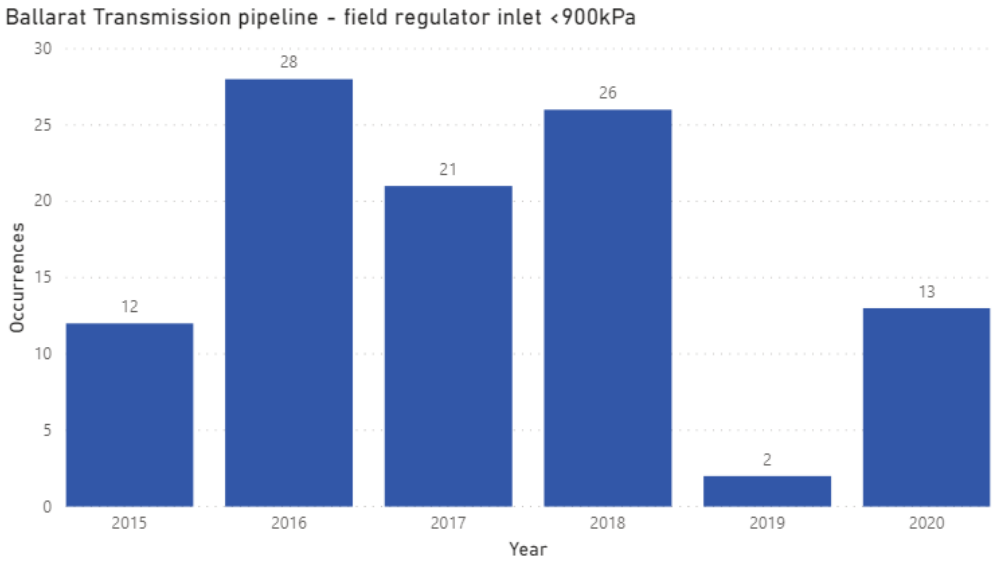


Figure 2: Ballarat Network Performance Issues

The above chart shows the reduction in instances when the transmission pipeline's capacity experienced shortfall in 2019. This is due to the non-expenditure initiative completed of raising Ballarat's City Gate outlet pressure from 1,1750kPa to the currently maximum allowable outlet pressure of 1,850kPa. Even though this has improved capacity in the Ballarat's transmission network, winter 2020 have seen increasing instances of low field regulator inlet pressure of less than 900kPa and with the continued growth in Ballarat West, the capacity shortfall is forecasted to increase year by year, affecting the safety and reliability of Ballarat's high pressure network supply. The table below shows the lowest 15 occurrences of lowest transmission pressure and the corresponding fringe pressures from 2019.

Timestamp	Year	TP Inlet Pressure (kPa)	Fringe Pressure (kPa)
4/08/2020 9:00:00 AM	2020	691	117
4/08/2020 10:00:00 AM	2020	703	147
9/06/2020 8:00:00 AM	2020	814	161
5/08/2020 9:00:00 AM	2020	827	197
9/06/2020 9:00:00 AM	2020	828	179
7/08/2020 9:00:00 AM	2020	845	208
31/07/2020 8:00:00 AM	2020	851	179
24/07/2020 8:00:00 AM	2020	860	188
4/08/2020 7:00:00 PM	2020	862	190
24/06/2019 8:00:00 AM	2019	864	214
24/07/2020 9:00:00 AM	2020	869	208
22/08/2020 10:00:00 AM	2020	883	209
31/07/2020 9:00:00 AM	2020	886	206
4/08/2020 6:00:00 PM	2020	908	214
4/08/2020 8:00:00 AM	2020	909	203

Figure 3: Ballarat lowest fringe pressure instances

The major contributing factors of capacity constraints in the Ballarat network include:

- Capacity limitations in the existing 200mm steel transmission pipeline supplying Ballarat's distribution network.

Continued growth in the Ballarat West's growth corridor with expanding fringes further away from the end Ballarat transmission pipeline.

3. Network Modelling

Network model for the Ballarat High Pressure network is matched with latest analysis of the network using SCADA monitoring, fringe pressures in 2020.

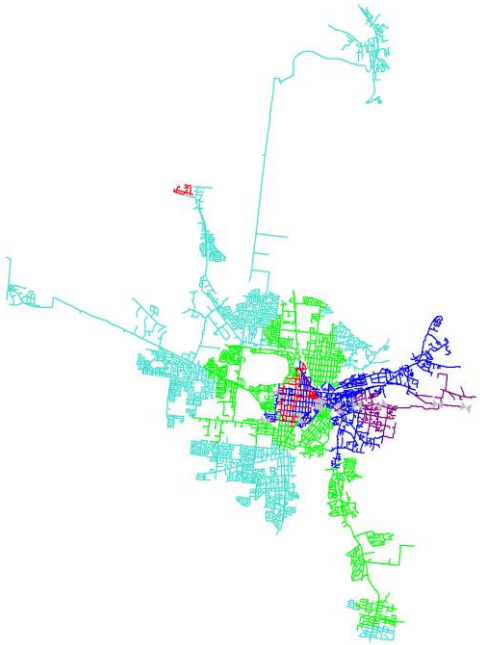


Figure 4: Ballarat model - winter 2020

Growth Forecasts rates provided Finance Data Analytics team in AusNet Services' Finance department for the Ballarat are as shown in table below

Table 1: Ballarat Growth Rate Forecast

Postcode	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
3356	1.54%	1.53%	1.59%	1.58%	1.58%	1.58%
3358	1.86%	1.73%	1.84%	1.79%	1.79%	1.79%

Modelling the growth forecast rates above, the forecast minimum network pressures and estimated number of customer impact for the regulatory period can be obtained and detailed below:

Table 2: Ballarat forecasted minimum pressure and customer impact

Ballarat	2022/23	2023/24	2024/25	2025/26
Minimum TP inlet pressure (kPa)	687	681	660	Reinforcement required
Minimum fringe pressure (kPa)	140	136	125	Reinforcement required
Customer impact (no.)	0	150	2,350	

4. Recommendations

4.1. Options considered

Several options were considered to increase the Ballarat network capacity, which include

Table 3: Options Description Summary

OPTION	DESCRIPTION SUMMARY
1	No Capital Expenditure
2	Transmission pipeline and Downstream High Pressure network reinforcement
3	Looping of existing Ballarat's transmission pipeline

4.2. Option 1 – Do Nothing / No Capital expenditure

With the current lateral transmission pipeline operating at MAOP of 1,900kPa, there is currently no further non-capital expenditure option of increasing Ballarat City Gate operating pressure and boost flow capacity to address pressure issues to Ballarat network.

4.2.1. Cost Estimations

The cost of the Do Nothing option is to accept a system capacity shortfall and hence affecting the safe and reliable supply of the Bendigo distribution network.

Total capital expenditure = $0

4.2.2. Capacity

Capacity limitations still existing with this option and capital expenditure cannot be deferred.

4.3. Option 2 – Pipeline and Downstream network reinforcement

This option looks to reinforce both transmission and downstream high-pressure network to increase capacity throughout the network. By looping the existing 200mm Ballarat's transmission pipeline for approximately [C.I.C] with 300mm Steel pipe from the outlet of Ballarat City Gate would considerably increase capacity in the existing transmission pipeline and increase the inlet pressure to each of the field regulators, including to the most impacted field regulator at "Dana St" field regulator. The increased inlet pressure would allow "Dana St" field regulator to output the capacity required to supply the fast-growing Ballarat network, complying with the gas distribution code minimum obligated pressure.

The downstream high-pressure network would also require reinforcement to connect current missing critical large high-pressure mains link to maintain maximum pressure available to the affected fringes.

Network Reinforcement work comprises of:

- Construction of transmission pipeline of [C.I.C] of 300mm Steel from existing Ballarat's City Gate outlet along Coulsons Rd to tie-in to existing 200mm steel pipeline at Coulsons Rd and Allens Rd intersection.
- Construct of [C.I.C] of 200mm steel pipe from the outlet of "Winter St" regulator along Russell St, Ballarat to tie-in to existing 200mm steel pipeline at Russell St and Eyre St intersection.

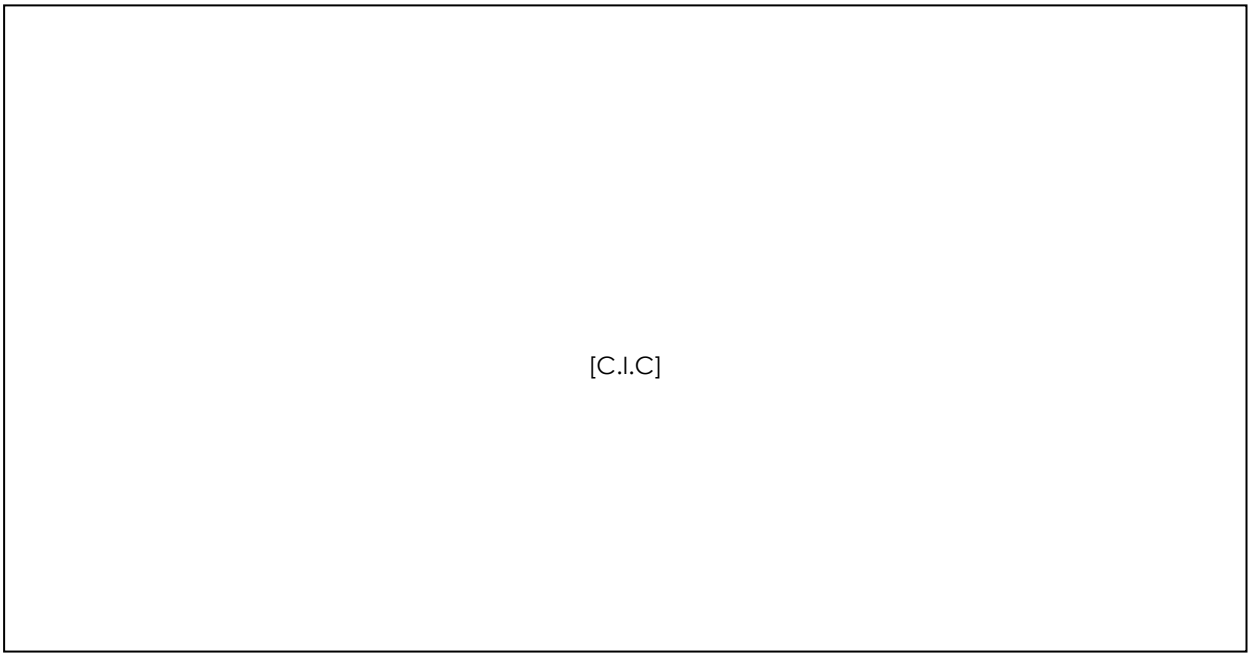


Figure 5: Ballarat reinforcement - Option 2

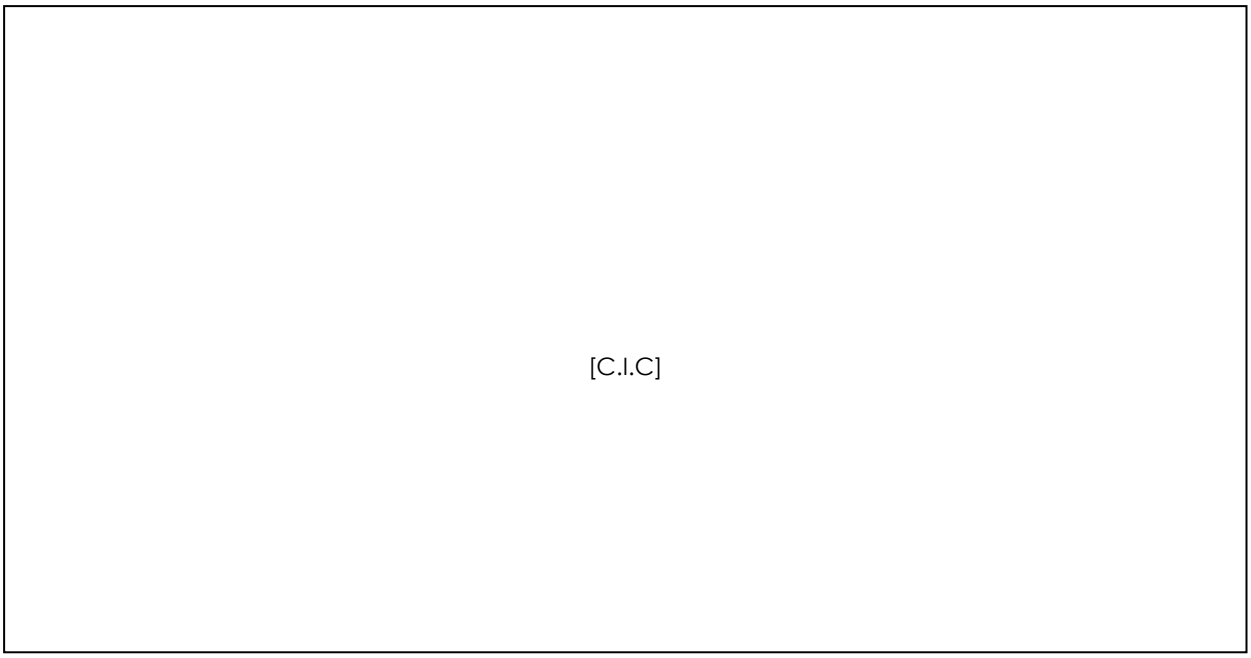


Figure 6: Ballarat reinforcement - Option 2

4.3.1. Cost Estimations

[C.I.C]

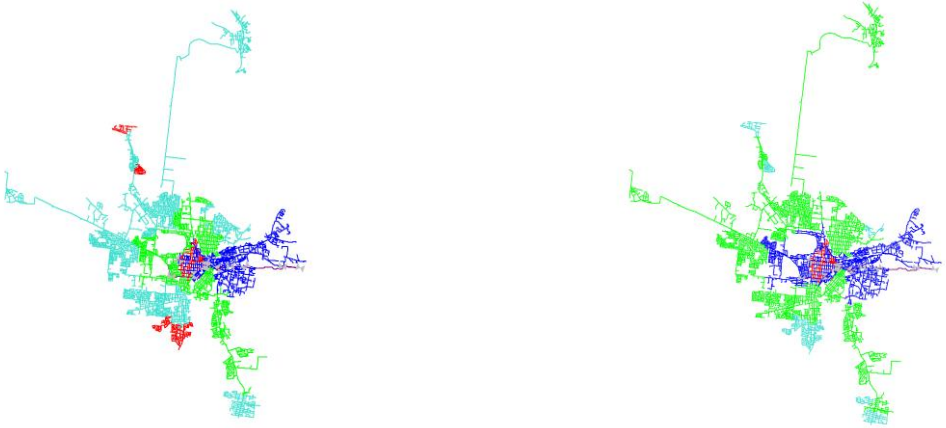
4.3.2. Capacity

Table 4: Option 2 - Ballarat Identified Network Reinforcement

2025 Forecast Minimum Pressure	Affected Customers	REINFORCEMENT SUMMARY	Post Reinforcement Minimum Pressure
110kPa	4,000	[C.I.C] of TP 300mm steel pipe and [C.I.C] of HP1 200mm steel pipe	240kPa

Table 5: Ballarat Forecast Minimum Network Pressures

Postcode	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
3356/3358	140kPa	136kPa	125kPa	240kPa	232kPa	210kPa



2025/26 Before Augmentation **2025/26 After Augmentation**

Figure 7: Ballarat before and after augmentation

4.4. Option 3 – Looping of existing Ballarat transmission pipeline

Looping the existing 200mm Ballarat's transmission pipeline for approximately [C.I.C] with 300mm Steel pipe from the outlet of Ballarat City Gate at Ballarat East significantly increases flow capacity in the network and inlet pressure to the most impacted field regulator namely Dana St field regulator, hence allowing Dana St field regulator to perform at its 100% capacity required to supply the fast-growing Ballarat network meeting gas distribution code.

Network Reinforcement work comprises of:

- Pipe looping of [C.I.C] of 300mm Steel from existing Ballarat's City Gate

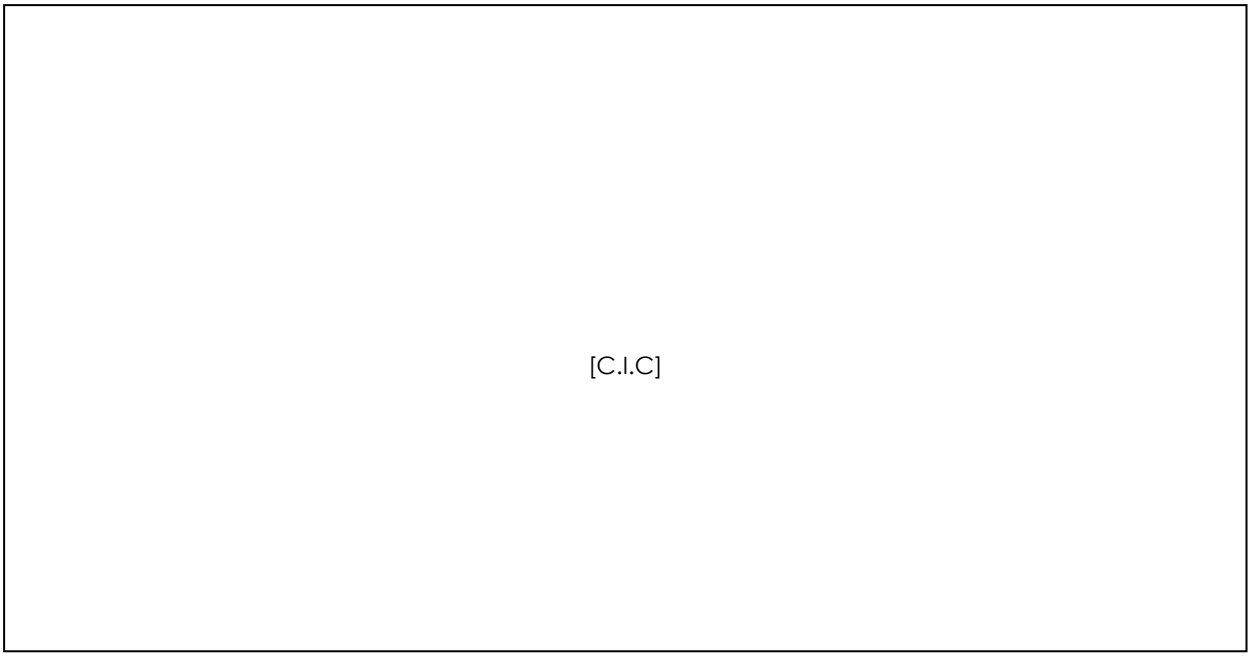


Figure 8: Ballarat reinforcement - Option 3

4.4.1. Cost and benefit analysis

[C.I.C]

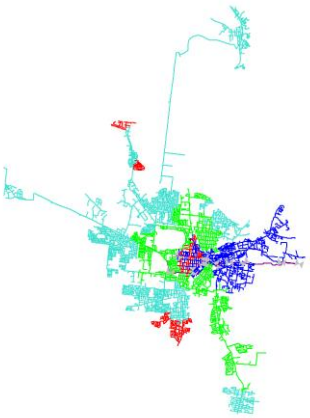
4.4.2. Capacity

Table 6: Option 3 - Ballarat Identified Network Reinforcement

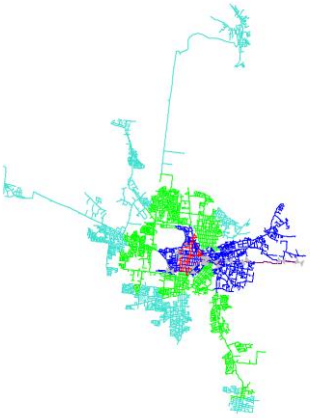
2025 Forecast Minimum Pressure	Affected Customers	REINFORCEMENT SUMMARY	Post Reinforcement Minimum Pressure
110kPa	4,000	[C.I.C] TP 300mm steel pipe	190kPa

Table 7: Ballarat Forecast Minimum Network Pressures

Postcode	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
3356/3358	140kPa	136kPa	125kPa	190kPa	181kPa	168kPa



2025/26 Before Augmentation



2025/26 After Augmentation

Figure 9: Ballarat before and after augmentation

4.5. Benefit Assessment

The preferred solution is Option 2 which involves the looping of [C.I.C] of transmission pipeline and high-pressure mains reinforcement with 200mm steel pipe. This augmentation is considered the most cost-effective solution to augment the capacity of the Ballarat network and would be required to be in service by winter 2025/26.

Table 8: Options Assessment Summary

OPTION	BENEFITS	COSTS ($2020)
Option 1	Nil.	Continue accepting Ballarat capacity shortfall and low fringe pressures during peak periods. Compromised safety and reliability of existing network.
Option 2	Preferred solution – addressing current capacity shortfall in Ballarat's transmission pipeline and increasing inlet pressure required at most impacted field regulator.	[C.I.C]
Option 3	This option would provide long term solution to current Ballarat's transmission network capacity shortfall. However, this will be at significantly higher cost with the high unit rate of transmission pressure pipeline, typically almost 4 times more costly than High pressure 1 reinforcement. Therefore, this option is rejected compared to option 2.	[C.I.C]

5. Capital expenditure summary

Table 9: Capital Expenditure Summary

	2023-24	2024-25	2025-26	2026-27	2027-28	2024-28 TOTAL
			[C.I.C]			

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