RELINING A SECTION OF THE MT COLE PIPELINE – INNOVATIVE SOLUTION TO A CHALLENGING PROJECT

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ABSTRACT

GWMWater owns and operates the Mt Cole Pipeline which supplies approximately 50% of Ararat's urban water demand. The water is sourced from the 800 ML Mt Cole Reservoir, and is transferred via a DN250 Pipeline 26 km to Ararat (Population ~8,500).

The first 1.4km of the pipeline was badly degraded and in urgent need of rehabilitation. This section was located within Mt Cole State Forest and traversed rugged, rocky, and steep bush land.

The declining condition of the pipeline was causing leaks and breaks which increased the risk of customer impacts. Flow had been restricted to minimise breaks, and it was expected that it would need to be reduced further if a rehabilitation solution could not be found.

Due to both difficult construction access and complex Planning Approvals including Cultural Heritage issues, GWMWater initiated an Early Contractor Involvement (ECI) process, calling for expressions of interest then working with a select number of partners.

The goal was to identify potential solutions and to choose a delivery partner with whom they could collaborate openly. A number of different methodologies were assessed through the process including other relining technologies, replacement with a new above ground pipeline and, drilling a new pipe through the mountain.

The selected contractor *Interflow* proposed using Primus Line, a strong, high pressure flexible liner that is specifically designed for pressure pipelines. This was the beginning of a collaborative process that led to the successful rehabilitation of the pipeline.

The solution proposed was deemed a low level planning risk in that neither a Planning Permit or Cultural Heritage Management Plan was required due to the relining solution being considered a *maintenance* activity rather than a construction activity.

The key to a successful installation was being able to install in *one shot*. This Primus Line installation is the longest 'single pull' in Australia to date. The single-pull installation eliminated impact on the natural environment by taking away the need to build access roads or clear native vegetation for work areas.

A key driver to the success of the project was attributed to the continual collaboration between the Contractor (Interflow) and GWMWater (Project Delivery and Operations)

1.0 INTRODUCTION

The first 1.4 km of the Mt Cole pipeline runs through the Mt Cole State Forest from Mt Cole Reservoir through to private property, and was experiencing an increasing rate of breakages and failures in recent years.

The pipeline upgrade section comprised the following (both above and below ground sections):
CH 0m – 400m DN250 AC (Asbestos Cement) Pipeline (circa 1973)
CH 400m – 1400m DN250 MSCL (Mild Steel Cement Lined) Pipeline (circa 1937)

The pipeline's rugged bushland location posed many challenges for the project. Replacing the pipeline would require significant interference with native vegetation and cultural heritage sensitive areas, as well as vehicle access only available at the top and bottom of the pipeline.

GWMWater initiated an Early Contractor Involvement (ECI) process, calling for expressions of interest then working with a select number of partners. The goal was to identify potential solutions and to choose a delivery partner with whom they could collaborate openly. A number of different methodologies were assessed through the process including other relining technologies, replacement with a new aboveground pipeline and, drilling a new pipe through the mountain.

Following the ECI process, GWMWater contracted *Interflow* to utilise 'Primus Line' a robust, high pressure flexible liner than is specifically designed to rehabilitate pressure pipelines. The new liner was pulled through the pipe, with a record-breaking installation of 1.4km of *Primus Line* in a single pull – the longest to date in Australia, and one of the longest globally.

Access was so constrained along the pipeline alignment that the materials associated with the air valve sites and pressure sustaining control valve site were helicoptered in.

Once commissioned, the pipeline was returned to service with the capacity to supply approximately 50% of Ararat's water supply. A key feature of the Mt Cole Pipeline is that it is a 'gravity pipeline' into Ararat, without the need for any pumping.

The outcome of this project is a more secure water supply for Ararat, as well as reducing carbon emissions by reduced pumping required from Lake Fyans Reservoir (Ararat's other water supply source).

Figure 1: ***Mt Cole Pipeline - DN250 AC (Asbestos Cement) Section***

2.0 DISCUSSION

The Mt Cole Pipeline relining project comprised of the following steps:

- Installation of 'pull' cable
- Pipeline cleaning (pigging)
- CCTV of Pipeline
- Pulling through new DN200 Primus Liner (Structurally 'self supported' internal pipe liner)
- Installation of Air Valve assemblies and Pressure Sustaining Valve assembly
- Pressure Testing
- Commissioning

The Early Contractor Involvement (ECI) challenged the market place to provide innovative solutions to solve the difficult pipeline upgrade project.

The solutions offered involved the following (in general):

- New above ground DN250 Stainless Steel Pipeline ($3.4m)
- Slip lining of existing Pipeline (HDPE) ($2.8m)
- HDD – New (HDPE) Pipeline installation inside Rock Bore ($4.2m)
- Primus Line Relining Solution (Structurally self supported liner) ($1m)

The 'Primus Line Relining Solution' offered by Interflow was selected for the following reasons:-

- Cost effectiveness
- Ability to be constructed as a *maintenance* activity from a statutory planning perspective. This negated the need for a Planning Permit and Cultural Heritage Management Plan
- Practical constructability in a rugged bush land environment

2.1 Pull Cable Installation and Pipeline Cleaning

The first step in the construction methodology for the Primus Liner installation was the installation of a pull cable for the entire length. A 10mm Stainless Steel Cable was utilised, with a parachute arrangement connected to it to enable the pull through of the cable utilising the water flow to successfully pull it through the pipeline.

The first main challenge found was that when winching upstream (uphill) with a pipeline foam swab (pig), that the cable kept snapping. The solution was to source and attach a second 2 km 10mm diameter stainless steel cable onto the first cable and only clean (pig) in the downstream (downhill) direction. The cable was coiled at the bottom onto a drum, disconnected and transported to the top and reconnected to the start of the other cable. This methodology worked, however resulted in taking a longer time to clean the pipeline that originally allowed for.

Figure 2: ***Cable Winching Trailer located at Downstream End (9t Rating)***

Cleaning of the silt in the invert of the host pipeline was critical for the new Primus Liner to ensure the integrity of the liner to prevent puncture of the liner.

The pipeline cut-outs for the future air valve sites were utilised as locations to discharge the silt (mud)

Utilising the 'pull cable', a CCTV camera was dragged through the pipeline alignment. The footage was vetted by the Contractor and their relining supplier to confirm acceptability to proceed with liner installation.

2.3 Primus Liner 'pull through'

Due to the high risk activity of pulling the Primus Liner through, a new 16mm diameter stainless steel 'pull' cable was retrofitted to the system. The pulling though of the 1.4km liner taken one (1) working day to complete. Lubricant was sprayed onto the outside of the Primus Liner to aid installation.

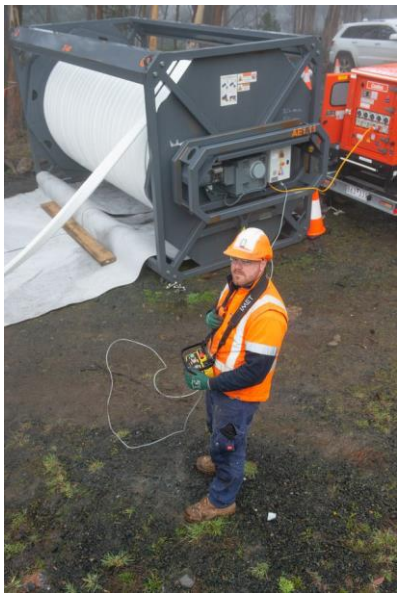

Figure 3: ***Unwinding DN200 Primus Liner from Transport Drum at Upstream End (Length: 1.4km)***

Figure 4: ***Primus Line in a compressed 'C' shape for installation***

Figure 5: ***DN200 Primus Line installed inside host pipe (DN250 MSCL) ready for pressure testing***

2.4 Pressure Testing and Commissioning

Compressed Air was initially utilised for Pressure Testing for the continuous liner (~1.4km) before the valve stations were cut in to prove the success of the liner install.

After successful liner Pressure Testing with air, the valve station sites were installed and the system was then pressure tested utilising water.

The commissioning process involved flowing water through the pipeline from 0 L/sec up to the maximum design flowrate of 37 L/sec, with the Pressure Sustaining Valve (at the end of the relined section) being utilised to create a suitable back pressure to ensure that the hydraulic grade line is higher than the entire relined pipeline length to create a fully inflated (round) liner at all times.

Figure 6: ***Combined Pipeline Commissioning and Operator Training. Photo of Pressure Sustaining Valve site - located at the downstream end of the relined section. (CH 1,400m)***

3.0 CONCLUSION

This project provided an alternate pipeline upgrade solution that utilised a practical construction methodology in a rugged bushland environment, as well as provided a 'low level' statutory planning risk by avoiding the need for a Planning Permit or Cultural Heritage Management Plan.

A key factor to the success of the project was attributed to the continual collaboration between the Contractor (*Interflow*) and GWMWater (*Project Delivery and Operations*)

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5.0 REFERENCES

Primus Line Liner System. *Liner Product* Tuesday 29 November 2022
http://www.primusline.com/en-au/product