DAYS NOT MONTHS: CITY OF GOLD COAST'S EMERGENCY PRESSURE PIPE REHABILITATION PROGRAM

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ABSTRACT

When a DN400 Class A recycled water main beneath Hope Island Road — the first arterial exit from the M1 into Surfers Paradise, carrying over 30,000 vehicles per day — required urgent rehabilitation in December 2025, City of Gold Coast faced a critical constraint: open-cut excavation through a major roundabout and a 90-degree bend was not viable. With Christmas and the summer tourist peak days away, road disruption was not an option. The council opted for a trenchless solution and contacted Primus Line.

Primus Line offers a flexible, pressure-rated Kevlar® fibre composite liner inserted into an existing host pipe requiring only two access pits at each end, eliminating excavation along the pipeline route and independently carrying operating pressure without reliance on the host pipe. Engineering analysis, technical advice, and on-site supervision were provided by Primus Line, with installation carried out by a local Gold Coast-based partner. The 130 m DN400 PN18 liner was pulled through the existing DICL and PVC host pipe — including the 90-degree bend — in under 20 minutes. Total installation time was 16 working hours. Material sourced from local stock enabled mobilisation within days of first contact.

This project was the first of four emergency pressure pipe rehabilitations City of Gold Coast completed with Primus Line over five months, spanning PVC, DICL, and asbestos cement pipes across potable water and recycled water networks, each constrained by conditions that ruled out open-cut excavation. This paper presents the technical and operational outcomes of all four projects, with the Hope Island Road installation as the centrepiece case study.

1. INTRODUCTION

Urban water utilities face a persistent and growing challenge: ageing pressure pipe infrastructure that fails without warning, often in locations where conventional open-cut repair is impractical or impossible. The standard response — excavate, remove, and replace — demands weeks of planning, procurement, and construction, during which the network remains compromised and communities bear the disruption.

City of Gold Coast manages an extensive pipeline network across one of Australia's most densely populated and traffic-sensitive urban environments. Between December 2025 and April 2026, the utility faced four separate pressure pipe failures requiring urgent resolution. In each case, the location — beneath a major arterial road, under protected trees, along a bridge crossing — made open-cut excavation either technically unviable or operationally unacceptable.

In each instance, City of Gold Coast contacted Primus Line. From first contact to completed installation, elapsed time was measured in days. This paper documents the approach and outcomes across all four projects, with particular focus on the most complex and time-critical:

a DN400 Class A recycled water main beneath Hope Island Road, completed just before the Christmas holiday period and the Gold Coast's summer tourist peak.

The paper also discusses the broader implications for water utilities managing diverse legacy networks in constrained urban environments, where the ability to respond rapidly and without road excavation is increasingly a core operational requirement, not an exceptional circumstance.

2. THE PRIMUS LINE SYSTEM

The Primus Line system is a trenchless pressure pipe rehabilitation solution comprising a flexible, spoolable composite liner and purpose-engineered mechanical end connectors. Designed and manufactured in Germany by Rädlinger Primus Line, the system has been deployed in over 60 countries across more than 25 years of operational service.

The Primus Liner consists of three functional layers: an outer wear-resistant polyethylene sleeve for installation protection; a middle strutcal layer of woven aramid (Kevlar®) or aramid-polyester blend fabric that carries the operating pressure; and an inner polyethylene coating certified for potable water contact under AS/NZS 4020, NSF/ANSI 61, and KTW W 270. The system is available from DN150 to DN550, with rated operating pressures from 10 bar / 1,000 kpa to 56 bar / 56,000 kpa.

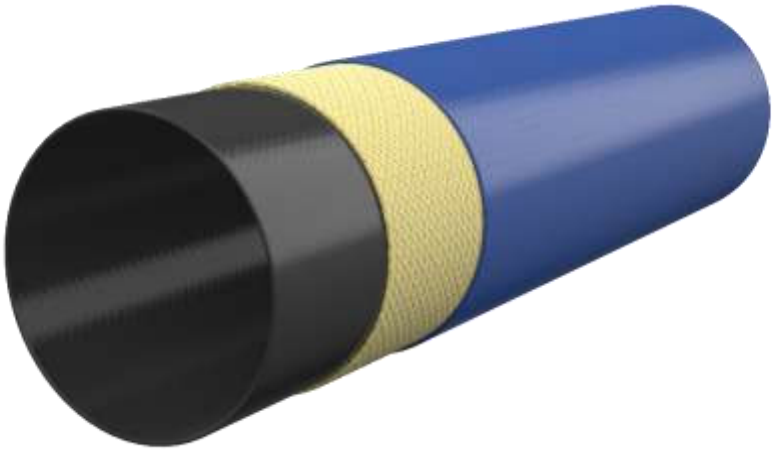

Figure 1: The Primus Liner consists of three separate layers.

2.1 The Loose-Fit Liner Principle

The defining characteristic of the Primus Line system is its classification as a loose-fit liner – formally codified in ASTM F3708-25 (Standard Specification for Flexible Fabric-Reinforced Pressure Pipe Liner). Unlike close-fit or interactive lining systems, the Primus Liner is installed with intentional clearance between the liner and the host pipe wall. The practical consequences of this principle are significant:

- The liner carries operating pressure fully independently, without any structural contribution from the host pipe.

- The host pipe is relieved of internal hydraulic loads and remains in place as a passive conduit, undisturbed.
- No bonding, grouting, or curing process is required.
- The liner can negotiate bends up to 90 degrees in a single continuous pull.
- The liner marginally reduces the internal bore; hydraulic performance is mostly maintained by its smooth inner surface.

2.2 Installation Process

Installation requires two access pits — one at each end of the rehabilitation section. The pre-folded liner is delivered on a compact transport reel that can be positioned at the entry pit with standard site equipment. A winching cable is threaded through the host pipe and attached to the liner's end. The liner is then pulled through in a single continuous operation — including any bends — and expands to its circular cross-section applying air pressure. Specially developed end connectors are installed at both pits to integrate the rehabilitated section with the existing network. Pressure testing follows, and the section is returned to service.

Figure 2: Primus Liner being pulled from the transport reel into the access pit during the Hope Island Road installation. The compact reel and minimal site footprint are characteristic of the system.

3. HOPE ISLAND ROAD: THE CENTREPIECE CASE

3.1 Site Context and Stakes

Hope Island Road is the first arterial exit from the Pacific Motorway (M1) into Surfers Paradise travelling from Brisbane — a critical corridor for residents, tourists, and freight serving the northern Gold Coast. Queensland Department of Transport and Main Roads (TMR) traffic

census data records an Annual Average Daily Traffic (AADT) of 30,878 vehicles on this road, with average weekday volumes exceeding 33,000 vehicles per day (TMR, 2020). The road passes through a major roundabout that serves as a key distribution node for surrounding residential and commercial areas.

The failure occurred in December 2025 — days before Christmas and the onset of the Gold Coast's peak summer tourist season. The timing could not have been more operationally sensitive. Any method requiring lane closures, traffic management, or extended road reinstatement would have imposed significant congestion on a corridor already approaching its peak annual demand. Open-cut excavation through the roundabout itself was assessed as simply not viable.

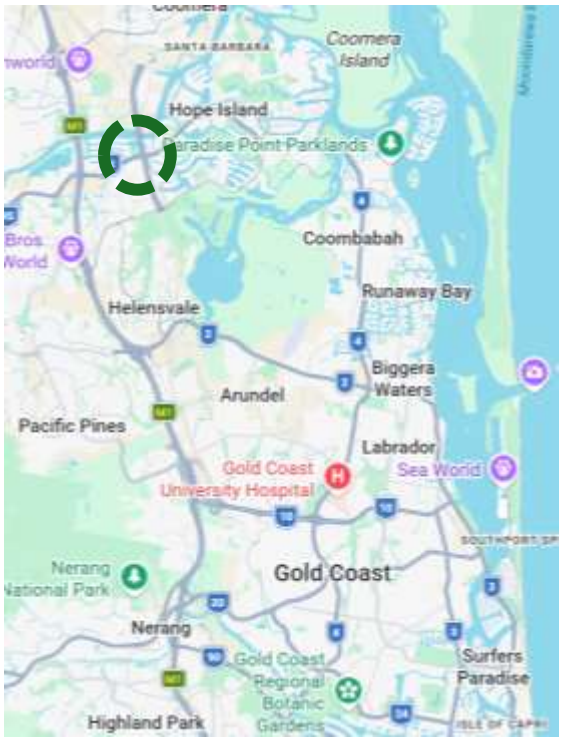

Figure 3: Satellite view of the Gold Coast, showing the M1 on the left and Hope Island Road.

Figure 4: Detailed satellite view of the Hope Island Road project site, showing the new Coomera Connector, the major roundabout beneath which the DN400 recycled water main runs, and the approximate pipeline rehabilitation route.

3.2 Pipeline Condition and Configuration

The failed asset was a DN400 Class A recycled water main. The pipeline comprised a combination of ductile iron cement-lined (DICL) and PVC pipe, reflecting the mix of materials typical of infrastructure built and extended across different eras. The rehabilitation section was 130 m in length and included unknown bends of up to 90 degrees — located within the roundabout footprint, beneath active road pavement. Maximum operating pressure (MOP) was 7.5 bar / 750 kpa.

Prior to liner selection, Primus Line conducted engineering analysis of the pipeline geometry, bore dimensions, operating conditions, and host pipe data in collaboration with its local certified installation partner. CCTV inspection confirmed internal bore clearance and identified the bend geometry. The combination of a large-diameter host pipe, a 90-degree bend, mixed

pipe materials, and a recycled water application made this a technically demanding rehabilitation scope.

3.3 Liner Selection and Engineering Rationale

The Primus Line system DN400 PN18 with connectors PN16 was selected. This Primus Liner provides an operating pressure of 18 bar / 1,800 kpa, when installed in a straight pipe and is de-rated to 8.1 bar / 810 kpa when installed through a 90-degree bend – so more than 1.5 times the maximum operating pressure of the main of 7.5 bar / 750 kpa / 75mh; also delivering a safety factor appropriate for a recycled water transmission main subject to pressure transients. The pressure rating is achieved by the aramid fabric layer operating entirely independently of the host pipe; no contribution from the DICL or PVC host is assumed or required.

The loose-fit liner principle was specifically enabling for this site. The ability to pull the liner through a 90-degree bend in a single continuous operation — without modification to the host pipe, without intermediate access points, and without excavation above the bend — meant the roundabout remained structurally undisturbed throughout the installation.

Material was available from local Sydney stock, eliminating any supply lead time from the response timeline. From first contact with Primus Line and the local installation partner to mobilisation on site, elapsed time was days.

3.4 Installation

Two access pits were excavated, one at each end of the 130 m section. The Primus Liner DN400 PN18 was positioned on its transport reel at the entry pit. A winching cable was threaded through the host pipe, connected to the pre-folded liner, and the liner was pulled through the full 130 m length — navigating several bends including a 90-degree bend — in under 30 minutes.

Figure 5: Installation of the Primus Line end connector at the Hope Island Road entry pit. The blue connector body provides the mechanical and pressure-tight transition between the Primus Liner and the existing flanged network connection.

End connectors were then installed onto flanged gibaults and torqued at both access pits, integrating the rehabilitated section with the existing recycled water network. The road surface above the entire 130 m pipeline route remained undisturbed throughout. Total Primus Line installation time, including both connector installations, was about 16 working hours.

Figure 6: A Primus Line DN400 PN16 R connector was choose for the installation. Though flanges it connects on side back to the host pipe and on the opposite side back to the existing pipeline system.

3.5 Outcome

The rehabilitated section passed pressure testing at MOP (750 kPa) on the first attempt and was returned to Class A recycled water service. The roundabout and Hope Island Road remained open throughout the works. The project was completed before the Christmas shutdown — the network was operational for the summer tourist peak, and the community experienced no road disruption associated with the repair.

The total project timeline from first contact to service reinstatement was a matter of days. For context: the conventional alternative — open-cut excavation through an active roundabout on a 30,000 vehicle-per-day arterial road, including traffic management, pipe removal, replacement, and road reinstatement — would conservatively require several weeks and substantial traffic disruption during the Gold Coast's busiest period of the year.

4. PROJECTS 2–4: A REPEATING PATTERN

The Hope Island Road project demonstrated that the Primus Line system could function as a rapid-response emergency tool under the most demanding urban conditions. What followed over the subsequent five months confirmed that this was not an isolated outcome but a repeatable pattern. City of Gold Coast returned to Primus Line and their local installation

partner for three further emergency rehabilitations, each presenting a different combination of pipe material, diameter, and site constraint. Table 1 summarises the key parameters.

No.	Application	Host Pipe	DN	Length	Key Constraint	Stock
2	Potable Water	PVC	150	35 m	Broken pipe under protected tree	Sydney
3	Potable Water	AC / PVC / AC	200	140 m	Main road alignment + bridge crossing; AC pipe	Own stock
4	Potable Water	AC	150	50 m	Broken pipe under protected tree; AC pipe	Sydney

Table 1: Summary of Projects 2–4. All projects involved emergency pipe failures with site constraints that precluded open-cut excavation.

4.1 Projects 2 and 4: Broken Pipes Under Protected Trees

Two projects involved potable water mains that had failed beneath protected trees — one DN150 PVC (35 m) and one DN150 asbestos cement (50 m). In both cases, open-cut excavation would have required significant disturbance to the tree root zone, raising environmental, community, and potentially legal concerns. A Primus Liner DN150 PN25 was selected for both, with material sourced from Sydney stock and mobilised to site within days. Installation from two small access pits preserved the root zones entirely; the sections were pressure tested and returned to potable water service without incident.

Figure 7: The construction footprint for the installation of the Primus Liner DN150 is extremely small.

4.2 Project 3: DN200 Potable Water Main — Road and Bridge Crossing

The third follow-on project was a DN200 potable water main with a rehabilitation length of 140 m, running along a main road and crossing a bridge. The host pipe configuration was complex:

alternating sections of asbestos cement and PVC including several bends, reflecting staged construction and maintenance history. Both the road alignment and the bridge crossing would have created significant complications for open-cut repair; together they made it effectively impractical.

The asbestos cement sections required particular consideration. AC pipe rehabilitation by open-cut methods generates airborne asbestos fibres during cutting and removal, creating occupational health hazards and producing hazardous waste requiring specialist disposal — a costly and operationally burdensome process. The Primus Line loose-fit installation method minimises this. The host pipe remains in place, sealed from internal pressure by the liner, and hardly any asbestos waste is generated. This characteristic has been formally validated in Germany, where Primus Line Rehab is recognised by the German Social Accident Insurance (DGUV) as a low-emission procedure (BT 62) under TRGS 519 — the technical rules for asbestos handling — making it the only drawn-in liner method with this classification.

A Primus Liner DN200 PN18 was installed from two access pits, traversing both the road section and the bridge crossing without any surface excavation along the 140 m route, which also included several bends. Material was available from City of Gold Coast's own stock. The section was pressure tested and returned to potable water service on schedule.

5. DISCUSSION

5.1 Speed of Response as a System Characteristic

Across all four projects, elapsed time from first contact to completed installation was measured in days. This is not a project management achievement — it is a direct consequence of how the Primus Line system is designed and supplied. Several characteristics combine to make rapid emergency response structurally achievable:

- Local stock: All four projects were supplied from Australian stock — Some from City of Gold Coast's own Primus Line stock, some from Sydney. No international lead time entered the critical path.
- Minimal installation plant: Two access pits, a winch, and a transport reel. No curing machinery, UV rigs, pressure vessels, or specialist excavation plant. A small, experienced crew of 3-4 people can complete an installation of this scale in a single working day.
- No curing period: Unlike CIPP systems, the Primus Line system is mechanically complete once end connectors are installed. Depending on the chosen connector, pressure testing follows immediately; there is no curing window between installation and recommissioning.
- Single continuous pull through bends: The 90-degree bend at Hope Island Road was navigated in the same 20-minute pull as the straight sections. No intermediate pits, no segmented installation, no additional mobilisation.

For a utility whose primary concern during an emergency is restoring service with minimum disruption, these characteristics are operationally decisive. The alternative — excavate, procure, replace — operates on a fundamentally different timeline.

5.2 The December Timing: When Speed Has Maximum Value

The Hope Island Road project illustrates a broader principle: the value of rapid response is not constant. It peaks when failure occurs at the worst possible moment. December on the Gold Coast — the tourist season influx, school holidays, pre-Christmas commercial activity — is precisely that moment. A road closure on the M1's first Surfers Paradise exit, at a major roundabout, in the week before Christmas, would have been a significant community and reputational event for City of Gold Coast. The ability to complete the rehabilitation without touching the road surface, within the available window before the holiday shutdown, converted what could have been a damaging incident into a seamless service restoration.

This is the case for maintaining an emergency response relationship with a trenchless rehabilitation provider — not just having the technology available in principle, but having the engineering relationship, the stock, and the trained installation capability ready to deploy within days.

5.3 Versatility Across a Legacy Network

The four projects collectively involved three pipe materials (DICL, PVC, AC), two network applications (potable water and Class A recycled water), and three liner sizes (DN150, DN200, DN400). This range is not a coincidence — it reflects the material diversity typical of any established urban water network, where decades of construction, extension, and maintenance have produced a heterogeneous asset base.

For utilities managing such networks, a rehabilitation technology that works across this range — without requiring different products, different contractors, or different engineering assessments for each material type — has practical value beyond any individual project. City of Gold Coast applied the same methodology to a DN400 DICL/PVC recycled water main and a DN150 AC potable water main. The engineering approach, the installation process, and the outcome were consistent.

5.4 Asbestos Cement: A Growing Challenge

Two of the four projects involved asbestos cement pipe — a proportion that will increase as Australian networks age. Approximately 45,000 km of AC pressure pipe remains in service nationally. The conventional response to AC pipe failure — excavate, remove, and replace — creates hazardous waste, requires specialist disposal, and imposes significant cost and programme risk on already stretched maintenance budgets.

The Primus Line approach leaves the AC host pipe in place, sealed from internal pressure, with minimal mechanical disturbance of the asbestos material. For Queensland utilities with AC pipe in their networks — and most have some — this is not a marginal advantage. It removes the most operationally complex element of AC pipe maintenance from the critical path of emergency response.

5.5 Constraints as Selection Criteria

In all four of these projects, the site constraint that ruled out open-cut was simultaneously the condition that made the Primus Line system the most technically appropriate choice. The 90-degree bend that precluded roundabout excavation is navigated as a standard installation step. The protected tree root zone that precluded open-cut is bypassed entirely by the

trenchless pull. The bridge crossing that complicated conventional repair is simply part of the liner route.

This is a reframing worth internalising for asset management planning: the sites where trenchless rehabilitation is hardest to justify on cost alone are often the sites where it is easiest to justify on technical necessity. When the alternative is genuinely not viable, the comparison is not trenchless versus open-cut — it is trenchless versus no available option.

6. CONCLUSION

City of Gold Coast completed four emergency pressure pipe rehabilitations using the Primus Line system in five months, across a range of pipe materials, diameters, network applications, and site conditions. In every case, the utility moved from first contact to restored service in days. The road surface above each pipeline route was undisturbed. The traffic kept flowing.

The Hope Island Road project — a DN400 Class A recycled water main beneath a major roundabout on the Gold Coast's busiest M1 entry corridor, rehabilitated days before Christmas and the summer tourist peak — demonstrated the full operational value of this capability. A 130 m liner pull through a 90-degree bend in under 20 minutes, 16 working hours total installation, pressure tested to MOP and returned to service: this is what emergency response looks like when the right technology, stock, and engineering relationship are in place before the failure occurs.

The key conclusions for Queensland and Australian water utilities are:

- Trenchless pressure pipe rehabilitation using the Primus Line system enables emergency response within days of pipe failure — a timeline fundamentally different from open-cut replacement.
- The system is effective across various pipe materials, and across potable, waste water, and recycled water applications, making it applicable to the material diversity of real legacy networks.
- For asbestos cement pipe specifically, the loose-fit installation method avoids asbestos waste generation and worker exposure — validated internationally under German DGUV BT 62 / TRGS 519.
- Limited local stock availability in Australia removes international supply lead times from the emergency response critical path. Many asset owners like Syndey Water, Urban Utilities, or City of Gold Coast hold their own Primus Line emergency stock.
- The hardest sites — bends, road crossings, bridge crossings, protected vegetation, areas of cultural significance — are standard installation scenarios, not special cases.

Trenchless pressure pipe rehabilitation should be part of every urban water utility's emergency response toolkit — not as a last resort when open-cut fails, but as a planned first option when the site demands it.

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