GP Friel Ltd.

Featherston, Whitmore & Bowen St Rising Main Upgrade

CCNZ Award Entry

May 2022

G.P. FRIEL LTD
UNDERGROUND INFRASTRUCTURE

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27 April 2022

Project/File: Whitmore-Bowen Rising Main

To Whom it May Concern
n/a

Dear Judges,

Reference: GP Friel Ltd – Featherston – Whitmore - Bowen Rising Main Construction

[G.P. Friel Ltd (GPFL) were allocated as the Contractor from the Wellington Water Contractor Panel for the Featherston-Whitmore-Bowen Rising Main project shortly after Stantec (we) commenced work as designers on this project under an Early Contractor Involvement relationship. This was one of the first projects allocated under the Wellington Water Contractor Panel and is held up as a good example of a project relationship.

From the start we were pleased to be working alongside GPFL on this critical project as we knew they would bring the best of their experience, knowledge, relationships and collaborative working style to this project, particularly as it was going to be constructed in a busy CBD environment.

During the investigation and design phase Gerry Friel and Dave Philipson and team worked alongside our design team to identify and prioritise the investigations needs in an area full of services with limited working hours, determine the best routes, methodology and programme to complete the works.

One of the difficulties of the site location was the number of other construction works going on in the same area, as well it being on multiple bus routes, hotels in the vicinity (limiting night works) and an entry to Parliament. Dave worked collaboratively with WCC and Wellington Bus Company to determine a construction programme that minimised the disruption to the public, kept them well informed about the works, and ensured efficient programmes for all parties.

The connection to the Main Interceptor Sewer Tunnel was identified as a high-risk piece of work, and the design relied on a number of investigations to locate the Tunnel and determine as much as possible about construction and condition. GPFL were involved in these investigations and part of the team developing clever and practical solutions to make this connection.

Like many works over the last few years this site has been struck by lockdowns and illnesses, as well as significant protest encampments, dragging the works past expected completion date. But we have remained impressed with the commitment to completing this work safely and to the high standard we would expect from a contractor such as GPFL, and the positive attitude the team has maintained through many difficult times.

Reference: **GP Friel Construction Ltd**

Ngā mihi nui,

STANTEC NEW ZEALAND

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Attachment: [Attachment]

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Project Overview

REFERENCE	FWB
PROJECT NAME	Featherston, Whitmore & Bowen St Rising Main Upgrade
CUSTOMER	Wellington Water Ltd.
VALUE	$4 – 5M
PROGRAMME	August 2020 – May 2022

Featherston, Whitmore & Bowen Street Rising Main Upgrade is a project aimed at improving the resilience of part of Wellingtons CBD wastewater rising main network and is the gateway project for a programme of rising main renewals across the northern half of the city.

Work commencing on Bowen St outside Parliament

"From the start we were pleased to be working alongside GPFL on this critical project as we knew they would bring the best of their experience, knowledge, relationships and collaborative working style to this project, particularly as it was going to be constructed in a busy CBD environment."

Anna Bridgman, Group Leader, Water, Lower North Island, Stantec

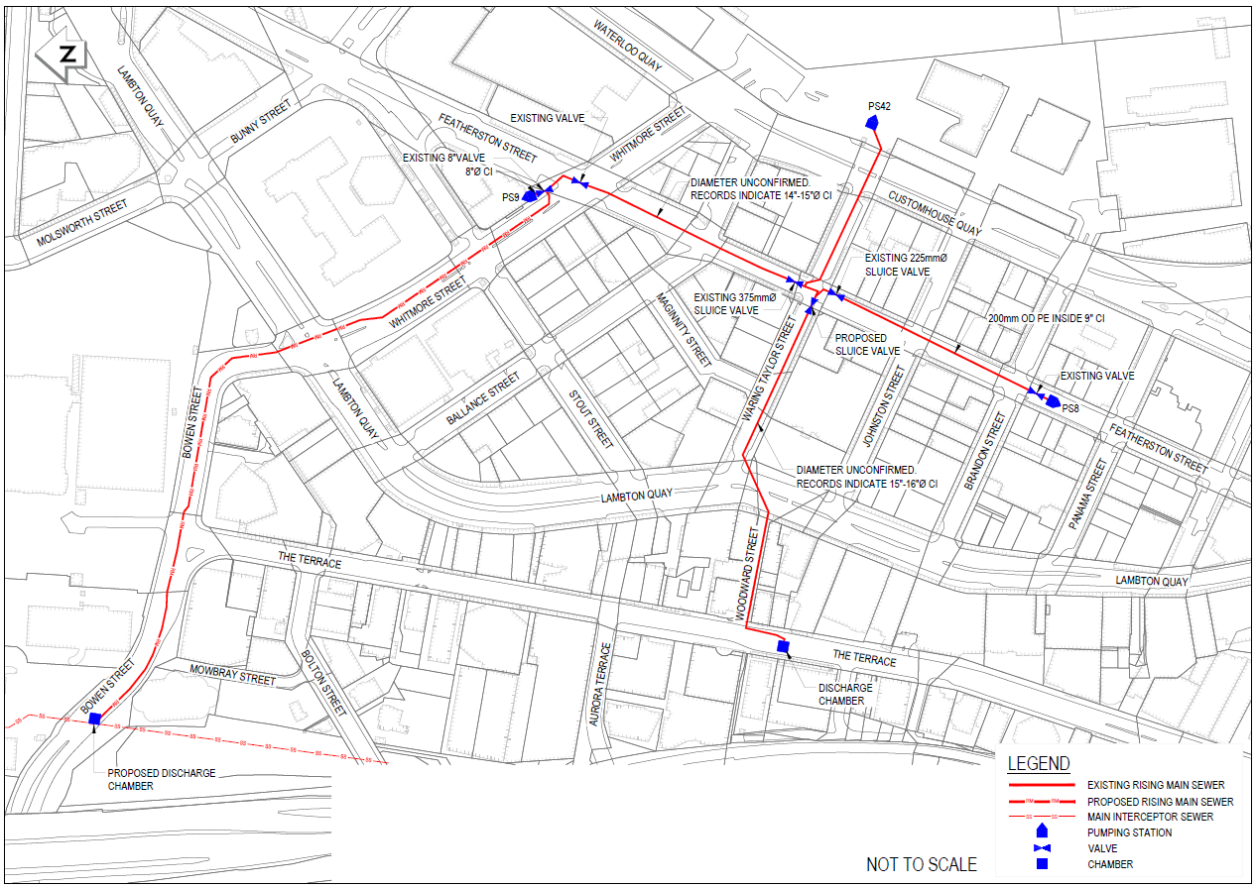
The project included several elements that make it stand out and make it an award winner.

- Collaboration with Stantec through ECI and construction to deliver the best outcome for WWL and the city.
- Management of high-profile external stakeholders while planning the project and during construction.
- Delivery of smart solutions to meet specific engineering challenges developed during the design phase of the project and followed through on site.
- Working safely in a constrained CBD environment where management of traffic, underground services and groundwater were particularly complex.
- Planning and executing a work to a high standard and overcoming difficulties to deliver a quality product.

The existing rising main network is comprised of several pump stations around the shoreline of the harbour connected with cast iron pipes that carry the waste up to the Main Intercepting Sewer at the top of the city which then conveys the waste, under gravity, to the treatment plant at Moa Point. There is no resilience in the existing network. If there is a failure on part of the network, then that part of the network will need to be shut down until repairs can be completed. During the shutdown period there is no back-up system, the waste will need to be controlled by limited storage, sucker trucks and constructed overflows to the harbour. There have been some additions and renewals but generally the network was constructed in the 1930s and is reaching the end of its service life. Because there is no resilience, the rising main network has been in constant operation since it was constructed with no practical way to inspect its condition or carry out planned maintenance activities. In recent times there have been failures of the cast iron pipes that have led to emergency repairs with associated disruption to the day-to-day business of the city and overflows of waste into the environment.

This is a critical asset, and it is in poor condition.

Our project is to install a new rising main up Whitmore and Bowen Streets that will provide a new route to convey waste from the shoreline up to the Main Intercepting Sewer. This new rising main delivers resilience by providing a secondary route in the event of a failure of part of the network and it will allow sections of the existing network to be taken offline to be renewed or rehabilitated in the future.



Layout of the Rising Main Network – showing the proposed Featherston, Whitmore & Bowen St Rising Main

Planning & Procurement

An ECI contract was awarded to GPFL through the WWL Contractor Panel arrangement. The ECI was aimed at identifying risks and opportunities and allocating their ownership to the most appropriate party. We pursued value for money initiatives and sought to provide cost certainty from the start of the project.

Through the ECI process we worked closely with the design team from Stantec. Our interactions were overwhelmingly positive and developed into construction in a manner that felt like we were delivering the project as one team. The strong relationships that we have formed on this project will be an asset to our business and our customer into the future.

Key components of the ECI were:

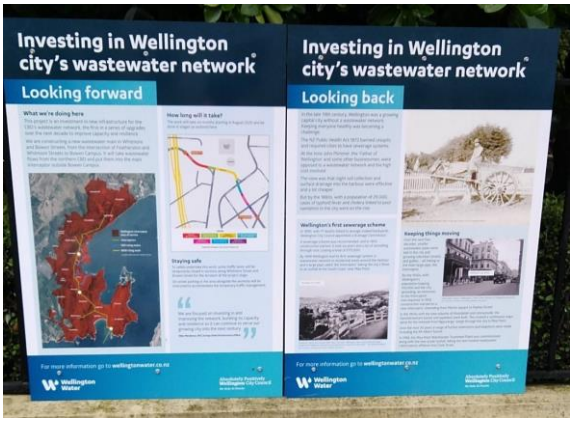
- High profile stakeholder engagement
- Early engagement with WCC RCA
- Value engineering reinstatement requirements
- Physical investigations
- Collaborative design of complex elements
- Risk Allocation

Following the ECI, GPFL responded to a request for quotation, negotiated with WWL and Stantec and were awarded a contract to deliver the work.

High profile stakeholder engagement

High profile stakeholder engagement that led to output that was used in our construction programme design. We liaised with Parliamentary Services, The Supreme Court, Victoria University and Rydges Hotel. Each had specific needs that we were able to identify early and then use to develop our construction programme. These included Court Case dates, Exam periods and event schedules that would draw tourists into Wellington.

This planning was successful and allowed us to progress with our work without significant complaints. The engagement also provided us with communication channels that we could use to manage change. For Parliament, we planned to cross their access onto the Terrace intersection during a parliamentary break. Things changed when an election was called and then Covid arrived. However, by keeping in contact with Parliamentary Services we were able to progress with the works and maintain their access.



Information Boards used to engage with Stakeholder

Early engagement with WCC RCA

Early engagement with WCC RCA included traffic modelling and co-design of a traffic management solution that met the project needs and was ultimately accepted. The project was of a significant scale and delivery would have been almost impossible under the WCC standard conditions. We met regularly with WCC RCA throughout the deign process to challenge constraints and set expectations. We proposed a traffic management solution based around permanent lane closures in the middle of the carriageway – leaving only the outside lanes for traffic to use. This proposal aimed to keep the city functioning without stifling progress of the work. WCC engaged in the process and carried out traffic modelling that showed that the proposal was optimal in the way it balanced safety, progress, and disruption.

During construction we built on the relationships that we had developed with WCC. Winning the trust of the RCA meant that we were able to be agile on site and react to any situation that arose. These relationships lead directly to the formation of a corridor working group that included all the developers and utilities that had an interest in Bowen and Whitmore Streets. By working in this group, we were able to identify opportunities to share space and work together to the benefit of the city (his included installation of the Bowen Campus Gravity Main described in a subsequent section of this submission). We were also able to manage risks that arose efficiently and without detriment to any of the parties.

Lane Closures outside The Supreme Court

Value Engineering Reinstatement Requirements

Working with the roading department of WCC to value engineer the reinstatement requirements and realise significant cost savings for the project. The original project design was for a "like for like" pavement reinstatement. Investigations showed that in some locations the existing pavement was over 200mm thick due to maintenance activities over a series of years. The existing pavement was also constructed from AC mixes due to the heavy usage of the route. AC mixes can only be effectively laid using a paver and are not suitable for trench reinstatement. Together with Stantec we negotiated with WCC roading and were able to provide a robust pavement solution comprised of 100mm of asphalt in DG mixes that would service the project and not compromise the integrity of the surrounding pavement. The direct saving for this on the project was over $100K and by applying these learnings to other CBD work savings will continue to be realised.

Physical Investigations

Physical investigations of existing underground services that informed route selection. We worked with Reveal Infrastructure Limited to carry out an extensive potholing exercise and investigate existing assets that could pose a risk to the design alignment. The results from this exercise were used to inform the design and to assist with service markouts during construction. In Bowen St the underground services are particularly congested and complex and there is very little available space in the corridor. Even with this investigation it was not possible to avoid change on site (described below) but the investigation did put us in a strong position to react to that change.

Investigation Works underway in 2019

Collaborative Design of Complex Elements

Collaborative design of complex elements including the interceptor connection details and crossings of The Terrace and Lambton Quay intersections were a critical aspect of the ECI.

Following on from the physical investigation work we proposed to Stantec that a trenchless crossing of the Lambton Quay intersection would eliminate the requirement to install traffic management and disrupt the busy bus routes out of Wellington City's bus hub. It would minimise risks associated with excavations and interface with underground services. We worked with Stantec to design a pipe rammed solution that would deliver safety and disruption benefits – the construction of this element is described in the sections below.

Connection to the existing interceptor was a complex piece of engineering around a critical, fragile asset. We workshopped a design solution that would protect the existing interceptor. Being involved at the early stages of this design element meant that we could ensure that constructability issues were considered and built into the solution. The construction of this element is described in the sections below.

Risk Allocation

During the ECI we Worked together with Stantec on production of the schedule of quantities to allocate risk appropriately. We sought to identify and understand risk and then decide which party was best placed to hold that risk. By doing this we could continue to provide cost certainty while seeking out value for the customer. An example of this was where the scope of settlement monitoring was not well understood – we changed this item from a lump sum to measure and value. WWL held the risk and ultimately made a saving as a result.

Physical Works Construction

The original scope of the project was to install a new 450OD PE100 SDR17 rising main on Whitmore and Bowen Streets. It is connected to the existing rising main out of pump station 9 on the corner of Whitmore & Featherston Streets. And outfalls into the main intercepting sewer on Bowen St between The Terrace and Ballantrae Place. During the project additional scope was added that extended the project duration and increased costs.

Key aspects of the final scope included:

- Connection at Pump Station 9
- Crossing the Lambton Quay intersection
- Crossing The Terrace intersection
- Making a connection to the Main Sewer Interceptor
- Installation of an FRP liner and Vortex Drop Structure
- PE Welding
- Addition of a section of new public gravity main
- Construction of a new watermain

Connection at Pump Station 9

Connection at Pump Station 9 included remodelling the internal pipework of the pump station, controlling the flow during a shutdown, and bringing forward parts of follow-on projects to ensure that they could be constructed efficiently.

The original project included an item to connect the new rising main to the existing rising main out of pump station 9. As construction progressed, we were instructed to make a new connection to the pump station and remodel the inside of the pump station so that it could pump into both the new and old rising main. To facilitate the refit a new valve was installed in the pump station that isolated one of the three existing pumps and allowed the pump station to continue to operate using the existing rising main in Featherston St. The valve was cut in during a shutdown of the system where we used a diesel pump to pump from the wet well into the newly constructed rising main. The cut in and refit were completed successfully, and this construction method meant that there was no interruption to service from the pump station and no risk of overflows of waste to the environment. GPFL managed the flows while the welding and fitting were subcontracted to Hutt Valley Welding Services.

Internal Modifications at Pump Station 9

In parallel with the construction of the Whitmore & Bowen St rising main we carried investigation work as part of an ECI phase of a project to renew the existing rising main in Featherston St. The programme is to carry out this work when the new main is in operation and the existing main can be isolated. As part of this investigation, we identified that delivery of the next project would be compromised by the current work – with newly installed infrastructure clashing with the launch pit required for the next stage. We raised the issue with WWL and Stantec and together we decided to accelerate a portion of the next project and deliver it under the current contract. This work involved sliplining the existing rising main with a new 315OD PE100 SDR17 main from a launch pit adjacent to PS9 to a connection point in the middle of Featherston St. By considering the work as a programme – rather than as individual projects we were able to look at the big picture and add value to the product.

Future Connection for Stage 2

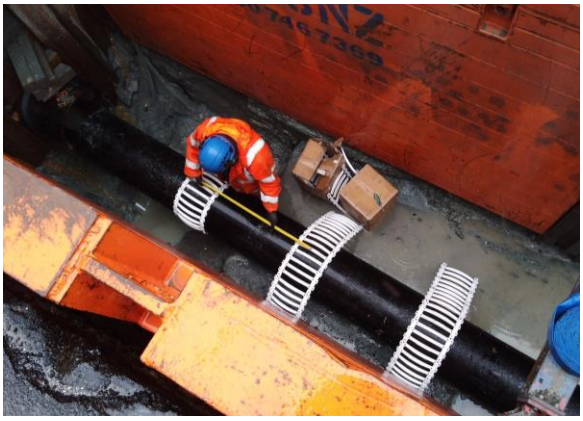
Crossing the Lambton Quay Intersection

Crossing the Lambton Quay intersection trenchlessly to minimise disruption on a busy bus route was identified as an opportunity in the ECI phase. We installed a 610OD steel casing with 14.2mm walls – approximately 50m across the intersection by pipe ramming. The casing was flushed clean, and the new rising main was inserted through it.

To carry out this work we excavated a 15m long launch pit in the middle of Whitmore St on the Southern side of the intersection. The pit was 2m wide at the workface to create space for a welding pit and 1.5m wide along the remainder of the pit. A concrete foundation was placed in the bottom of the excavation and rails were fixed to control the grade and alignment of the pipe ram. The launch pit was surrounded with noise barriers to minimise nuisance for The Supreme Court and Victoria University facilities.

The casing was rammed in 12m lengths with a weld completed in the trench between each section. The first casing had a cutting shoe welded to the end. We fitted a Grundoram Koloss ramming tool c/w two 375CFM compressors to the end of the casing – using steel collets that would transfer force to the casing. The tool is a pneumatically powered hammer that dynamically rams the casing through the ground.

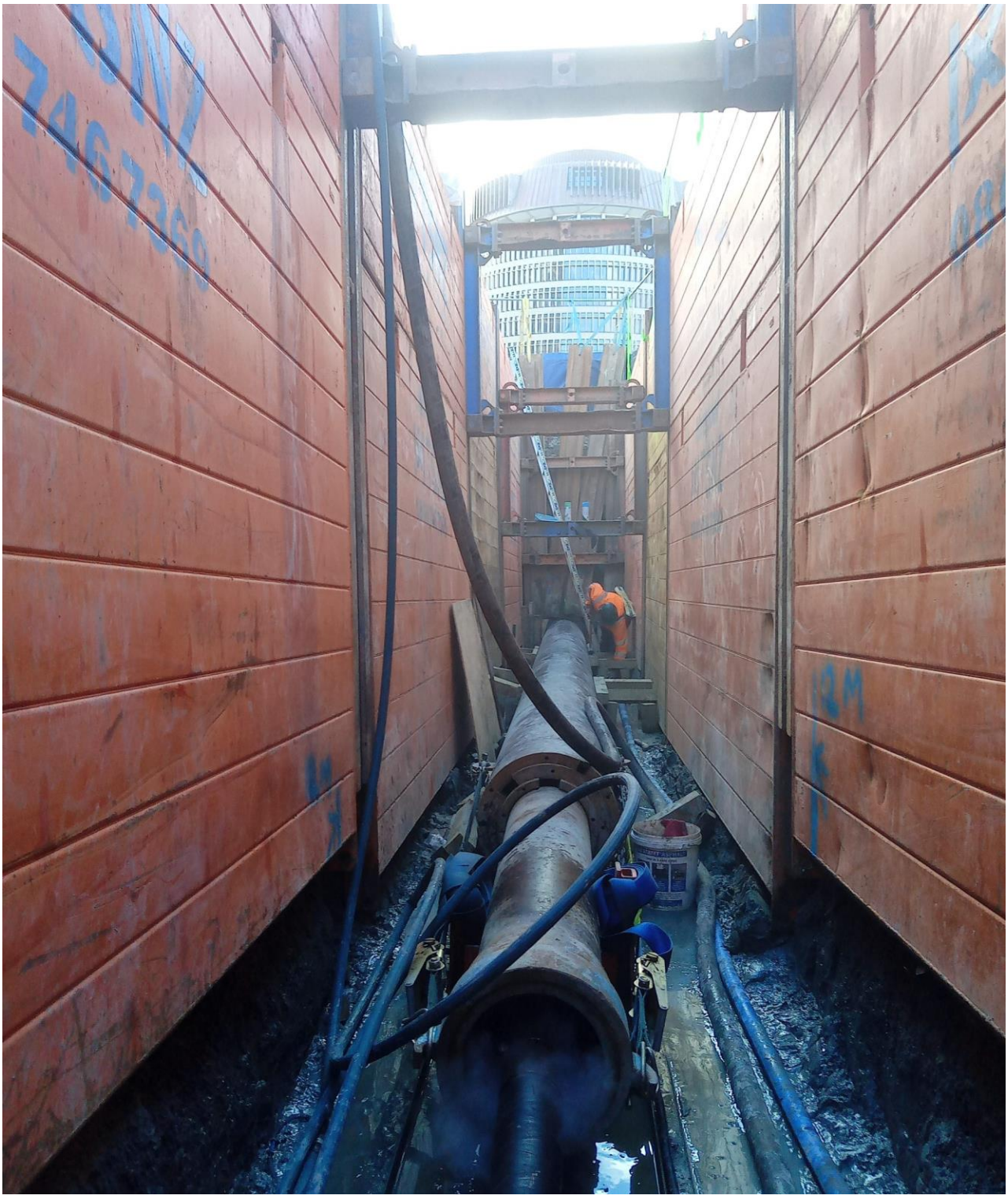
Due to very tight traffic management constraints, a sacrificial chamber was sunk onto the end of the casing to receive the inserted rising main at over 4m deep. The casing was flushed clean with high pressure water before it was sliplined with a butt fusion welded string of pipe complete with centralisers that hold it secure in the casing.



Spacers installed ahead of slip-lining the pipe rammed casing

This operation was executed perfectly on site with each 12m length was rammed in a working shift. The flushing operation was challenging – due to the silts of the old seabed forming a plug in the casing – but completed without incident. Excellent planning and execution of this element of work delivered the desired safety benefits and the pipe ram exceeded the expectations of WCC RCA in eliminating disruption.

We installed a 610OD steel casing with 14.2mm walls – approximately 50m across the Lambton Quay by pipe ramming.



Pipe Ramming under Lambton Quay

Crossing the Terrace Intersection

Crossing The Terrace intersection under complex traffic management, around congested underground services and while interfacing with access arrangements for Parliament was a critical challenge for the project team. It was also the first piece of work that took place, programmed to take advantage of a parliamentary break and to create fixed points (along with the pipe ram) and set the levels and gradients of the remainder of the project.

To execute this work safely we designed a traffic management solution that banned turns into and out of The Terrace from Bowen St. This involved working with WCC traffic signals team to redesign the traffic signal phasing to suit the new arrangement. The project also put together an extensive communications strategy to keep road users informed ahead of the work and as we moved from one traffic management phase to another.

This location was one of the most congested areas of the project for existing underground services. Much of the excavation was carried out using hydro-excavation with bespoke shoring solutions required to fit between the obstructions and protect our people in the trench. It had already been identified during the design phase that a straight trenchless alignment was not possible and on site the situation was found to be worse than anticipated. A significant bank of Chorus infrastructure meant that the designed alignment was not viable. We worked with Stantec to make changes on site and keep the project on track. Although these changes caused a minor delay, we were able to use the communications channels that we had opened to keep Parliament and the public informed.

Getting across the Terrace intersection was the first element of the project that we completed, and it proved to be one of the most challenging. Completing it successfully motivated and focussed the team on delivery and strengthened the working relationship that we had with Stantec and the WCC RCA.

Congestion of Services in The Terrace Intersection

Working around congested services on The Terrace

Making a Connection to the Main Sewer Interceptor

Making a connection to the Main Sewer Interceptor while ensuring that this critical piece of infrastructure was protected was one of the most challenging engineering challenges on the project. The interceptor is a strategically important asset, carrying the wastewater from Johnsonville and the Northern suburbs, through the CBD and out to Moa Point. It was constructed by tunnelling in the 1930's and there were fears that it's condition would be poor. It was critical that we did not compromise the existing structure in making the new connection.

After we produced a design solution during the ECI phase of this project with Stantec – a related section of adit, connected to the interceptor in Dixon St failed – as was well covered in the media. This section of adit had a similar construction to the interceptor in Bowen St and added to the fears about its condition. Our design solution was used to inform the design of a new connection to replace the collapsed Dixon St adit and the learnings from that connection were fed back into our design. Collaboration of this type across the WWL supply chain has become more possible because of the panel relationships that have been created.

In Bowen St the existing interceptor is a hand tunnelled structure – 6ft by 3ft and has approximately 4.5m cover. There is an upstream access point approximately 50m away but no practical downstream access. The first challenge in making a connection was to locate the interceptor in the road. We used a combination of survey from old records and sonde readings from an inspection boat in the tunnel. During this process we discovered several uncharted assets that have now been used to update the records. Unfortunately, there was not good correlation between the sonde readings and the set out, so a pothole was used to confirm the position.

Throughout the construction we had an operational response plan in place that would come into action if the interceptor was compromised. This plan included scenarios for mild, moderate, and catastrophic damage. It contained traffic management arrangements to suit each scenario, an over pumping arrangement that could be set up to divert the upstream flows into the stormwater network and a shoring solution to open cut to the interceptor. During the work the pumps and shoring were held on site so that they could be mobilised quickly.

Based on the confirmed position we drilled a 65mm diameter hole from the surface down through the crown of the interceptor. This hole was used to confirm the invert level of the tunnel and as an inspection point, by camera, throughout the work. We drilled and sleeved a second hole offset from the side of the interceptor to the beneath the invert level. This hole was to prove that the chamber would not clash with the interceptor and to provide a guide during construction. We wanted to be as close to the interceptor as was practical without clashing with it – this meant that we could use the new connection as our access to carry out remedials inside the interceptor.

Drilling through the crown of the Interceptor

A 2100mm dia. Chamber was installed by caisson sinking to approximately 6m deep. The chamber was constructed from precast concrete risers. The centre of the risers was excavated using hydro-excavation with new risers being added as the previous ones sunk down. A reinforced concrete internal base was cast in the chamber with a port to reduce floatation risk from groundwater until the full weight of the chamber was complete.

Caisson sinking using hydro-excavation

A 600mm diameter core was removed from the new chamber and a short section of steel casing was installed through the wall. We excavated inside the casing and advanced the casing by hand until it reached the outer wall of the interceptor. Unexpectedly we encountered a timber column in our excavation that was part of the original temporary works from the tunnel. Once the timber was removed, we took a small diameter core from the interceptor wall and had it crushed at a lab – we did this to provide confidence that the existing structure was strong enough to connect to. The core returned a strength of 44MPa – more than our requirement to proceed. A 500mm diameter core was removed from the wall of the interceptor and a ductile iron carrier pipe installed between the new chamber and the interceptor. The connections of the pipe were reinstated, and the annulus grouted.

By being involved in this connection early we were able to work together with Stantec to deliver a high-quality product without compromising the stability of the existing critical asset.

A Birds Eye View of the Interceptor Connection Chamber

Installation of an FRP Liner & Vortex Drop Structure

To protect the new and existing asset from H2S attached we installed an FRP liner and vortex drop structure in the chamber. In our chamber the waste needs to drop approximately 4m from the rising main system into the interceptor. Wastewater can give off H2S particularly in locations of turbulence and rising main systems are known to produce it in high quantities. H2S is attacks and degrades concrete over time and, given that the interceptor asset is critical and almost 90 years old, this is a high-risk situation.

Through the design process, Stantec engaged with Armatec Ltd. who carried out hydraulic modelling and specified a vortex structure that would control the flow. In construction we engaged Armatec to fabricate the vortex structure, complete with a chamber liner. On site we installed system as three elements: A basin that was surrounded in concrete and includes a channel to deliver flow into the interceptor, A liner that was supported with grout and protects the new chamber walls from H2S attack, and a Vortex drop structure that takes energy out of the flow and minimises the amount of H2S that is released.

The product from Armatec is of a high standard and was well put together on site. It provides a smart finish to the connection that will reduce maintenance costs and prolong the life of the asset.

The vortex in action

To manage residual H2S we installed a vent and passive carbon filter in the berm on Bowen St. This involved installation of approximately 60m of duct by directional drilling (subcontracted to Aiden Kelly Contracting) and construction of a new passive filter structure and foundation. Directional drilling was a great solution for this aspect of the construction as it meant that we could work under the live lane and overlap the operations without compromising traffic flows. The filter location included some complex work around existing trees and was carried out under a Tree Protection Plan.

Passive Carbon Filter

Installation of the FRP liner and drop structure

PE Welding

Most of the pipeline is constructed from Polyethylene. The pipes were connected by PE Welding. We used a combination of Electrofusion and Butt Fusion welding, as was appropriate to the task. And we implemented a robust inspection and testing regime that provided quality assurance during and after the work was completed for all parties to the contract.

The specification requires that Butt Welding is preferred over Electrofusion welding. This is because it presents a lower risk of brittle weld failures. On this project, as with any project, the amount of butt welding that can be completed is limited by the length of trench that can be opened and any obstructions in the trenches. This in turn is determined by external constraints including length of traffic management sites, type of shielding/shoring, underground service congestion and dewatering requirements. In Whitmore St our Trenches were deeper and below the water table, this meant that we were limited in how much butt fusion welding we could carry out, so this area of the project was completed using EF couplers. The trenches in Bowen St were shallower and drier so we were able to install three long strings of pipe that were butt fusion welded.

This methodology introduced some challenges on site due to the space required for the pipe strings and the length of trench open at a time. But they reduced our exposure to quality risks associated with EF welding and that was well received by the customer.

For both EF and Butt Fusion Welding it is important to have a quality plan in place that addresses the risks.

It is a highly skilled task that requires trained and experienced operators, good plant & equipment, and a robust welding procedure. Our procedure included pre-construction testing (12no. destructive weld tests) that prove the people, plant and procedure and construction weld tests (9no. destructive weld tests) that prove consistency on site. It is critical that the construction weld testing is carried out correctly. Batch testing from the correct sample size limits exposure to risk and is in the interests of all the parties to the contract.

Pre-Construction Butt Fusion Weld Testing

Our people have a track record across a series of contracts of producing high quality PE welds. This project was an opportunity for them to improve their capability, showcase their skills and train new people in the correct procedures.

EF Welding around challenging underground services in The Terrace

Addition of a Section of New Public Gravity Main

Addition of a section of new public gravity main associated with an adjacent development to reduce overall disruption to the city. As part of the corridor planning meetings with WCC it was identified that a new section of public gravity main was required to be constructed between a new development on Bowen St and The Terrace intersection. The new main was comprised of approximately 100m of new 250OD PE100 SDR17 main complete with 3no. new manholes. It was to be constructed in a similar alignment to the rising main and at a similar time. The projects were challenged by WCC to consider that this was an opportunity and investigate ways of constructing the projects in parallel – rather than sequentially.

WWL, Stantec & GPFL worked with Precinct Properties and LT Mcguinness to put together a commercial solution under which the work could be delivered. The work was awarded to us as a variation to our current contract with the developer funding the project through WWL. We worked with Harrison Grierson (Developer's designer) and Stantec to amend both designs so that the pipes were suited to being installed in the same trench – parallel, close together and at the same grade/depth.

On site we incorporated the new gravity main into our existing site and delivered it alongside the main work. It was challenging due to the width of the trench required to allow the rising main to get past the manholes on the new gravity service (approx. 1.5m), especially in a constrained traffic management environment. However, the team rose to the challenge, and we did a great job of delivering work while looking at broader outcomes for the City.

Construction of a New Watermain

Construction of a new watermain was added to the programme and delivered under a separate contract to meet a funding constraint. This project was delivered for WWL in the same location and had to be incorporated into our programme. We worked with Stantec and Beca (Water Main Project Manager) to deliver a new section of 250OD PE100 SDR11 watermain between The Terrace and Ballantrae Place. Most of the main was installed by Directional Drilling under a subcontract with Tier One. GPFL installed fittings and carried out connections by open trenching. Some key risks on this project were working around the existing asbestos water main and interaction with surrounding projects such as the Bowen Campus Development and the Rising Main work.

WWL were pleased to be able to incorporate this work into the main rising main programme rather than carry over the funding into a subsequent year. It also delivered an added benefit of reducing overall disruption to the road corridor by carefully phasing the projects and eliminating additional mobilisations.

We did a great job of delivering work while looking at broader outcomes for the City

Shared Trenching for the Rising Main and Gravity Main in Bowen St.

Physical Works Risks and Constraints

Working in a CBD environment adjacent to the harbour presented several significant risks that had to be addressed through the construction phase to achieve a successful outcome.

- Working around heavily congested underground services
- Deep excavation (over 4m)
- Dewatering in high permeability reclaimed land
- Working with the existing tram slab
- Excavation in contaminated ground
- Working in a narrow road corridor
- Working on busy pedestrian commuter routes

Working around Heavily Congested Underground Services

Working around heavily congested underground services and management of changes due to clashes with the design alignment were a significant feature of the project.

Despite significant investigation ahead of the work there were several areas that were so heavily congested that it was not possible to anticipate the extent of the services or the ways that they had been constructed in the past. This resulted in three locations where the alignment had to be amended on site: Across the Terrace intersection where services were too congested to excavate any portion of the trench mechanically, adjacent to the cenotaph where communications cables were cast into the concrete tram slab and split around the existing wastewater infrastructure and around Stout St where existing gravity stormwater infrastructure included additional unmapped vertical bends. We worked with Stantec to develop solutions quickly that eliminated any significant downtime being experienced.

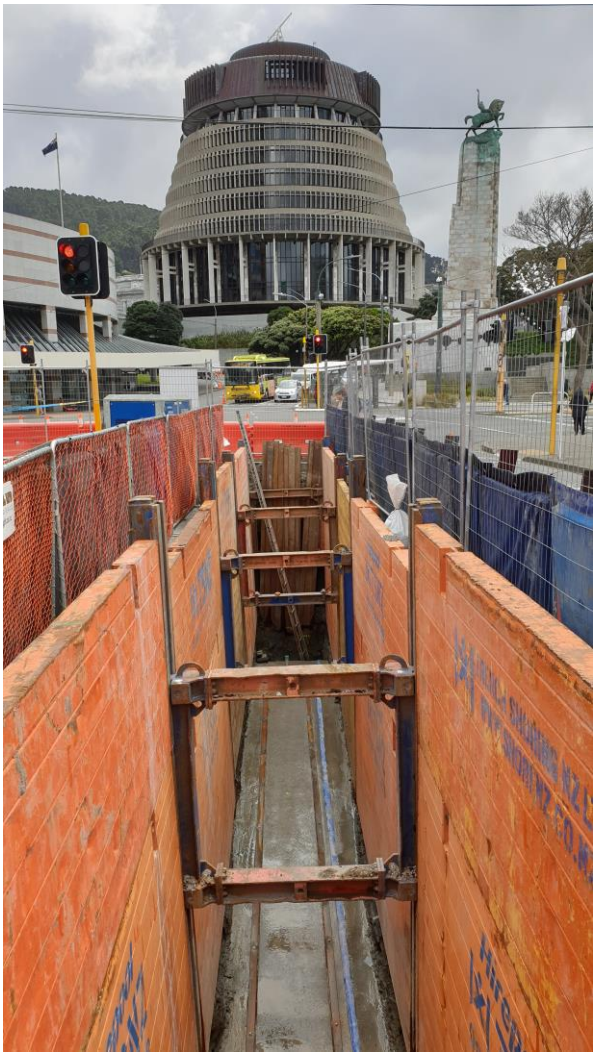
Communications Cables Cast into Concrete Tram Slab and Subbase

By implementing a robust permit to dig system, potholing ahead of the work and selecting the appropriate excavation technique we were able to protect the services that we encountered. This included working around strategic communications cables – associated with the media centre at Parliament, IP gas mains and Transmission water pipes. We had one service strike on the project – on communications cables that had been cast into the concrete tram slab and road subbase adjacent to the Cenotaph. This was an almost impossible situation to manage for the team on site, but they dealt well with it and were able to continue their work without losing motivation.

To shore around the congested services, we used hydraulic soldier sets to support the trench between the obstructions. Each section of shoring had to be carefully considered on site by trained and competent people. It was put together out of proprietary plant but was bespoke to each situation.

Deep Excavation (over 4m)

Deep excavation (over 4m) in the carriageway of Whitmore St with temporary works provided to ensure the safety of our people and adjacent road users. Due to the topography of the area and the nature of a rising main, sections of the project in Whitmore St were constructed between 4m and 5m deep. We used certified slide rail shoring to protect these deep sections. This shoring solution allowed us to work safely and productively in the trench and helped to support the adjacent carriageway.



Slide Rail Shoring used to Protect Deep Trenches

Temporary works provided to ensure the safety of our people and adjacent road users

Excavation in Contaminated Ground

Excavation in contaminated ground requiring separation of clean and contaminated fill for disposal at a Class A facility. Complete with additional PPE and transport requirements. During investigation the ground was found to be contaminated with heavy metals above the threshold for disposal at a cleanfill.

During construction over 200T of contaminated material was removed under the conditions of a resource consent to a Class A facility. Areas of contamination were marked out on site and the team separated the waste to ensure that all contaminated areas were dealt with correctly. We wore full cover PPE in the contaminated trenches to ensure that our people were protected. The waste was removed on covered trucks by specific routes.

This was a complex logistical challenge for the site team. Operators and truck drivers needed to focus on their tasks and lead from the front to maintain productivity.

Working in a Narrow Road Corridor

Working in a narrow road corridor where constant active traffic management was required to ensure that the space could be safely shared between the worksite and major bus routes. We had secured a Traffic Management Plan based around permanent lane closures by working closely with the RCA during the planning process. But this was still a very challenging site to plan and work in for our traffic management team.

On The Terrace intersection and while crossing Stout St we created working space by restricting turning movements. This involved putting in place diversion routes and using VMS boards to signal them to drivers in advance of the dates and during the set up. By eliminating some interfaces, we were able to create safe spaces for our workers and the remaining road users.

On Bowen St the existing carriageway is only 4 lanes wide with no shoulders or median. We left a single lane in each direction for traffic, but this left only a 6m wide site to work in that had to include traffic management equipment and fencing. Adjacent to the Cenotaph the road turns through a 90-degree bend. Long vehicles – such as the buses on the route – could not make the bend in a single lane and we found that the site was becoming too narrow to work in. We ran bus trials to investigate the capability of traffic in each direction with the trench in a series of locations around the bend. The result was a phasing plan and traffic management plan that needed to work closely together, and the traffic management team had to constantly monitor and amend the lane widths to suit.

Buses Navigating a Narrow Traffic Management Site

Good traffic management, delivered in a manner that suited the construction was critical to the success of this project. By adopting a self-delivery model, engaging with the RCA, and always considering that the traffic and the worksite were sharing the space we were able to balance safety, disruption, and productivity.

Working on Busy Pedestrian Commuter Routes

Working on busy pedestrian commuter routes across the city with a communications strategy to alter behaviours that included liaising with the association of blind citizens, signage on site and active traffic management.

Whitmore & Bowen Streets are surrounded by busy facilities such as law courts, education facilities and government buildings. They are also between the bulk of the city and the train station. For these reasons the site saw a large amount of pedestrian traffic moving through it each day. The work required that pedestrian crossings were temporarily closed or diverted to allow excavation to take place or for site traffic to move. Controlling pedestrians was critical for their own safety around our plant and other traffic.

Traffic management at the worksite can direct most pedestrians but we found that some blind users on the route needed more warning to plan their routes in advance. To communicate with pedestrians, we sent regular updates to a variety of organisations, including the Association of Blind Citizens for them to disseminate to their members. This allowed people to be aim for the best route from the outset of their journey.

While this approach saw some success and assisted some pedestrian groups – we still found that pedestrians will take the shortest route available to them, even if it means walking in live traffic lanes. Some events that took place during the project (e.g. graduations, graduations & protests) were very challenging to manage and resulted in parts of the site being temporarily closed and requiring significant maintenance. Secure fencing and active traffic controllers were our best last line of defence in keeping people moving safely around the construction work.

Interface with pedestrians was an area where there was a risk of someone getting seriously injured due to our activities but by implementing the controls described here and constantly checking that they were working, we kept everyone safe – in some cases – despite their own best efforts.

Traffic Management on Busy Intersections

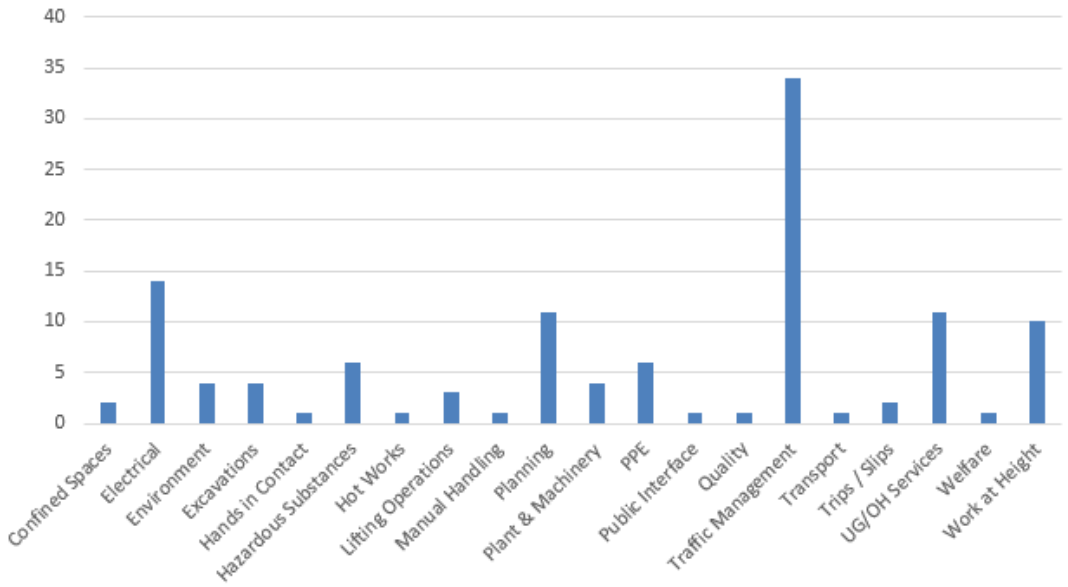
Health & Safety Performance

This was a high-profile project, with work taking place in a busy urban environment on strategic roads and around critical underground infrastructure. Our actions on site were under constant scrutiny from a variety of stakeholders. Every day was like a safety audit.

The team took this attention in their stride and set themselves up for success by owning their performance. They worked hard to ensure that our own systems and processes were being implemented consistently and used to pro-actively identify risks before someone could get hurt.

Some of the risks being managed were critical and had the potential to cause serious harm if they left unchecked. Carrying out deep excavation work in a constrained environment creates pinch points where our people can get hurt. Managing this risk requires good communication and focus from the operatives on the site. Pedestrian management around the construction site was a particular challenge for our traffic management team.

The commitment of the team is demonstrated by their **pro-active health and safety reporting**. There were 118 reports generated from the project. 10 of these were minor incidents such as small spills, small cuts, property damage and the service strike described above. 82 reports were pro-active hazard reporting where the team identified an issue and corrected it before it resulted in harm. And the remaining 21 reports were of positive events where we exceeded expectations in delivering good health and safety outcomes.



Summary of Risks Reported over the Project

This reporting record is indicative of the positive health and safety culture on the project that was responsible for nobody being harmed because of our work.

In addition to the normal risks that we are comfortable managing on a construction project, this project was affected by Covid-19. We had two lockdowns while on site, continued the work under alert level 3 protocol followed by the red traffic light of the Covid Protection Framework and experienced several protests and an occupation of Parliament.

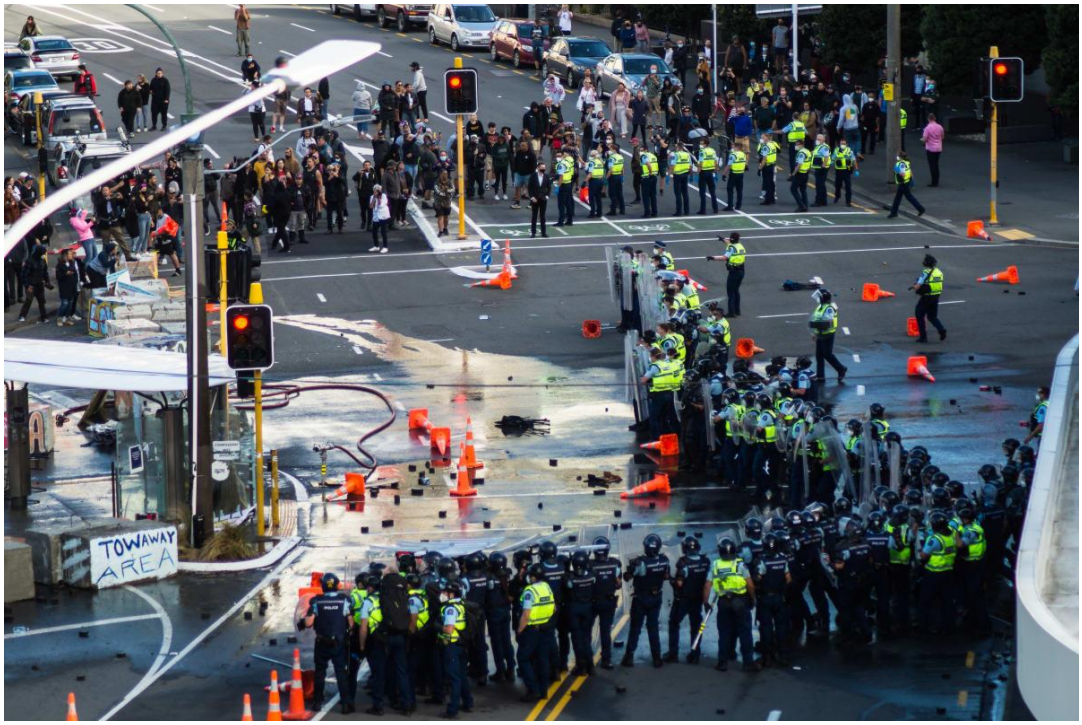
During the lockdowns we made our site safe and then focussed on our people. We set up communications to keep people in contact with each other and ran virtual training for those that wanted to keep their brains

ticking over. We worked with WWL and used information coming out of other industry bodies to get plans in place that would allow construction to resume as soon as practical.

Under a variety of alert levels and traffic lights we implemented controls on site, such as physical distancing, team bubbles and mask wearing, to try and control or eliminate the spread of Covid-19 within our teams. Our people responded well to the changing environment; they stayed positive and productive.

Due to the proximity of the project to Parliament – we did experience some disruption from protests and the Parliamentary occupation. Luckily our work at the time was focussed on the extreme ends of the project in Bowen St and adjacent to Featherston St. The pipe around the Cenotaph and parliament being complete. Nevertheless, we had to remove our offices and welfare facilities from the site due to misuse, amend our Traffic Management Plans in conjunction with the requirements of WCC to accommodate the road closures and altered bus routes and we interacted with the protestors daily to manage them through the site.

Like the rest of the country, we did not expect to be working adjacent to a protest. It was jarring to see images of a riot taking place over the top of our freshly reinstated trenches. But by good luck and good management we were able to keep our people safe and get the job finished.



Rioting on top of freshly reinstated trenches

"Like many works over the last few years this site has been struck by lockdowns and illnesses, as well as significant protest encampments, dragging the works past expected completion date. But we have remained impressed with the commitment to completing this work safely and to the high standard we would expect from a contractor such as GPFL, and the positive attitude the team has maintained through many difficult times."

Anna Bridgman, Group Leader, Water, Lower North Island, Stantec

Physical Works Commissioning

Handover of the completed asset involved **complex pressure testing** of viscoelastic pipe and **dealing with quality issues** that arose during the commissioning phase. Commissioning the project was critical to the project being a success and we took ownership of the process and made certain that the product was of a high quality.

Pressure Testing

The new rising main was tested using a Pressure Decay method for PE pipes. The test is extremely sensitive to entrapped air and takes place over a period of around 49 hours to pick up small changes in pressure inside the pipe. Both GPFL and Stantec were unfamiliar with the specifics of the test, and we worked together to develop a methodology that met the requirements of the standard and could be practically carried out on site.

Over 60,000 litres of water were introduced to fill the line. Removing the air from the pipe was achieved by operating the scour and air valves on the main in conjunction with a pig forced through the main from the pump station to the interceptor chamber. This was successful and the pre-test showed that entrapped air was close to 0%

A test pressure of 1000KPa was introduced using a constant pressure diaphragm pump over a period of 195 minutes. The temperature of the water was recorded so correction factors could be applied. The system was isolated and monitored for just under 49 hours. A data logger was used to record the pressure and flow throughout all stages of the test. The information from the data logger was later interpreted and showed that the test was passed, and the pipeline was fit to be put into service.

Ownership of Quality Issues

At the start of the commissioning phase, it became apparent that there was an issue with the water tightness of the system. GPFL took ownership of this issue and quickly started an investigation to locate and correct any faults.

The fault was difficult to locate because it only became apparent at high pressures but by breaking the pipeline into a series of shorter lengths between the existing fittings and testing each section, we were able to narrow the search and then use a CCTV camera to confirm that the fault was on one of the mechanical joints on the pipeline.

The pipeline is mostly jointed by PE welding but at the location of fittings such as scour valves and air valves there is a transition to steel pipe and mechanical joints were used to make this transition. When we exposed the joint, we found that an incompatible backing ring and PE stub flange had been supplied and installed. We worked with the supplier and developed a solution that was successfully implemented on site.

Modified Stub Flange & Backing Ring Arrangement

This was a challenging part of the project for the site team and our suppliers, but it was important to us that we owned and rectified the problem in a manner that continued to provide assurance that the quality of the product was high, and we could be proud of what we were handing over. We were impressed by the way our people pulled together and worked through this challenging issue.

The learnings from this issue were captured and publicised jointly by GPFL and our supplier to ensure that they are not repeated in the future.

Stakeholder Relationships & Project Culture

Wellington Water & Stantec

Anna Bridgman (Stantec), Mark Ford (WWL), Matt Pirika (GPFL) & Pete Daken (GPFL)

"From the start we were pleased to be working alongside GPFL on this critical project as we knew they would bring the best of their experience, knowledge, relationships and collaborative working style to this project, particularly as it was going to be constructed in a busy CBD environment."

Anna Bridgman, Group Leader, Water, Lower North Island, Stantec

This project was delivered as one of our first pieces of work under a panel agreement with WWL and as our first project in recent times with Stantec from the WWL consultancy panel. It was great to be involved from the early stages of the design, to influence the product and develop strong relationships with our customer and their representatives.

By taking a collaborative approach we created a project culture of mutual trust that guided our actions throughout. There was change to be managed and pressure on decision making – like in any construction contract – but all the parties were open and honest throughout and worked with the best interests of the project in mind. Issues were dealt with quickly and fairly – never escalating to become problems.

Critically, all the parties were invested in the success of the project and every aspect was addressed with enthusiasm and energy. Throughout, we have felt like one delivery team, even though we work for different organisations.

Our customer views this work as a success and demonstrated that by continually bringing forward sections of future projects to be delivered under this contract. Now that the work is complete – the same team have started working on an ECI for the next stage of this rising main network and we are looking forward to constructing that project in late 2022.

WCC and External Relationships

Working in a busy CBD environment this project had a series **of high-profile stakeholders** to be managed prior to the project starting on site and then throughout construction. This included several departments from WCC (RCA, Roading & Traffic Signals), Representatives from GWRC and the bus companies, Parliament, The Supreme Court, Victoria University and Rydges Hotel. It also included several construction sites such as #Whitmore St and the Bowen Campus development.

Due to the scale of our project and interactions with surrounding stakeholders, a group was set up to coordinate activities. By actively participating in this group, we were able to identify opportunities to collaborate and mitigate clashes between worksites. As the most potentially disruptive project in the corridor we took a leadership role within the group producing external communications and in helping WCC to manage corridor access.

Proactive communications and early engagement with stakeholders such as Parliament, The Supreme Court, Victoria University and Rydges Hotel allowed us to incorporate their needs into the programme. Ongoing communications gave each stakeholder an open channel to raise issues as required.

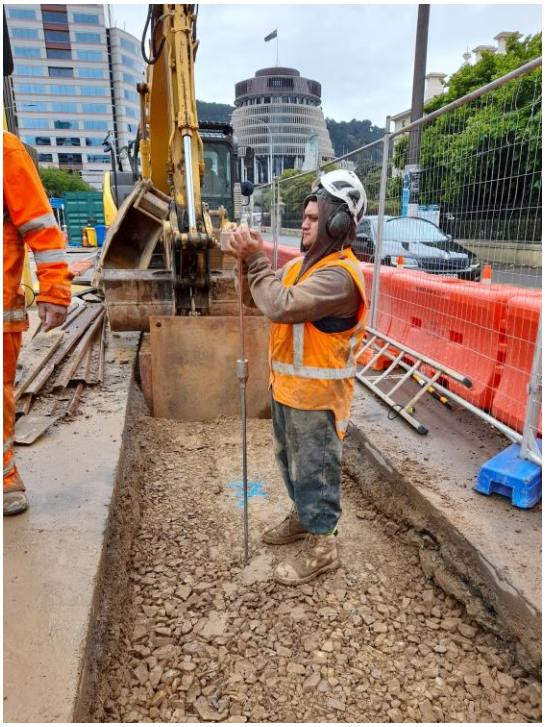
"The project team were open to working with others who also needed access to the corridor. Additionally, their proactive communications with affected parties such as Parliament, the Supreme Court and Victoria University, ensured that the needs of these key stakeholders were factored into the methodology of the works."

Denise Beazley, Network Activity Manager, WCC

The project design and delivery has been focussed on addressing the needs of the city alongside the needs of the project. Initiatives like pipe ramming under Lambton Quay and delivery of the Bowen Campus Gravity Main in parallel with the rising main directly reduced disruption for corridor users. Open and consistent communication allowed us to deal with issues and minimised negative feedback associated with the project.

Internal Team Culture

This was a very challenging project and a great learning environment for our people and the business. The work was completed by two of our teams that included a mixture of experienced and junior staff. One team focussed on the trenchless installations and the connections while the other carried out the bulk of the trenching work. The project was an opportunity for some of our trainees to progress in their studies and Lindin Strickland, one of the trainees, achieved his level 2 qualification as Pipelaying Technician as a direct result of being on Whitmore St.



Lindin Strickland Training on the Project

For the experienced staff this was an opportunity for them to develop leadership skills that will be an asset to the business in the future. An example of this is our Contract's Administrator – Tori – co-hosting a visit from the National Association of Women in Construction (NAWIC).

Tori Leach Co-Hosting a visit from NAWIC

In recent years we have been building towards carrying out work of this nature and our success here will add to an excellent track record. Our teams are growing, and leaders are emerging. The way that the teams work together to deliver an outcome is the key to our success.

Absolutely Positively
Wellington City Council
Me Heke Ki Pōneke

26 April 2022

The Judges
Wellington Wairarapa Branch
Civil Contractors NZ

Subject: Letter of Support

This letter is to endorse the application submitted by GP Friel Ltd to enter the CCNZ Wellington Wairarapa Construction Awards 2022, for the construction of the Whitmore Bowen Streets Rising Main.

This was a major project for the City, facing a number of critical challenges to mitigate the impact, namely:

- 24/7 site set up taking out lanes and parking over many months
- Working on a strategic connecting road corridor for the city's transport network
- Meeting the competing needs of critical, directly affected stakeholders, including Parliament, Supreme Court, Victoria University, located at the start/end point for a number of major events and parades in the city, as well as multi storey hotels, business, retail and hospitality
- Crossing two major intersections – Lambton Quay and the Terrace
- Intersecting along almost the entire length of the project, key pedestrian flow routes to and from the train station and bus hub
- Two major vertical development sites at either end of the project to coordinate with for space and access (Bowen Campus and 1 Whitmore St).

GP Friel actively participated in a multi-organisation project coordination group. This group was led by Council (TMC, signal operations and network planning staff), as well as the project managers from the two vertical build sites, Dave Philipson as project lead from GP Friel, and the rising main project communications and stakeholder lead Dan Ormond.

This group met fortnightly, from well before the rising main project started and continued to meet throughout the project duration. The focus of the group was to collaborate and manage the needs of each project – and the needs of the city and its inhabitants. The GP Friel team actively participated in the corridor management discussions, incorporating adjacent work into their work package to reduce overall disruption. Through regular communication, on-site meetings and phone calls, issues were able to be identified and resolved. An example of this included the decision to pipe ram under the Lambton Quay intersection. Ramming rather than digging up a critical intersection for the city minimised the impact, particularly for public transport.

Work along this busy and constrained corridor was always going to cause disruption and there were times when commuters were delayed. However, thanks to mitigation planning and ongoing monitoring, communication and adjustment to work activity by the project team, the scale of the impact and negative feedback was much reduced.

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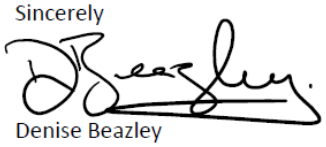
The project team were open to working with others who also needed access to the corridor. Additionally, their proactive communications with affected parties such as Parliament, the Supreme Court and Victoria University, ensured that the needs of these key stakeholders were factored into the methodology of the works. Dave and the team organised and ran bus trials with Metlink and NZ Bus to ensure that the TTM would suit bus needs along an important bus route.

The learnings from this project have subsequently been shared by the project team with other projects being planned for the city, both what went well and lessons learnt.

This endorsement includes feedback from the planning, traffic management and signal operations groups within Council.

I am happy to answer any questions regarding this endorsement.

Sincerely



Denise Beazley
Network Activity Manager
021 597 166

Why this is a Winning Project

Our rising main network is some of the most critical infrastructure that the City owns. It is fragile, at the end of its service life and needs to be renewed. This project addressed this basic need without compromising the network we were there to replace.

The wider project team (WWL, WCC, GPFL & Stantec) came together and collaborated through an ECI process and into construction. Some outstanding people brought expertise and skills to the delivery that really ensured it's success. Everyone approached their work with an enthusiastic, positive outlook that made it a great job to work on.

We engaged with high profile stakeholders in a manner that encouraged two-way communication and sought to deliver mutually beneficial outcomes. This approach set the project up for success.

The project included some smart engineering and construction delivered to a high standard around a list of constraints and risks associated with working in Wellington's CBD. Many of the solutions that we implemented were aimed at delivering safely and without unduly disrupting the day-to-day business of the city.

Having delivered this project, the individuals involved and the teams they work in have grown and improved. The new skills that we have learned and the strong relationships we have made are as much of an asset as the rising main itself and we are ready to tackle the next challenge together.

The Work We Do

Featherston, Whitmore & Bowen Street Rising Main Upgrade

G.P. FRIEL LTD
UNDERGROUND INFRASTRUCTURE