

KRED Pipe Jack

an alternative delivery option

Stormwater Conference 2023

May 2023

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Tauranga City

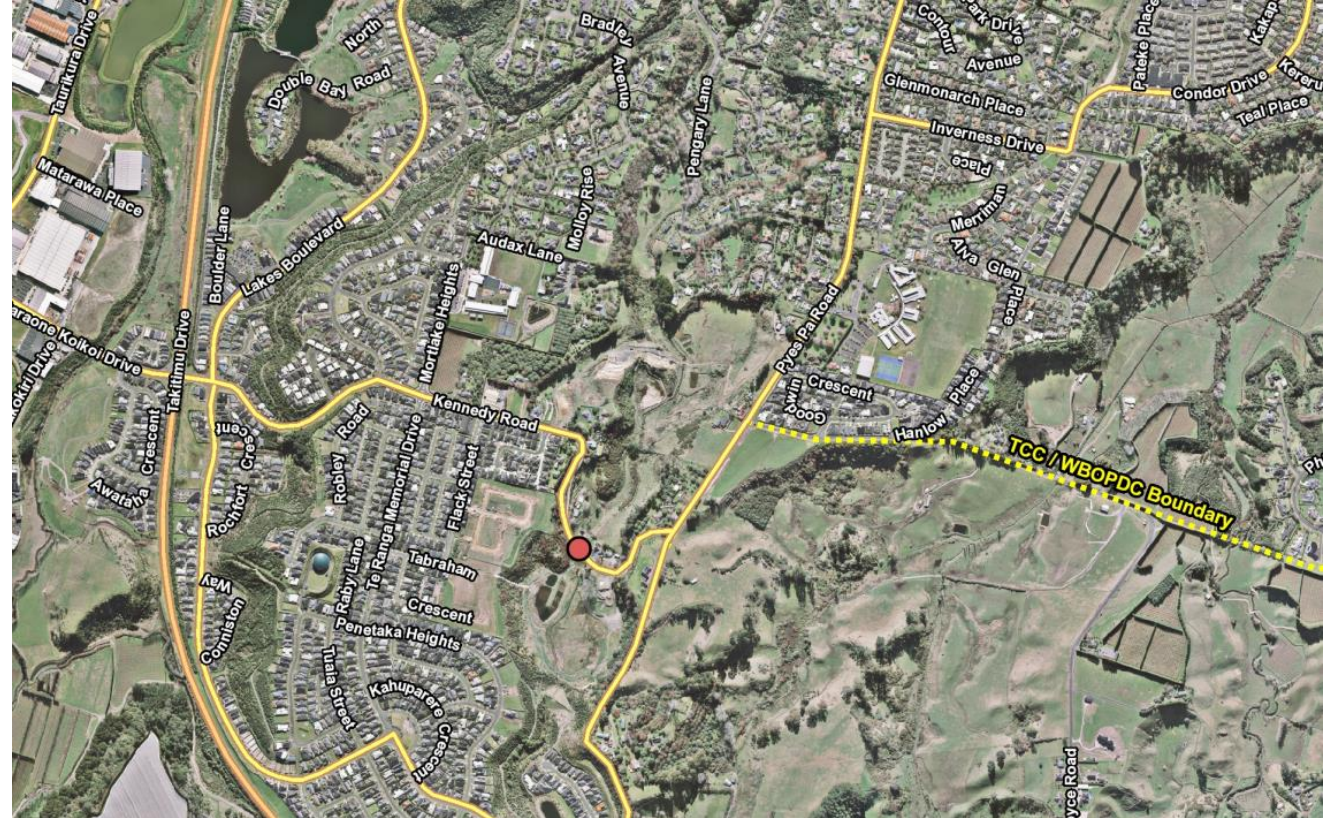
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Background

- For the KRED culvert install, we opted to use pipe jack/thrust technology.
- Why???
 - **Quicker construction**, facilitating **faster delivery of much needed housing** for the city, as well as **enabling us to keep Kennedy Road open and operational during the works** (negating reconstruction of the road)
 - Reputational Risk – ‘a real pickle’
 - Kennedy Rd upgrade (new road over dam) recently completed



Catchment overview (*where we are*)



- Zone A – 13.8 ha zoned as suburban residential, including the 4.4 ha Lakes Primary School site.
- Zone B – 20.7 ha zoned large lot residential and 4.5 ha zoned suburban residential, with Takhar Trust being the majority landholder.
- Zone C – 17.7 ha zoned suburban residential, with Paradiso Holdings being the majority landholder.

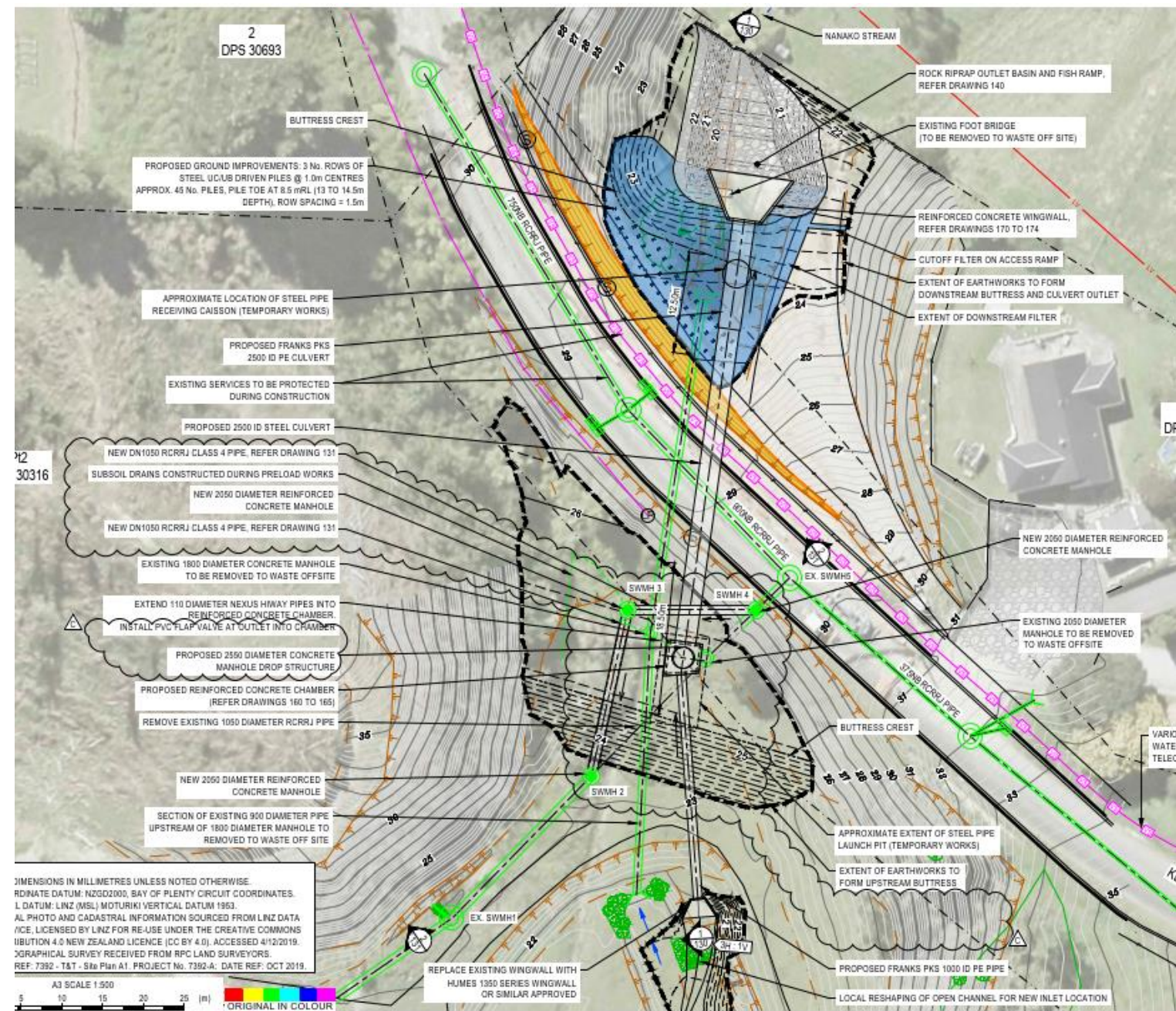
KRED Timeline

- October 2020 - Award ECI contract to MAPP
 - Strait into optioneering with T+T
- November 2020 - Approval in Chambers for trenchless and budget increase
 - **Rationale: quicker construction, houses to market sooner and less disruption to public (but carries higher risk – we may need to revert to open cut)**
 - **Win / Win**
- December 2020
 - SPB split into SPB1 and SPB2
 - SPB1 – preload/enabling and steel cassion supply (awarded)
 - SPB2 – trust and everything else
- Feb 2020 – Practical Completion for SPB1
- March 2021 – Awarded SPB2 (thrust and main works)
- April 2021 – Commenced SPB2 (Inc **Jacking Works from June to Sept**)
 - 17 Aug NZ moves to AL4
 - 31 Aug BOP moves to AL3
 - 7 Sept BOP moves to AL2
- March 2022 – Practical Completion SPB2 (**DNP just wrapping up**)

Design intent



KRED plan-view



2550 DIAMETER CONCRETE MANHOLE

SCRUFFY DOME

0.5m WIDE, 0.1m THICK CONCRETE APRON (17.5 MPa CONCRETE) & SEEPAGE COLLAR, REFER DETAIL (A 160)

SURCHARGE MATERIAL TO BE REMOVED AND TO WASTE OFFSITE

EXISTING 1050 DIAMETER, RORRJ PIPE TO BE REMOVED AND REMOVE ADDITIONAL MANHOLE RISER SECTIONS ON 1800 DIAMETER MANHOLE TO WASTE OFF SITE

LOW PERMEABILITY FILL

1000yr WL = 27.2m RL

1000yr WL = 25.7m RL

2% slope

25.7m RL

20.2m IL

20.2m IL

1000 ID FRANK P.K.S. PE PIPE, 27.9m LONG, 0.36% GRADE

2500 ID STEEL PIPE PIPE, 39.0m LONG, 0.4% GRADE

EXISTING 900NB RORRJ STORMWATER PIPE

26.1m IL

EXISTING GROUND

EXISTING EMBANKMENT (ROAD AND FOOTPATH)

EXISTING MSE WALL

19.16m

DESIGN SURFACE

BUTTRESS GRANULAR FILL MATERIAL

EXISTING SERVICES UNDER FOOTPATH INCLUDING:
11kV ELECTRICITY
150NB WATER MAIN
TELECOMMUNICATION CABLES
FIBRE OPTIC

SURCHARGE MATERIAL TO BE REMOVED AND TO WASTE OFFSITE

APRON AND CULVERT FLOODED BY APPROX. 350mm AT DOWNSTREAM END OF FISH PASSAGE IN LOW FLOW EVENTS

REINFORCED CONCRETE WINGWALL (REFER DRAWINGS 170 TO 174)

FENCING SYSTEMS NZ TYPE 1 BALUSTRADE REFER DRAWING 170 FOR DETAILS

EXISTING GROUND (SURVEYED)

20m RL

W/L

ROCK RIP RAP BASIN & FISH RAMP (REFER TO DWG 140 FOR OUTLET DETAILS)

3000

DOWNSTREAM DAM FILTER DRAIN TO BE CONSTRUCTED USING FILTER MATERIAL

FRANK P.K.S. 2500 ID PE CULVERT SPIGOT AND RUBBER RING JOINT CONNECTION

2500 ID FRANK P.K.S. PIPE, 13.7m LONG, 0.4% GRADE

1000

BACKFILL BETWEEN SHEETPILE AND CONCRETE CHAMBER WITH 30 MPa CONCRETE

SHEET PILE FROM CONTRACTOR'S THRUST PIT TO STAY IN PLACE

REINFORCED CONCRETE CHAMBER (REFER DRAWINGS 160 TO 165)
CHAMBER BASE TO BE SET 150 BELOW PIPE INVERTS TO PROVIDE 300 DEEP FISH REFUGE POOL

PLACE SITE CONCRETE TO REQUIRED LEVEL FOR CONCRETE CHAMBER BASE

FOUNDATION TRENCH 2.0m WIDE, 1:1 SIDE SLOPES

CONCRETE ENCASE 5m SECTION OF 1000 ID FRANKS PIPE UNDERNEATH LOW PERMEABILITY CUT-OFF TRENCH (REFER SECTION 4 131)

CONCRETE FLOOR FROM CONTRACTOR'S THRUST PIT TO STAY IN PLACE

STAGGERED RECTANGULAR SPOILER BAFFLES TO AID FISH PASSAGE

HUMES 1350 SERIES CONCRETE WINGWALL OR SIMILAR APPROVED

FENCING SYSTEMS NZ TYPE 1 BALUSTRADE REFER DRAWING 141 FOR DETAILS

20.3m RL

EXISTING GROUND

EXTENT AND DEPTH OF LOW PERMEABILITY CUT-OFF TRENCH TO BE CONFIRMED ON SITE BY ENGINEER

NOTES:

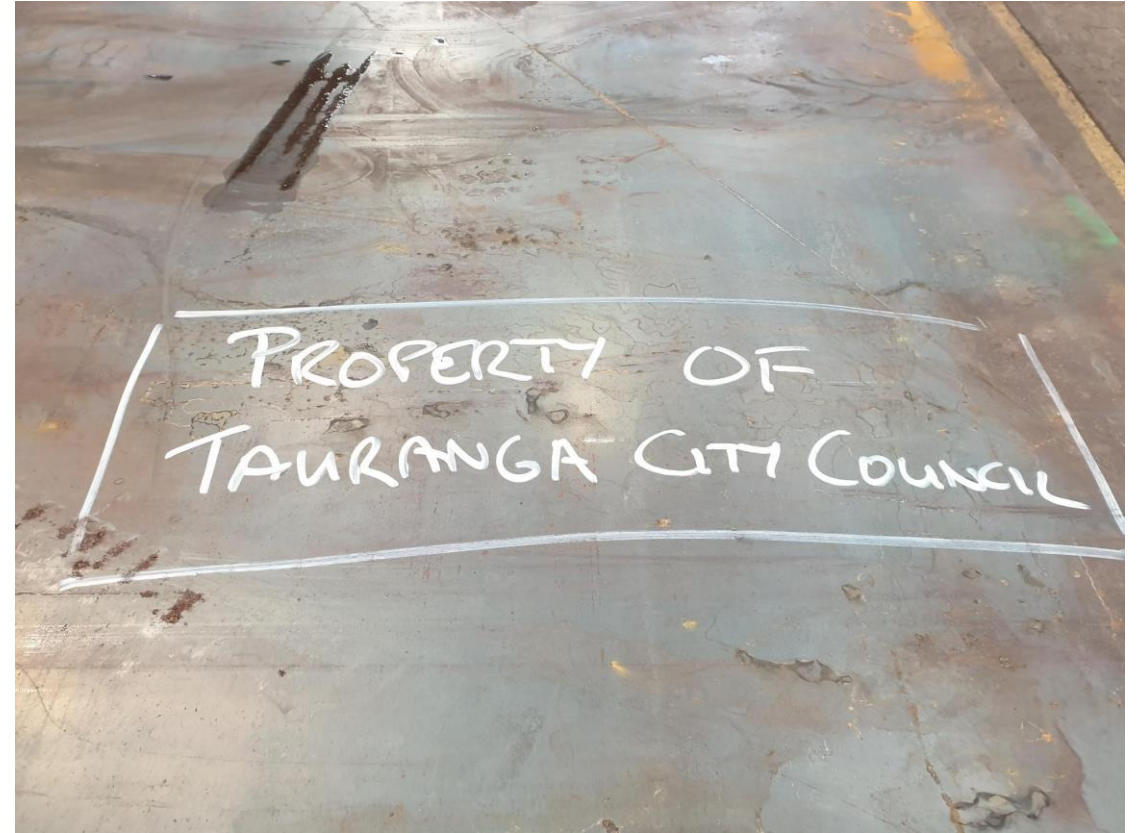
- ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.
- COORDINATE DATUM: NZGD2000, NEW ZEALAND TRANSVERSE MERCATOR (NZTM2000).
- LEVEL DATUM: LINZ (MSL) MOTURIKI VERTICAL DATUM 1953.

DOWNSTREAM GROUND IMPROVEMENTS (NOT SHOWN FOR CLARITY)

Pipe Jack *(enabling/risk avoidance)*

- Exploratory Geotech
 - Pilot shots (6 through the face)
 - CPTS / HAs
- Various Risk Workshops (3x)
 - Experts (SMEs)
- Plan B (hammering) and Plan C (open cut)

Australia to Petone (11x 32mm sheets 3mx9m) – May 2021

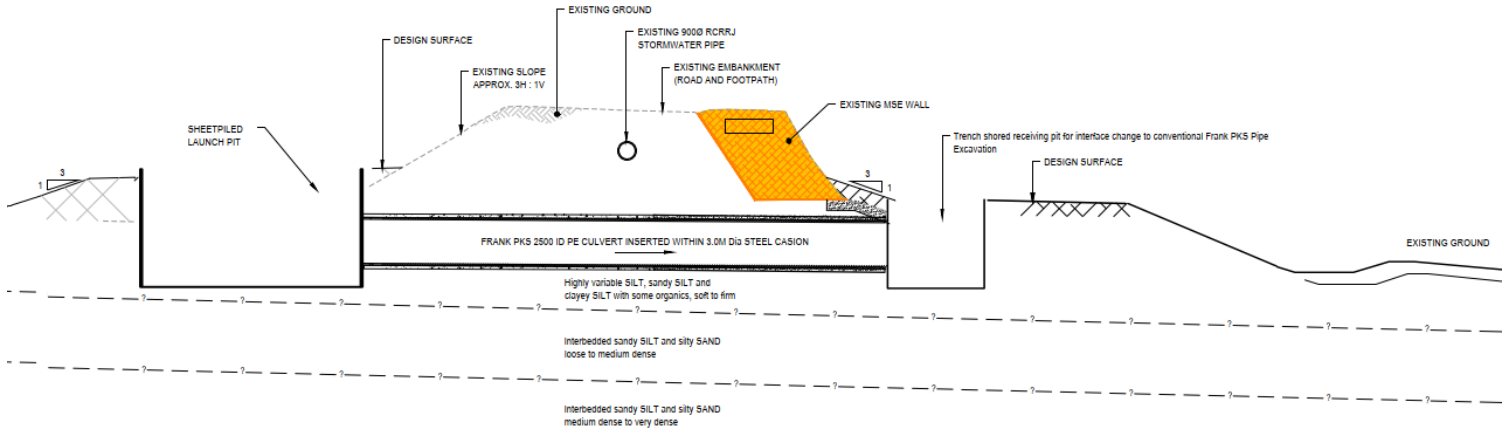
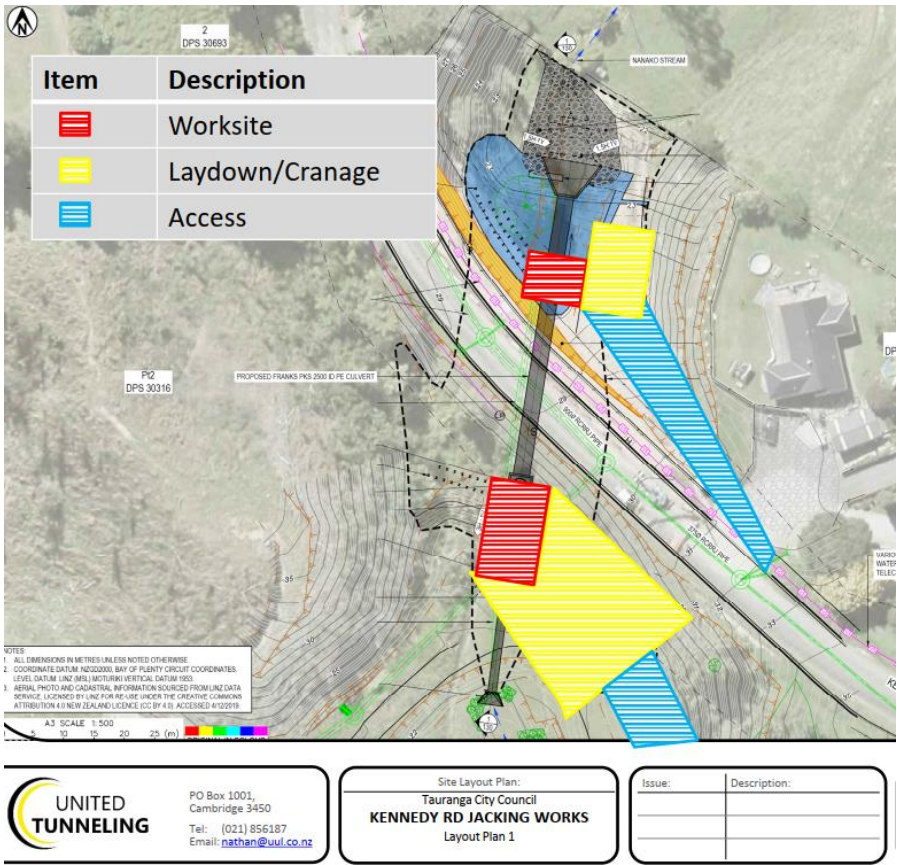


Submerged arc weld – Petone (June 2021)





Jacking set-up (June)



Upstream – 12m x 6m (1m below IL)

- Contingency for hammer

Downstream – 4m x 4m



Pilot (July 1st)



Steel Arrives at Site (July)



Jacking in Action (July)



Augering / Clearing out pipe

- After each 6-metre jack (roughly halfway through), we needed to clear out and remove the material from inside the pipe. This material was removed via a smaller pipe (600mm) within the larger pipe which draws back the material via a rotary setup and into the skips on the side.



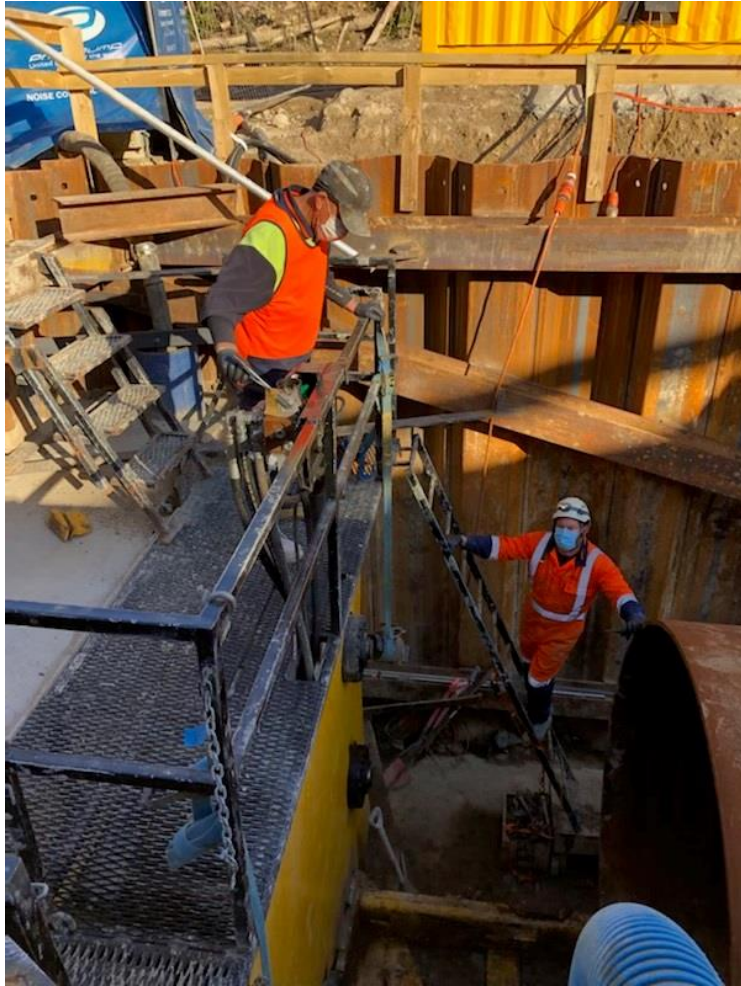
Pipe welding

CS Entry

- The welders were required to wear a full self-contained respirator and protective gear;
- forced ventilation system and gas detection in place.



Working during AL4 / through the other side (Sept)



Still need to build Dam....









Conclusion

- Successful Delivery
- Collaborative ECI / Innovation
- Alternative means to Open Cut
- Limited disruption to residents/stakeholders
- Delivered under budget