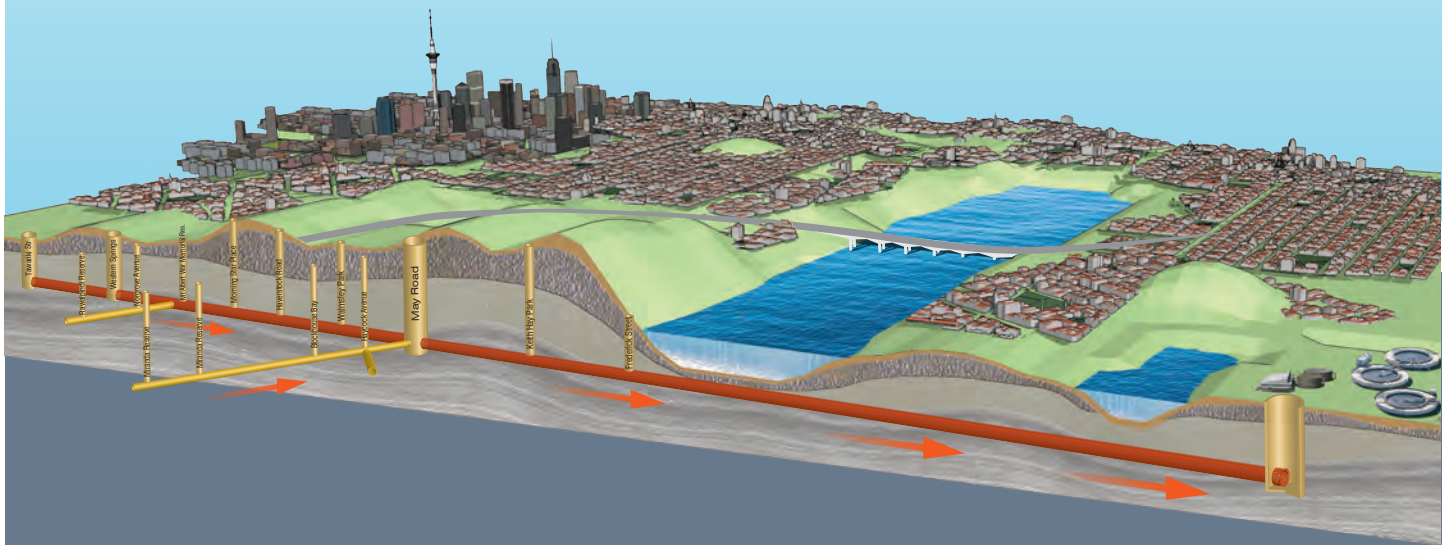


CENTRAL INTERCEPTOR **FACTSHEET**

The Central Interceptor Project is underway building Watercare's new super-sized wastewater tunnel. This tunnel will significantly reduce overflows in central Auckland, improving the health of local waterways. The 16.2 kilometre tunnel runs from Grey Lynn to Māngere Wastewater Treatment Plant. We have 17 above-ground construction sites, where activities such as piling, and excavation use heavy machinery creating vibrations and loud noise which may disturb our neighbours. Our noise and vibration limits and the hours we work are monitored regularly to ensure we are compliant with Auckland Council requirements.

- The Central Interceptor tunnel is 16.2km long
- New Zealand's longest wastewater tunnel
- 17 sites across Auckland
- Shafts are between 20 and 110m deep
- There are 19 total shafts (two at Māngere and two at May Road)
- The tunnel is as tall as a giraffe and as wide as four rhino (4.5m internal diameter)
- The Tunnel Boring Machine will cross the Manukau Harbour 15m below the seabed
- When completed, the tunnel will have the capacity to hold 299,000m³ of wastewater and stormwater.





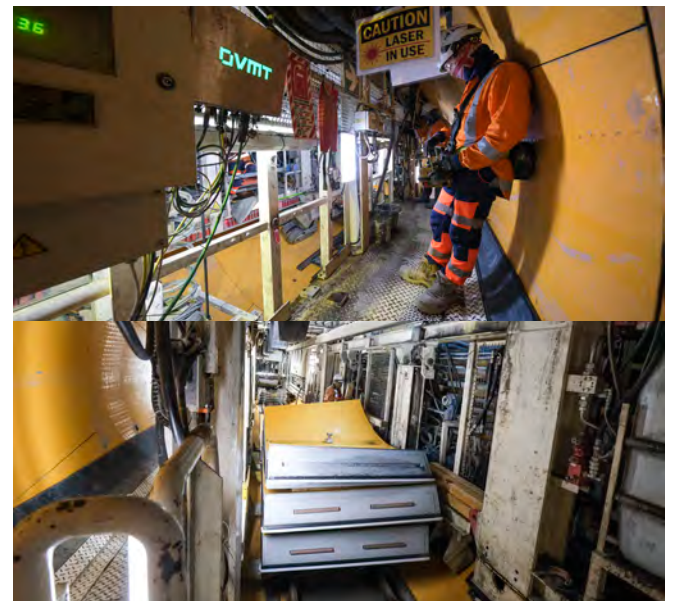
Shaft depth

Site	Depth (m)
Māngere Pump station	41
Māngere Inlet shaft	38
PS23 Frederick Street	29
Keith Hay Park	75
May Road A	71
May Road B	73
Walmsley Park	63
Haverstock Road	51
Lyon Avenue	47
Mount Albert War Memorial Park	38
Western Springs	30
Tawariki Street	28
Haycock Avenue	29
Dundale Avenue	24
Miranda Reserve	16
PS25	13
Norgrove Avenue	29
Rawalpindi Reserve	28
Pt Erin	30



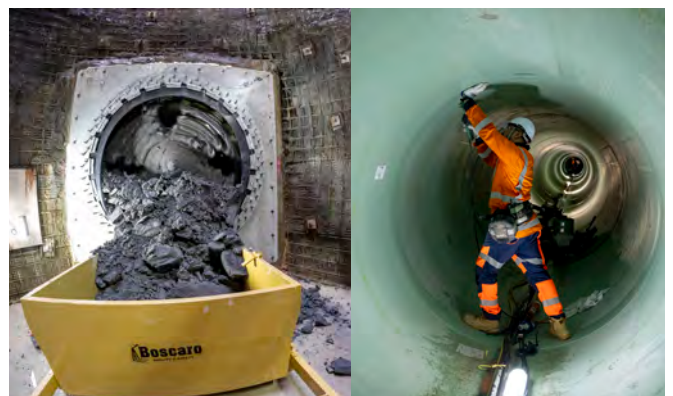
Inside the Main Tunnel

- Segment rings form the lining of the tunnel
- Each segment weighs three tonnes
- Six segments form one ring
- Made from precast concrete by local company Wilson Tunnelling
- Central Interceptor tunnel will use more than 10,150 segment rings
- They are made with a special polyethylene 3mm lining to prevent corrosion of the pipe
- There are five different types of segments with different colours to represent their features
- The different colours represent differences in the geological condition of the ground that our TBM is driving through
- The tunnel has an internal diameter of 4.5 metres.



Link Sewer B and C

- Our micro Tunnel Boring Machine, Domenica, will complete the drives on link sewers B and C
- Link Sewer B is 1.1km long with an internal diameter of 2.4m
- Link Sewer C is 3.2km long with an internal diameter of 2.1m.



Hiwa-i-te-Rangi

- Hiwa-i-te-Rangi is our Tunnel Boring Machine
- She is 190m long
- She weighs 740 tonnes
- The TBM uses Earth Pressure Balance (EPB) with precast concrete segmental lining
- 18 gantries
- Each gantry is 9m in length
- All gantries have a different function and different equipment that drives the TBM
- Gantry 8 stores the hydraulic fluid and pumps
- Gantry 11 holds the transformer and electrical components
- Gantry 14 is the lunchroom
- Gantry 17 is a toilet
- Hiwa-i-te-Rangi is so large that she had to be lowered into the shaft at Māngere one piece at a time
- TBM navigates with laser-guided GPS
- 15 people, 3 shifts per day inside the machine
- Hiwa-i-te-Rangi travels approximately 12m per day.



Naming the TBM

- We visited 16 local schools talking with students about our project in both English and te Reo Māori
- The students were asked to choose a name for our machine that they believed best represented the future impact of the TBM
- Hiwa-i-te-Rangi is the youngest star in the constellation and symbolises prosperity and growth
- It is the star to which we send our wishes, hopes and dreams to at the beginning of each new year
- The artwork on Hiwa-i-te-Rangi was created by students from Mt Roskill Primary, May Road School and Hay Park Primary School
- Traditionally, TBM's are given female names. This honours the memory of Santa Barbara, the patron saint of tunnellers.



Domenica

- Domenica is our micro Tunnel Boring Machine
- She is helping to construct Link Sewer B and C (LSB, LSC)
- Pipe-jacking machine
- Lays pre-cast pipes from behind the mTBM and uses pipe jacking to push the pipes into place.
- Her longest drive is from Dundale to Miranda reserve measuring at 1195m
- She is 12.5m long
- Weighs 76 tonne
- Domenica is a name that is significant for the Ghella family going back five generations.



Drives

Mainline

From	To	Drive length (m)
Māngere	PS23 Frederick Street	4,112
PS23	Keith Hay Park	1,849
Keith Hay Park	May Road	1,664
May Road	Walmsley Park	1,119
Walmsley Park	Haverstock Avenue	1,141
Haverstock Avenue	Lyon Avenue	741
Lyon Avenue	Mount Albert	722
Mount Albert	Western Springs	1,701
Western Springs	Tawariki Street	1,625
Tawariki Street	Pt Erin Park	1,530

Link Sewer B

From	To	Drive length (m)
Mount Albert	Norgrove Avenue	800
Norgrove Avenue	Rawalpindi Reserve	300

Link Sewer C

From	To	Drive length (m)
May Road	Haycock Avenue	970
Dundale Avenue	Haycock Avenue	715
Dundale Avenue	Miranda Reserve	1195
Miranda Reserve	PS25	330



Laundry

- We have our very own laundry service for our staff on site called Te Whare Manaaki
- It was opened in November 2021
- There are four staff (2 full-time and 2 part-time)
- They wash between 800-1200 overalls per week
- The laundry also repairs old uniforms where possible
- Construction sites can expose employees to potentially harmful substances. Employees who are exposed to these substances could take residue home on their PPE if there is significant exposure. The laundry helps to eliminate the risk to whānau or household members who share the washing machine.

Cascade shafts

- Most of the shafts for the CI tunnel are cascade shafts
- Cascade liners are installed to stabilise the walls of the shaft
- These are made from Fibre Reinforced Plastic (FRP) like fibreglass
- The cascade liners create mini waterfalls, reducing the energy of falling wastewater.
- More than a dozen cascades will be installed along the Central Interceptor's route.
- Each liner module weighs up to 25 tonnes. A single liner can be between two modules (as at PS23) to 24 modules (as at May Road shaft A)
- Slippery bentonite is used to help smooth the liners lowering process.

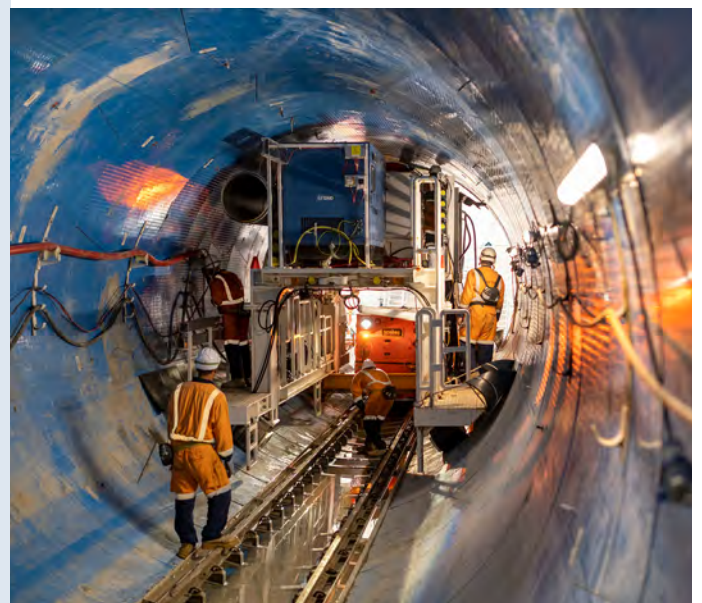


Caisson shafts

- Two of our construction sites are using caisson excavation methods due to the variable geology underground.
- Our Mount Albert War Memorial Reserve construction site uses segmental caisson and our Lyon Avenue construction site uses cast in-situ caisson.
- At Mount Albert, pre-cast concrete sections are assembled like giant lego blocks at the surface and then pushed into the ground using a combination of excavation from inside the shaft and jacking pressure from hydraulic rams above ground. There are 12 sections per ring.
- At Lyon Avenue, the rings are made by building up two metres of steel reinforcements around the shaft, then pouring concrete around the steel to create the next section of the shaft. Then it is pushed into the ground using the same hydraulic rams as at Mount Albert.
- We use bentonite on the outside of the rings as lubrication to help push the concrete sections into the ground. It also helps to support the earth walls around the shaft.
- Once the excavation is complete, we will replace the bentonite with grout to fix the shaft in place.

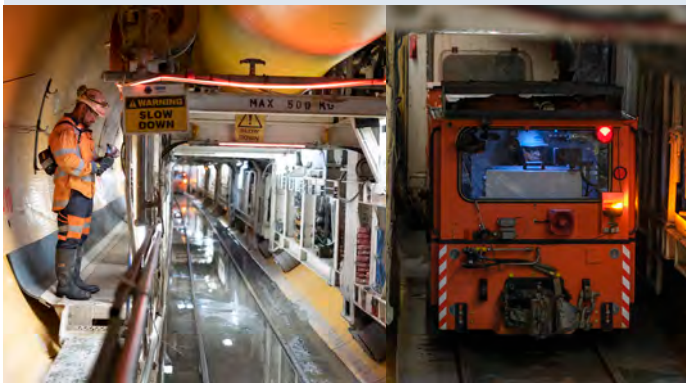
Sustainability

- Electric locomotives are used inside the main CI tunnel and both link sewers to replace diesel and reduce fuel use.
- This improves air quality and reduces fire risk in the tunnel
- Electric locomotives reduce CO2 emissions by 400T
- The CI project has purchased three electric trucks
- These trucks require less maintenance and have lower running costs
- They are also much quieter than diesel reducing noise pollution
- The trucks will help transport spoil coming out of the shafts during excavation
- Excavated spoil is used to rebuild the volcanic cone at Puketutu Island in Māngere.



Spoil

- Spoil is material (such as rock or earth) that is removed when excavating or mining
- The Link Sewer C tunnel will excavate approximately 17,000 bank cubic meter (BCM) of spoil
- A truck and trailer can hold 16 BCM of spoil
- That's equivalent to 2833 truckloads of spoil
- The estimate for amount of spoil that will be excavated from the entire project will be well over half a million BCM.



Museum Programme

- CI has partnered with Auckland Museum and specialist palaeontologists to document these taonga
- We have funded the museum to employ two part-time specialists who will do further field work and help with species identification
- The discoveries will be kept at Auckland Museum to help facilitate education projects by our teams and the wider scientific community.



Shells

- The Kaawa formation is a sandy and fossiliferous geological unit which was deposited 3-3.5 million years ago
- This unit was excavated from the Māngere shaft in 2020, resulting in the unearthing of hundreds of marine fossils
- We found formations of giant oysters, scallops, clams, cockles and other seashells. We also unearthed a whale vertebra
- The world's oldest flax snail (the previous oldest flax snail came from Cape Reinga)
- Fossils can help us understand the environments that came before us. Three million years ago, most of Auckland was underwater
- The shells found during excavation were thick with many layers. This suggests that they come from a high energy environment where they had to grow thicker shells for protection against waves and predators.

