NZ TRANSPORT AGENCY
WAKA KOTAHI

1 Victoria Park Tunnel

Fascinating facts about the Victoria Park Tunnel

How far below the surface of Victoria Park is the tunnel?

The floor of the tunnel is between 12 and 14 metres below the park's surface. The roof is about one metre below the park surface.

The tunnel is 450 metres long and will carry three lanes of northbound traffic.

What do drivers need to be aware in the tunnel?

There is nothing special they need to do or know except:

- Keep driving
- Stay a safe distance from the vehicle in front
- Stay within the temporary 70 kph speed limit (increasing to 80 kph when the broader project is complete)

Will drivers need to turn their lights on in the tunnel?

Car lights are not needed in the tunnel. The tunnel's 1800 lights are more than adequate. The intensity of the light in the tunnel will vary depending on the time of day. Surprisingly, the light will be brighter around the middle of the day, when it is lightest outside. This will maintain drivers' visibility when the move underground and then out into daylight again.

How was the tunnel built?

The tunnel was built using a 'top down cut and cover' construction method. This construction method involves the following steps:-

- Services like water, storm water, telecommunications, power, gas and sewerage are relocated away from the path of the tunnel
- The walls are built from the surface down
- The roof of the tunnel is built using concrete crossbeams and slabs, leaving gaps for excavation
- Soil and rock is excavated from the surface down to form the tunnel trench
- The floor slab is poured, forming the base of the structure and the roadway
- Concrete panels are installed to form the interior walls
- Mechanical and electrical services are installed
- The tunnel is commissioned

Why was this construction method used?

For most of its 450-metre length, the tunnel goes through land reclaimed from Freemans Bay between 1885 and 1901. The Rob Roy Hotel marks the former foreshore of the bay.

The 'cut and cover' construction method allows excavation from the surface. This method of construction is common where the tunnel is shallow, the surface area is free of buildings and the ground conditions are soft – all conditions that existed for the Victoria Park Tunnel project, once the services and Rob Roy Hotel were moved out of the way.

How were the tunnel walls built?

The tunnel walls are up to 1 metre thick. Behind the interior wall panels are two types of wall construction:

- Interlocking secant pile walls from the middle of Victoria Park north, where piles could be drilled well into the sandstone bedrock
- Diaphragm panel walls from the middle of the park south, which is a more efficient construction technique in soft reclaimed ground

The walls were built from the surface down. At the height of their construction, there were up to 27 cranes, drilling rigs and excavators working within the 1.2 hectares of Victoria Park occupied by the project.

What impact did the old harbour have on construction?

At its lowest point, the Victoria Park Tunnel is some 9 metres below Mean Sea Level and the average surrounding ground water level. Two hundred tension piles drilled into the sandstone bedrock, up to 10 metres below the tunnel floor, prevent the structure from floating up.

During excavation for the tunnel trench, bunding and pumps were used to prevent water flooding the excavation.

Some of the material that had been used to fill the harbour had come from waste from the old Beaumont Street gasworks nearby. There were, therefore, pockets of contamination, which meant all fill removed was tested for contaminants before excavation and disposed of to appropriate landfills.

The large Freemans Bay Stormwater Culvert that had to be relocated is tidal as far as the Rob Roy Hotel. Work inside the new precast box culvert had to be fitted between high tides, or behind temporary bunds constructed to prevent flooding.

How much material was removed? Was anything interesting found?

Approximately 160,000 cubic metres of ‘earth’ was excavated to form the tunnel trench and another 100,000m³ for the tunnel approach.

The big dig uncovered the remains of an old wharf, logs that had probably fallen from ships in the late 1880s, and some old structures associated with the former gas works on Beaumont Street.

Excavation for new drainage for the motorway widening in St Marys Bay uncovered the remains of the original Point Erin Park swimming pool, which was destroyed when the approach to the Auckland Harbour Bridge was constructed in the 1950s.

What was the biggest challenge during construction?

One of the most challenging and complex parts of the Victoria Park Tunnel project has been the relocation of the Orakei Main Sewer. This is New Zealand’s largest sewer pipeline. Its flow at peak times is two thousand litres per second.

A section of the sewer, which was built more than 100 years ago, ran between Weld Street (behind the Rob Roy Hotel) and Drake Street (behind the Victoria Park Market), across the path of the tunnel. It had to be diverted via a temporary pipeline so that the tunnel could be built. A new, permanent diversion was then built along a longer curved alignment across the roof of the tunnel, immediately behind the Rob Roy Hotel.

The sewer had to remain ‘live’ throughout the work. Critical connections had to be carried out at 2am, when flows are generally at their lowest.

Another significant challenge was the requirement to protect the Rob Roy Hotel. The heritage-rated building, opened in 1886, was built of unreinforced brick and mortar. The building was strengthened and then moved 44.7 metres up Franklin Road, out of the way of construction. Once the tunnel was built, it was moved back. Its final resting place is the top of the tunnel but in the exact same location it was originally built.

What are the best tunnel innovations?

The future of the historic Campbell Free Kindergarten in Victoria Park was secured by an agreement between its owner, the then Auckland City Council, and the NZ Transport Agency. Under the agreement, the NZTA upgraded and protected the heritage building, which had been abandoned for more than 20 years and was in significant disrepair. In return, part of the building has been used to house the standby electrical and communications equipment needed to operate the tunnel, and the remainder – the two original ground floor classrooms – have been handed back to Auckland Council for community use.

The project had planned to build a plant room much further from the tunnel. Money saved on not constructing this building covered most of the cost of restoration.

Movable lane barrier

Another innovation is the extension of the moveable lane barrier on the Auckland Harbour Bridge through St Marys Bay to the Fanshawe Street on ramp. The extension will help improve peak hour traffic flows. It will not be necessary to cone off lanes at night, as is currently the case.

How are drivers protected if there is a tunnel emergency?

The Victoria Park Tunnel follows international expertise and best practise in safety, using the latest technology and safety features.

The systems can be grouped as: incident detection systems, occupant notification systems, emergency egress (exit) systems, fire suppression systems and smoke management systems.

Incident detection systems

These include complete CCTV coverage of the motorway which is monitored 24/7 from the Joint Traffic Operations Centre operated by the NZTA and Auckland Transport at Smales Farm; automatic video incident detection which analyses the video stream in real time and raises alarms for stopped vehicles, vehicles travelling the wrong way, pedestrians, animals, debris and smoke; linear heat detection cables detecting rapid increases in temperature; and smoke detection in ancillary plant areas. There are motorway emergency telephones every 50m in the tunnel to allow motorists to speak directly to the Traffic Operations Centre. Mobile phones will work inside the tunnel.

Occupant notification systems

These include public address systems for the tunnel, egress passage and ancillary areas; radio rebroadcast system which enables the traffic operations centre to communicate messages to drivers via their vehicle radios; and tunnel variable message signs. The messages on these systems are coordinated to ensure there is no confusion in instructions that are given to drivers during an emergency.

Emergency egress (exit) systems

There are exit doors every 50m in the tunnel. They lead to a fire-separated exit passage behind the western wall of the tunnel. It is pressurised to keep it free from smoke.

This passage leads to the egress stairs exiting to Victoria Park via two egress structures, and to exits at each portal.

Systems installed inside the tunnel

The tunnel includes a Public Address (PA) System that will broadcast pre-recorded messages, advising motorists what action they should take. This works in conjunction with seven variable message signs which provide text based displays.

Eighteen sprinkler deluge zones, each covering a 25m section of tunnel, will be used to put out a fire. The deluge system is capable of delivering 10mm of water per second or 250 tonnes per hour - equal to the hardest downpour. At this rate, it could deliver Auckland’s annual rainfall in 24 hours.

Eight roof mounted jet fans are provided to remove smoke and gases from the tunnel if there is an emergency. The jet fans a capable of clearing smoke and fumes from a 75 megawatt fire. The fans are not required for everyday ventilation – air will move naturally through the tunnel in the same direction as the traffic (northbound). However two fans could be activated if fumes build up from idling cars.

Emergency equipment cabinets are located every 50m along the roadside. Each holds an emergency phone, hose reel and hydrant connection point.

How will the emergency systems be triggered?

The tunnel’s CCTV system allows operators based at Smales Farm to view all areas of the tunnel. Operators have the ability to manually override or initiate the tunnel’s automated emergency responses based on the video footage they are viewing.

In addition, the linear heat detection system cable mounted to the roof will sense any heat generated below. This will trigger an alarm and tell the control system the exact location of a fire. The control system will operate the nearest deluge zones to put out the fire.