

5 Proposed modification

This chapter describes the proposed modification to the approved project related to relocating the MOC4 underground.

5.1 Overview of the proposed modification

The proposed modification would relocate the MOC4 underground within caverns housing the electrical substation and ventilation facilities and a ventilation tunnel connecting to the ventilation outlet, which would remain above ground in the same location as shown in the EIS. Only a switch room, high voltage regulators, an alternative Operational Motorway Control System (OMCS) room and a separate stair access leading down to the ventilation tunnel would be required on the surface on the southwestern side of Victoria Road between Toelle and Callan Streets.

The main elements of the proposed modification include:

- Construction of a ventilation tunnel about 340 metres in length that connects the Iron Cove Link tunnel, at an underground location between Cambridge and Waterloo Streets, with the Iron Cove cut and cover structure near Callan Street
- The ventilation tunnel that includes two caverns for the housing of ventilation equipment and the electrical substation, along with access tunnels to be used for maintenance
- Extension of the Iron Cove cut and cover area on the southwestern side of Victoria Road to facilitate connection to the ventilation tunnel
- All plant, equipment and materials required to construct the proposed new ventilation tunnel and caverns supported from the Iron Cove civil site (C8), with the potential for some tunnelling to be supported from the Rozelle civil and tunnel site (C5) later in the construction program.

The following sections provide a more detailed description of the proposed modification to the project.

5.2 Details of the proposed modification

5.2.1 Undergrounding of ventilation facilities and substation

As stated in section 3.2.1, the EIS proposed to locate the substation and ventilation facilities above ground on the southern side of Victoria Road, between Toelle Street and Callan Street, in the area used during construction of the project by the Iron Cove civil site (C8).

By relocating the substation and ventilation facilities underground, the only above-ground structures to be constructed at this location would be a switch room, high voltage regulators, an alternative Operational Motorway Control System (OMCS) room and a stair access to the ventilation tunnel.

A ventilation tunnel, including caverns, would be constructed to connect the Iron Cove Link tunnel with ventilation exhaust facilities, substation and the ventilation outlet. The ventilation tunnel would connect with the Iron Cove Link tunnel underground near the tunnel portals and at a side extraction point south of Moodie Street, between Waterloo and Cambridge Streets.

The alignment of the proposed new ventilation tunnel and caverns at Iron Cove for the proposed modifications are shown in Figure 5-1. The approved Iron Cove Link road tunnels are shown in orange and the approved cross passages shown in brown. A cross-section showing indicative arrangement of ventilation tunnel connection to ventilation outlet is shown in Figure 5-2.

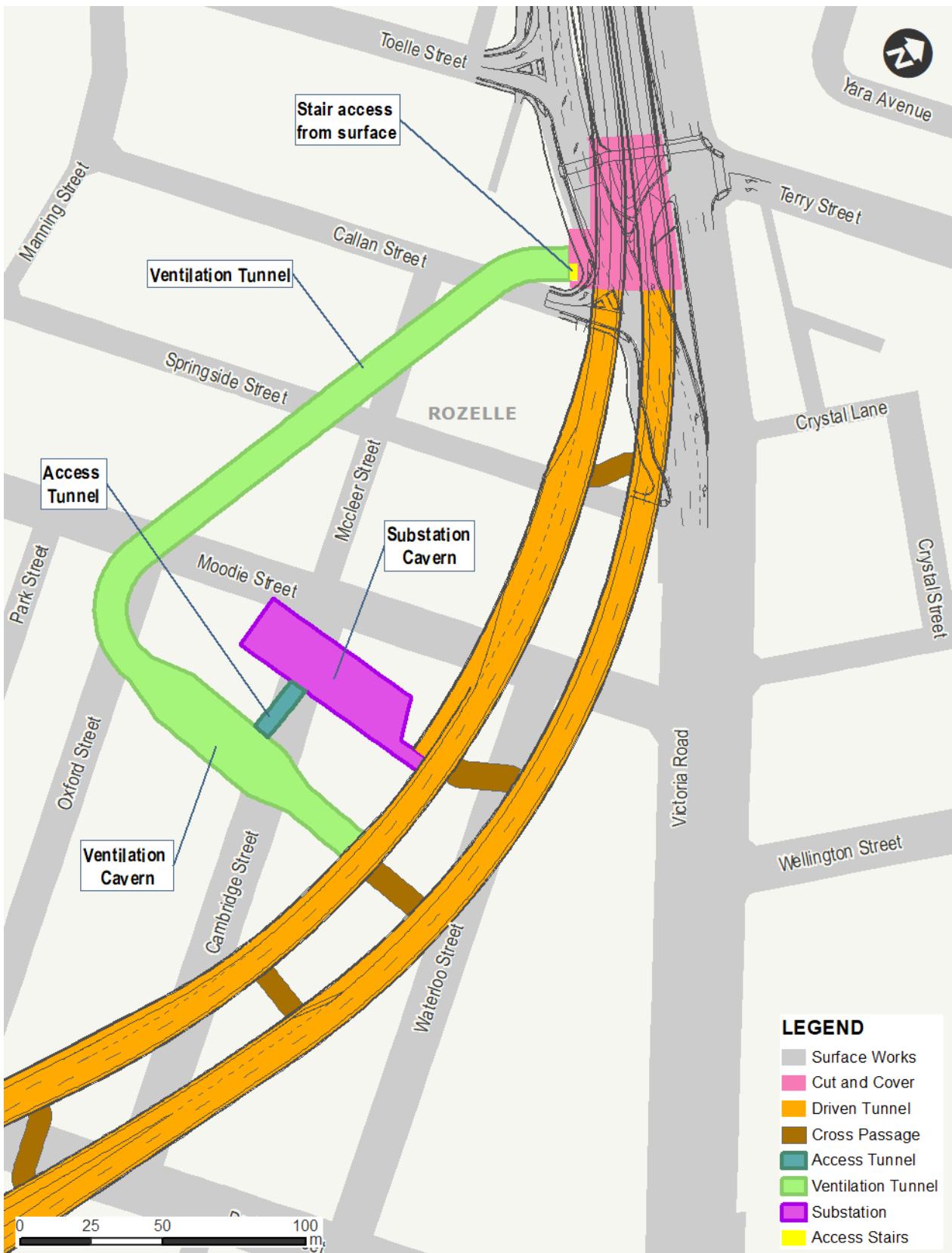


Figure 5-1 Alignment of proposed new ventilation tunnel and caverns at Iron Cove

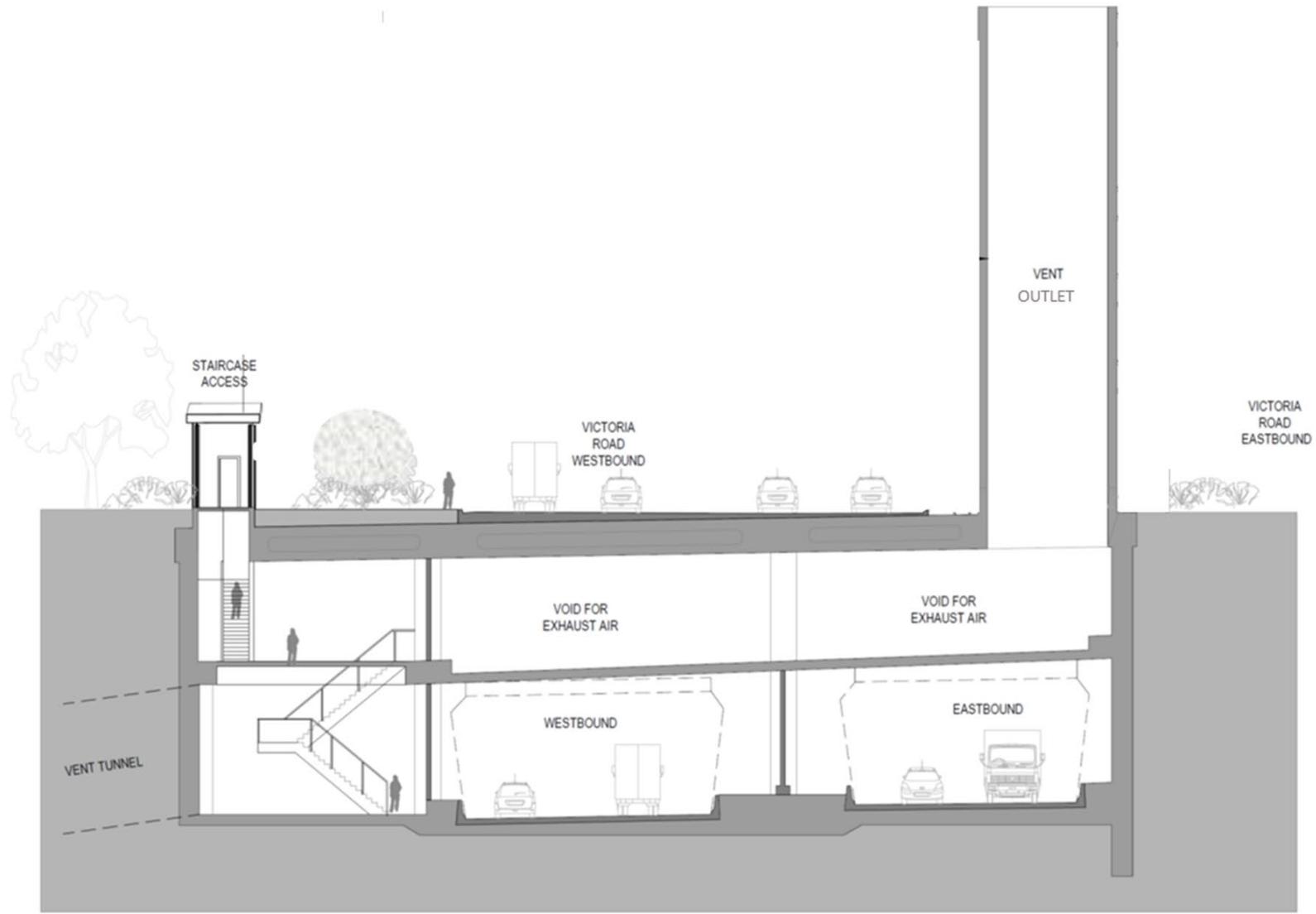


Figure 5-2 Cross-section showing indicative arrangement of ventilation tunnel connection to ventilation outlet

The ventilation tunnel and caverns would have the following features:

- The ventilation tunnel would be about 340 metres in length. This ventilation tunnel would be on average about seven metres high and about 10 metres wide. The depth of the ventilation tunnel would vary from about eight metres (from ground level to tunnel crown) at its shallowest to about 25 metres (from ground level to tunnel crown) at its deepest (see Figure 5-3)
- The ventilation tunnel would include two caverns for the housing of ventilation equipment and the electrical substation:
 - A cavern containing ventilation exhaust facilities, including four ventilation fans laid horizontally, with associated attenuators and dampers. The dimensions of the ventilation cavern would be about 25 metres wide, 15 metres high and 70 metres long
 - A cavern containing the electrical substation, parallel to the cavern containing the ventilation facilities. The dimensions of the substation cavern would be about 20 metres wide, 10 metres high and 65 metres long.
- An access tunnel about five metres wide and 20 metre long, to facilitate maintenance access from the ventilation cavern into the substation cavern
- The Iron Cove cut and cover area would include a side access for the vent tunnel to connect to the cut and cover about seven metres wide and 17 metres long. This area would also accommodate the access stairs to the surface.

Maintenance access to the substation cavern for maintenance personnel and heavy maintenance vehicles would be provided via an approved breakdown bay located off the westbound lanes within the Iron Cove Link tunnel as well as via a stairwell to the surface.

The underground arrangement proposed in this modification has been designed to meet the in-tunnel air quality outcomes as per the EIS and Planning Approval (see section 6.4 Air Quality).

The ventilation tunnel and caverns would be drained, and a sprayed shotcrete lining would generally be used, consistent with the other ventilation tunnels and caverns to be constructed as part of the approved project (see section 6.10 Groundwater). During operation, any groundwater seeping into the tunnel would drain towards the Iron Cove Link tunnel drainage system, where it would be pumped to the operational water treatment plant at Rozelle Rail Yards, as described in Section 5.9.1 of the EIS.

No changes are proposed to the Iron Cove ventilation outlet. This would remain in the location shown in the EIS, between the eastbound and westbound carriageways of Victoria Road.



Figure 5-3 Indicative depth from ground level to crown of ventilation tunnel and caverns

5.2.2 Surface infrastructure

The proposed modification includes undergrounding of the electrical substation and ventilation facilities. By locating the substation and ventilation facilities underground, the only above-ground facilities buildings to be constructed on the southwestern side of Victoria Road near the Iron Cove Link portals would be located between Toelle and Callan Streets and limited to a switch room, high voltage regulators, an alternative Operational Motorway Control System (OMCS) and a small structure containing stair access to the ventilation tunnel.

The switch room would house equipment, such as electrical meters, which would be used to monitor the operation of the substation and ventilation facilities. The combined switch room and high voltage regulator structure would be about six metres wide and 30 metres long, with a height of up to five metres. This structure would be adjacent to the Victoria Road Shared Use Path on the eastern side of the intersection of Victoria Road and Toelle Street. Within the same area would be the smaller 'L'-shaped OMCS room with a footprint of approximately nine metres wide by nine metres long and five metres high.

This residual infrastructure which cannot be located underground is required to support the fans and substations underground. This infrastructure has been placed on the southwestern side of Victoria Road between Toelle and Callan Streets as this is the location closest to which the ventilation tunnel will pass and can fit the structures. At this point above and below ground infrastructure can be connected. No buildings are proposed to remain on Victoria Road between Springside Street and Callan Street as there is no connectivity to the tunnel at this location.

A small above-ground structure in the vicinity of Callan Street, about two metres wide, six metres long and three metres high would contain an access door and a stairway. The staircase would provide an alternative safe maintenance and emergency access to and from the ventilation tunnel from the surface, with the main access from within the road tunnels.

Dedicated parking would be provided for operations and maintenance personnel with access off Clubb Street and within the switch room site with access off Toelle Street. The parking at Clubb Street will support all operational infrastructure near the Iron Cove Link western portal, including; water quality drainage devices, intelligent traffic system assets and the infrastructure subject to this report between Toelle Street and Callan Street.

The proposed modification would decrease the surface footprint of the permanent works associated with the Iron Cove ventilation facilities. This would increase the amount of residual land available following the completion of the project (see section 6.7).

An indicative layout is shown in Figure 5-4.



Figure 5-4 Indicative location of proposed above-ground structures at Iron Cove

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5.3 Changes to construction methodology

5.3.1 Surface works

The proposed modification substantially reduces the extent of permanent surface works required at Iron Cove.

Construction of switch room, high voltage regulators, the alternative Operational Motorway Control System (OMCS) room and stair access would entail minor excavation, foundation preparation, drainage works, concrete works and structural works as well as mechanical and electrical fit out. Commissioning of the entire project would begin at Iron Cove Link and the alternative OMCS room would also be used to support commissioning and testing of motorway systems to ensure they are safe and meet required specifications.

5.3.2 Ventilation tunnel and cavern excavation

The proposed new ventilation tunnel and caverns would be constructed in sound rock (i.e. sandstone) and be excavated as described for the project's other ventilation tunnels in section 6.4.2 of the EIS and EIS Figure 6-13.

Approximately 61,000 bank cubic metres (BCM) of spoil would be excavated to construct the new ventilation tunnel and caverns. Tunnel lining would be installed progressively following tunnel excavation. As noted in section 4.2.2, the ventilation tunnel would be drained, and a sprayed shotcrete lining would generally be used.

5.3.3 Tunnelling support from within Iron Cove cut and cover

All plant, equipment and materials required to construct the proposed new ventilation tunnel and caverns would be supported from the Iron Cove civil site (C8), with the potential for some tunnelling to be supported from the Rozelle civil and tunnel site (C5) later in the construction program (see section 5.3.5).

The proposed new Iron Cove ventilation tunnel and caverns can be easily accessed from within the Iron Cove cut and cover and would not require any change to the design or construction of the cut and cover. Tunnelling supported from the Iron Cove civil site (C8) would be undertaken within the cut and cover using a single roadheader. Other techniques for non-heading excavation would also be undertaken consistent with the EIS. Noise will be mitigated in accordance with the requirements of the Planning Approval and the Construction Noise and Vibration Management Plan as approved by the Secretary of the Department of Planning, Industry and Environment or delegate.

Tunnelling works would use a roadheader launched from Iron Cove. It is anticipated that the roadheader would be used to excavate the rock beneath the cut and cover structure to gain access to the tunnel portal located under the cut and cover structure. This rock would ordinarily be excavated using large excavators with rock breakers as part of surface construction works. Using a roadheader for this work would reduce noise and vibration impacts on the community.

Once the rock beneath the cut and cover structure has been removed, the chamber beneath the roof of the cut and cover structure would be temporarily converted into an acoustic shed. A temporary shed wall and roller door would be installed at the western end of the cut and cover structure, and this wall combined with the concrete roof of the cut and cover structure would assist with minimising ambient noise and dust impacts during tunnelling. An indicative site layout is provided in Figure 5-5 and an additional layout in Figure 5-6 which shows a three dimensional layout where the ground surface has been removed from the image to show how the site will be configured underground.

A generator, dust collector, water treatment plant and ventilation fans would be installed inside the enclosed cut and cover structure and/or the dive structure as appropriate to support the tunnelling works. Tunnelling would take place from within the enclosed cut and cover structure and include the excavation of the proposed Iron Cove ventilation tunnel and two caverns.

Spoil from tunnelling would be loaded into off-road trucks at the tunnel face. Spoil generated at night-time would be transported from the tunnel face and stockpiled in the enclosed cut and cover structure, and rehandled and loaded, using a wheel/track loader or excavator, into spoil trucks during daytime hours for disposal off-site. During daytime hours, tunnel spoil would be transported and stockpiled in the dive structure area and loaded into trucks for off-site disposal. Concrete deliveries would be required regularly during tunnelling for tunnel ground support and concrete lining works.

A scaffold stairway is proposed to be installed to provide a link for tunnel workers to access the enclosed cut and cover structure from the surface of the Iron Cove civil works site (C8). The surface civil compound facilities at the Iron Cove civil works site (C8), including crib rooms and amenities, would be jointly used by the tunnelling workforce and supervision. Light vehicles and delivery vehicles would access the Iron Cove civil works site (C8) and the enclosed cut and cover structure regularly to support tunnelling operations.

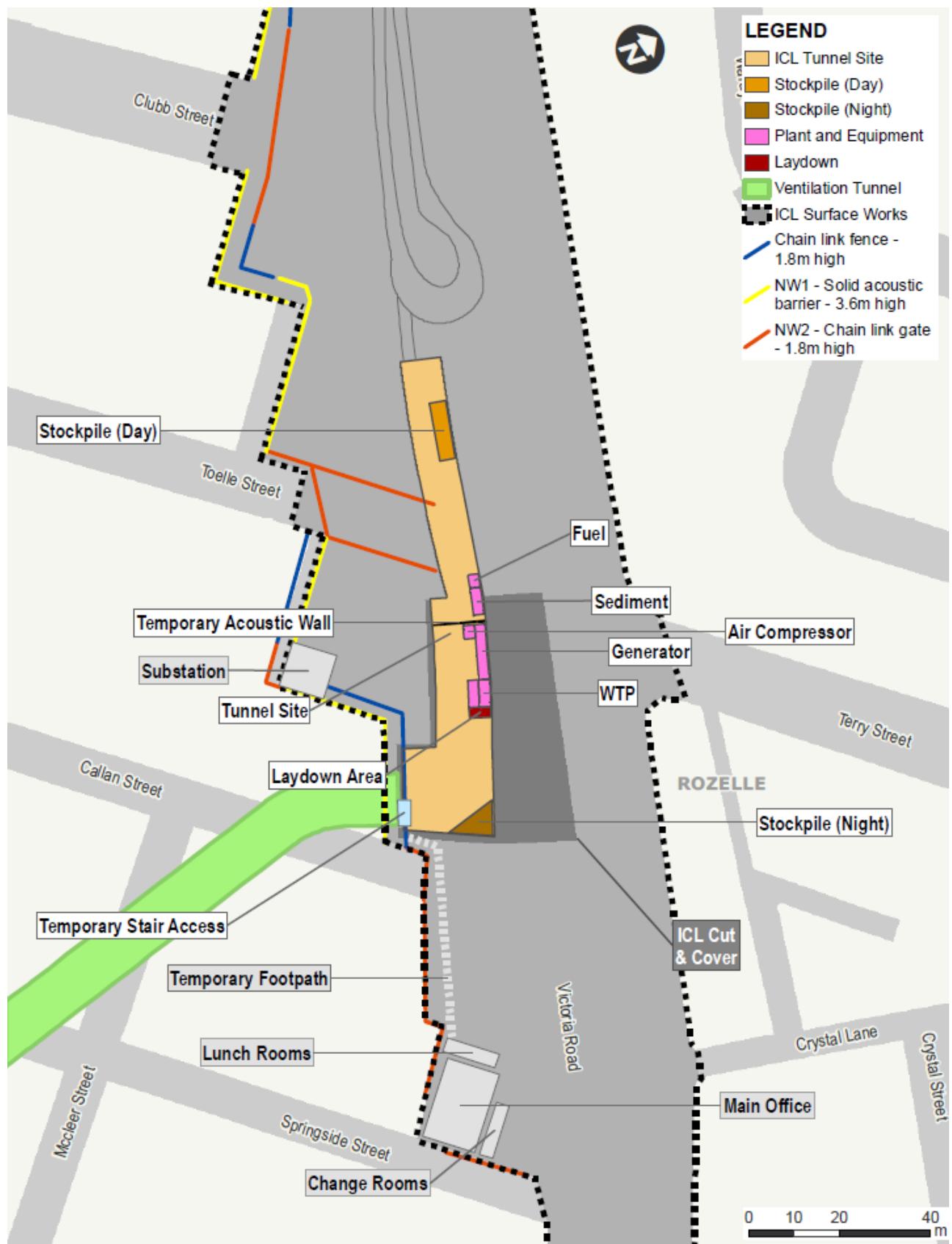


Figure 5-5 Indicative Iron Cove cut and cover tunnel support site layout

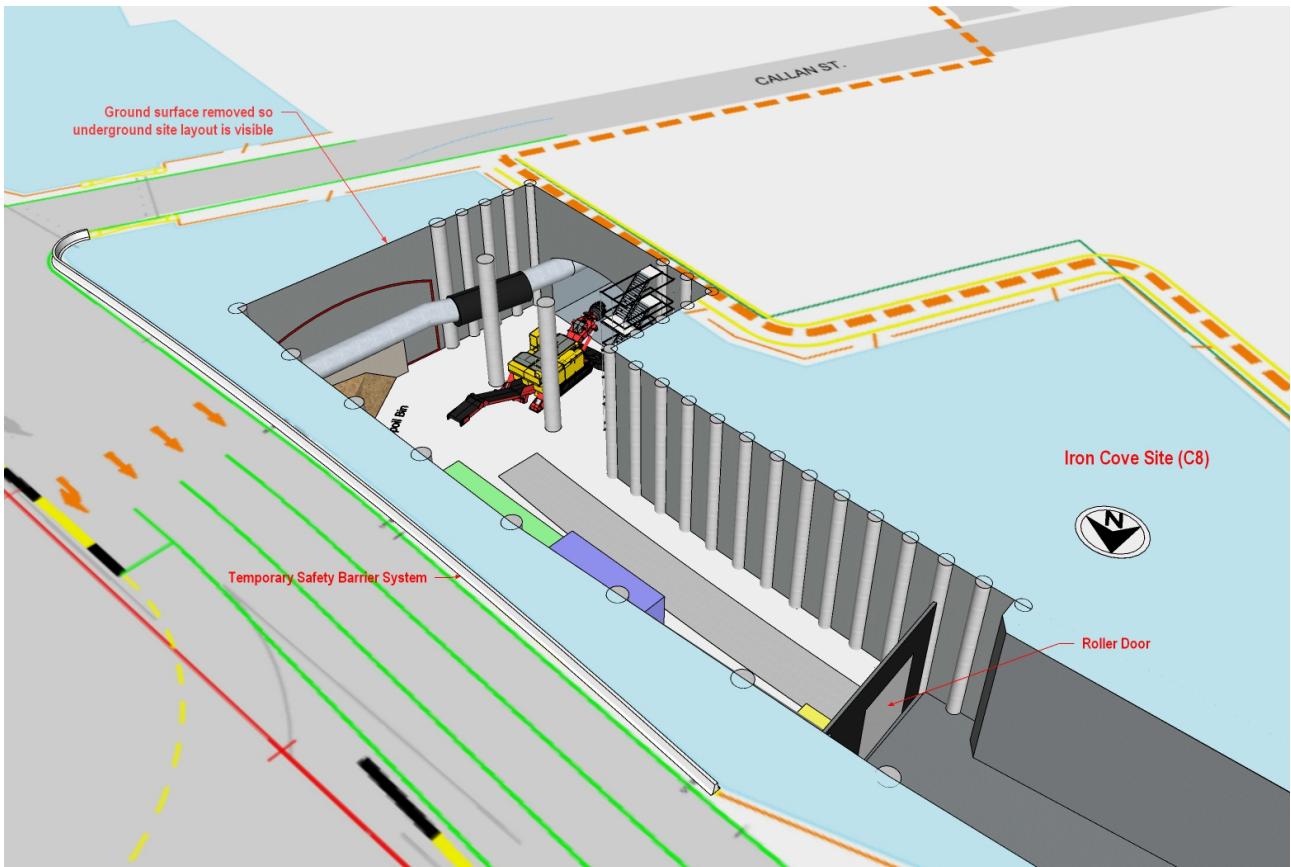


Figure 5-6 Indicative Iron Cove cut and cover tunnel support site (ground surface removed from the image to provide visibility underground). Aspect from Victoria Rd looking towards Callan St.

5.3.4 Additional plant and equipment

The additional plant and equipment that would be used at the Iron Cove cut and cover site (C8) to support these additional tunnelling activities would be:

- Scaffold access
- Dust collector and ventilation fans
- Water treatment plant
- Roadheader
- Wheel loader
- Dump trucks
- Drilling/bolting rig
- Generator and air compressor
- Shotcrete rig
- Excavators
- Delivery trucks including concrete trucks
- Light vehicles
- Spoil trucks.

Reasonable and feasible methods to reduce potential impacts, such as using surface miners and/or blasting, would be further considered during detailed construction planning.

5.3.5 Tunnelling support from Rozelle civil and tunnelling site (C5)

Any tunnelling of the proposed new ventilation tunnel and caverns supported from the Rozelle civil and tunnelling site (C5) would be commenced from within the Iron Cove Link Tunnel once it is excavated. This would not require the installation of any additional temporary surface support infrastructure at the Rozelle civil and tunnelling site (C5).

5.3.6 Utilities

The proposed modification would not alter the extent of utility works required for the project.

5.4 Construction program

The indicative program for construction of the proposed modification is outlined in Table 5-1.

Tunnelling works at the Iron Cove cut and cover would commence once the southern half of the cut and cover structure has been constructed in about Q3 2020. The tunnelling works, including tunnel excavation, ground support and tunnel lining as well as the concrete works in the floor of the tunnel, are anticipated to be completed by the end of 2021.

Commissioning of the entire project would begin at Iron Cove Link. Tunnelling of the proposed new ventilation tunnel and caverns from Iron Cove would potentially allow the project to commence commissioning two to three months early. Starting commissioning earlier would give the project more opportunity to finish early and more certainty that it would finish on time.

Any tunnelling supported from the Rozelle tunnel and civil site (C5) would commence later in the construction program in about Q2 of 2021. As the proposed new ventilation tunnel and cavern works would be supported from the Iron Cove civil site (C8) with the potential for some tunnelling to be supported from the Rozelle civil and tunnel site (C5) later in the construction program, this assessment has been completed assuming the worst case impacts of all deliveries and spoil transportation occurring from either of these sites.

Table 5-1 Indicative construction program for the proposed modification

Construction activity	Indicative construction timeframe						2023
	2018	2019	2020	2021	2022		
Construction of cut and cover and tunnel portals (EIS Table 6-16)							
Excavation of proposed new ventilation tunnel and caverns from C8							
Mechanical and electrical fitout							
Construction switch room, HV regulators, OMCS and access stair structure							
Testing and commissioning							

5.5 Construction workforce

Additional workforce required for tunnelling operations from the Iron Cove tunnelling site would typically range from six to ten people at any one time, made up of supervision, workforce and tunnelling equipment maintenance personnel.

5.6 Construction hours and justification for 24-hour tunnelling

5.6.1 Overview

Construction hours for the proposed modification would be in accordance with the Planning Approval.

Work hours for construction of the ventilation tunnel and caverns and fit out works would be in accordance with the Planning Approval Condition E70 and E73, which allow tunnelling activities (excluding cut and cover tunnelling) and tunnel fit out works to occur 24 hours a day, seven days a week.

Tunnelling is carried out sequentially 24 hours a day, seven days a week. The justification for the out of hours works is twofold:

- Excavation of each round or cycle would take on average 6–12 hours of rock hammering or roadheader excavation. Once completed, temporary support in the form of shotcrete, steel sets and/or rock bolts must be installed immediately to ensure stability of the works and minimise any potential ground movement or settlement
- The duration of construction works under roads and other infrastructure would be less. This would reduce the likelihood and length of time during which excessive ground movement or settlement may occur and result in the need for road closures for repairs or due damage to surface structures.

It is noted that spoil haulage outside standard daytime construction hours specified in Planning Approval Condition E69 is not required for the proposed tunnel support site within the Iron Cove cut and cover.

5.7 Operation of the proposed modification

The ventilation tunnel would operate as the ventilation facilities described in the EIS; that is, the road tunnels would comprise longitudinally ventilated tunnels, which rely on the movement of air through the tunnels in the same direction as the flow of traffic. Air would be extracted from near the Iron Cove Link tunnel exit portal, and conveyed to the ventilation cavern, where the four ventilation fans would push the air towards the ventilation outlet facility (located between the eastbound and westbound carriageways of Victoria Road).

As described in the EIS, the ventilation facilities would be in operation 24 hours a day, seven days a week.

As indicated in section 5.2.1, heavy maintenance vehicles would access the underground ventilation facilities and substation via an approved breakdown bay adjacent to the westbound lanes within the Iron Cove Link tunnel. Access for maintenance personnel to the ventilation tunnels would also be possible from the access stairway structure located near Callan Street.

Access would also be required to the switch room for scheduled meter readings, monitoring of the equipment and in the event of an incident.

The alternative OMCS room is not expected to be frequently used and would only be operated as a backup measure. Maintenance would be undertaken in accordance with the asset management schedule.

The High Voltage regulators would be maintained in accordance with manufacturer's specifications and be replaced about every 25 years. The replacement of the High Voltage regulators would likely involve a road closure on Victoria Road and a crane to lift them from the road over the wall onto a semitrailer.

Personnel attending the site for scheduled maintenance and monitoring would park in the designated parking with access off Clubb Street, and within the switch room site with access off Toelle Street.

5.8 Conditions of approval

The proposed modification would require some of the Conditions of the Project Approval to be amended as some of the proposed changes would not be consistent with the existing project approval. Chapter 8 (Conditions of approval) provides a review of the relevant Conditions in relation to the proposed modification and details the proposed changes.