

WESTERN HARBOUR TUNNEL AND BEACHES LINK

ALTERNATIVE PROPOSAL

BACKGROUND

The proposed Western Harbour Tunnel and Beaches Link proposal was announced by the NSW State Government on the 16th March 2017, prior to the Manly and North Sydney State By-elections.

The RMS provided a simplified map of the proposed route of the tunnel. The Beaches Link portion showed 2 portal locations, one at North Seaforth along the Wakehurst Parkway, and one at Balgowlah, connecting to Burnt Bridge Deviation near Serpentine Crescent.

CURRENTLY PROPOSED PORTAL AND EXHAUST STACK LOCATIONS

The Sydney morning Herald published leaked documents on 21st July, 2017, which showed details of the proposed portal and exhaust stack locations. The article showed diagrams of an RMS proposal for the locations of the two portals at North Seaforth and Balgowlah. The diagrams also showed proposed exhaust stack locations near each portal.

These exhaust stacks were shown close to homes and schools. In the case of the Balgowlah exhaust stack and portal, this was shown within 150m of Seaforth Primary School.

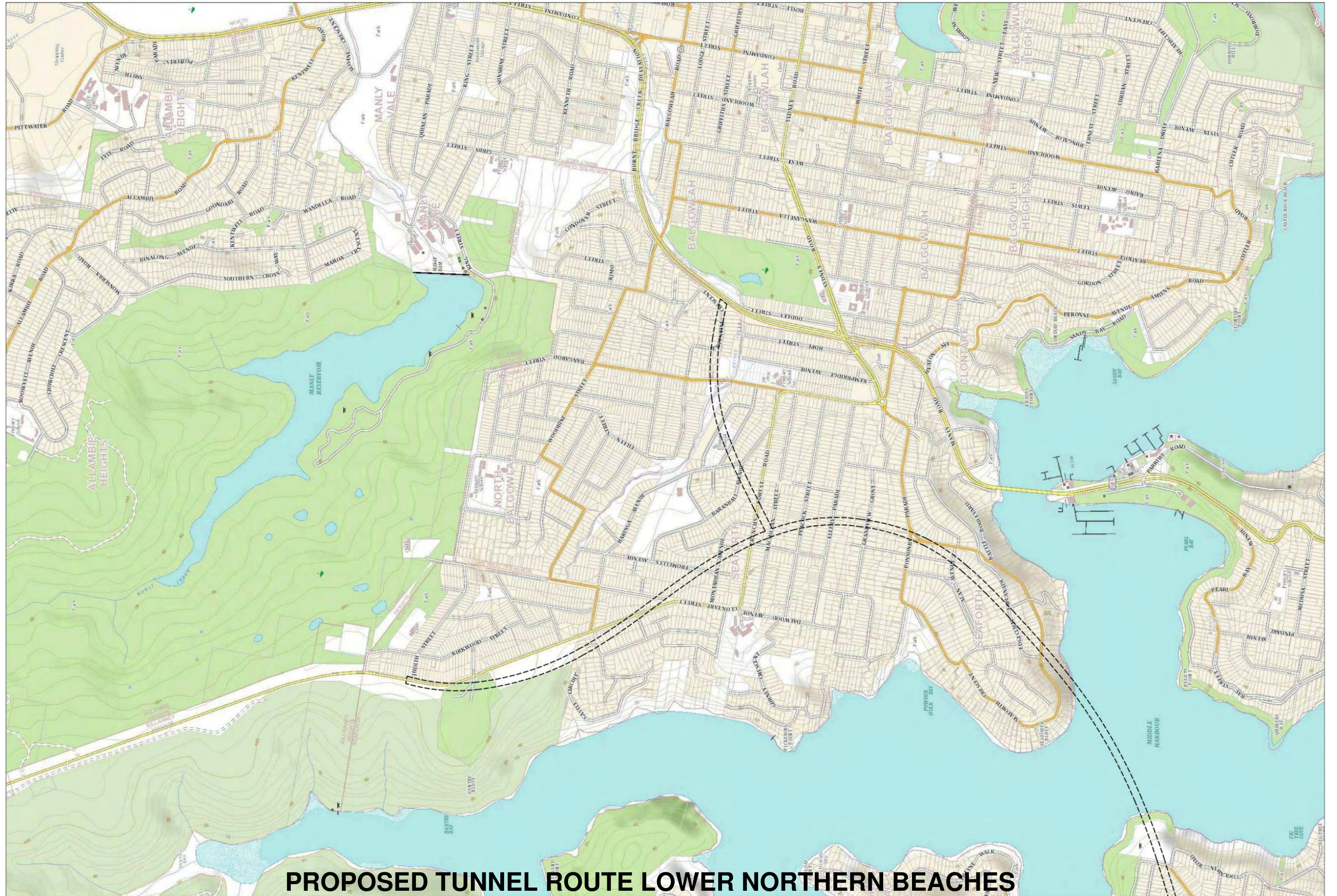
The "Beaches Link" portion of the tunnel extends from Cammeray to the lower northern beaches and requires a crossing at Middle Harbour between Clive Park at Northbridge and Seaforth Bluff.

The length of the tunnel between Cammeray and North Seaforth as per this diagram, would be approximately 7.2km. The main tunnel from the Middle Harbour crossing to North Seaforth would be approximately 3.6km. The spur which extends from this main tunnel to Balgowlah would be approximately 1km in length.

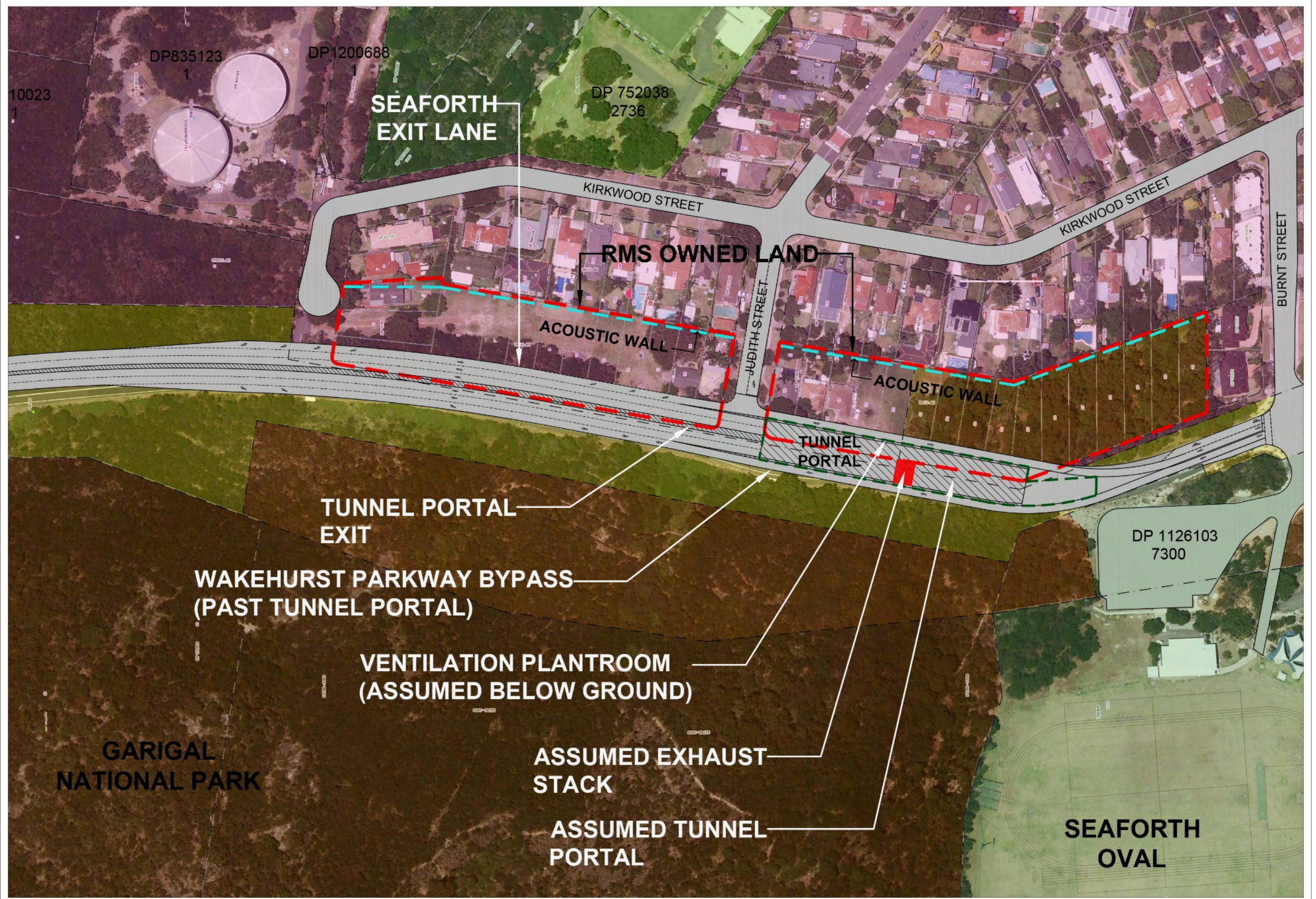
The depth of the Harbour at the proposed tunnel crossing point is known to be one of the deepest sections of Sydney Harbour. The portal location at North Seaforth would be on Seaforth ridge at a high point of approximately 114m above sea level. The portal at Balgowlah would be located in a valley at a relative low level of approximately 30m above sea level.



RMS PROPOSED TUNNEL ROUTE



PROPOSED TUNNEL ROUTE LOWER NORTHERN BEACHES



ASSUMED LAYOUT OF NORTH SEAFOORTH PORTAL



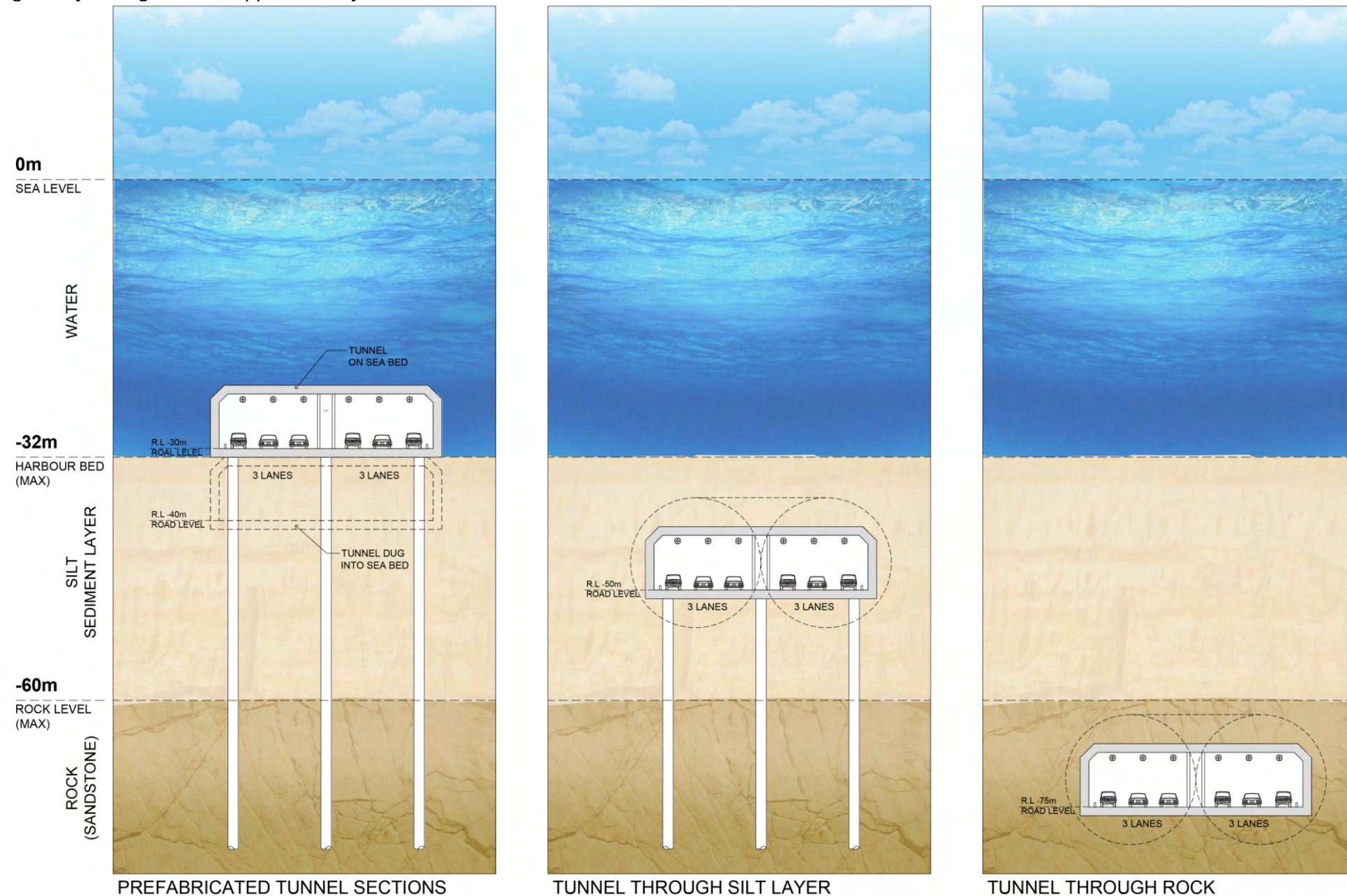
ASSUMED LAYOUT OF BALGOWLAH PORTAL

HARBOUR CROSSING OPTIONS

The RMS has published some of their findings in relation to the proposed Middle Harbour crossing. The RMS have found that the water depth at the harbour crossing location could be as deep as 32m, and the depth to rock is approximately 60m below sea level. A silty sediment layer exists between the harbour sea bed and the rock layer.

The diagram below shows Harbour crossing options which could include:

- An immersed tube tunnel sitting on the harbour sea bed at 30m below sea level at the deepest point.
- An Immersed tube dug into the harbour sea bed at approximately 40m below sea level at the deepest point (similar to the Sydney Harbour Tunnel).
- A bored tunnel option passing mostly through rock but partially through the silt layer at approximately 50m below sea level
- A bored tunnel option passing wholly through rock at approximately 75m below sea level.



ASSUMED HARBOUR CROSSING OPTIONS

We have been advised by the RMS policy is for a 4% maximum average grade on road tunnels. The North Seaforth Portal is at a much higher altitude than the Balgowlah Portal. The critical tunnel grade is between the Harbour Crossing and the North Seaforth Portal. The RMS have advised that they are currently proposing an immersed tube harbour crossing, where the immersed tube would rest on the harbour sea bed at approximately 30m deep. This would provide an average grade of 4% between the middle harbour crossing and the proposed portal location at North Seaforth.

The immersed tube harbour crossing option is the least environmentally sensitive option. It will require the construction of coffer dams within middle harbour to join the immersed tubes at either end, and will disturb the silt layer at the bottom of the harbour during dredging works required to place and secure the tunnel segments. It will also cause considerable disruption within middle harbour and will further require the use of foreshore land (either private or public) as construction sites from which the construction works would be staged. It is noted that no harbour crossing has been permitted using immersed tube construction since the Sydney Harbour Tunnel was completed in 1992. The recent metro rail tunnel proposal initially proposed an immersed tube crossing as the preferred method of crossing the harbour. This method was rejected on environmental grounds (stated in the final business case summary dated October 2016). A bored tunnel option is currently being utilized for the new metro rail harbour crossing.

THE CURRENT RMS PROPOSAL

There are a number of substantive reasons why we believe the current RMS concept design for the beaches link component of the Western Harbour Tunnel and beaches link project is unacceptable in its current form. The substantive negative impacts include:

North Seaforth Portal and Exhaust Stack

1. The immersed tube harbour crossing is more environmentally intrusive method of constructing the Harbour Crossing. A less disruptive method would be to select a bored tunnel option. The immersed tube crossing option is being proposed to minimise the length of tunnel between the Harbour crossing and the North Seaforth Portal.

A bored tunnel harbour crossing option would require the tunnel to be at least 20m deeper than an immersed tube option. At the maximum 4% grade the tunnel would need to be extended at least 500m further north of the current location proposed for the North Seaforth portal.

2. The impact of Tunnel Exhaust Emissions. The North Seaforth tunnel exhaust stack is currently shown immediately adjacent to an established residential area and Seaforth oval. These impacts can be avoided if the tunnel portal and exhaust stack are simply relocated further north along the Parkway.

3. Environmental Considerations - The current proposed location would irreplaceably displace the geographically significantly and ecologically rich, southern tip of the endangered Duffy's Forest Communities, which exist east of the Wakehurst parkway between Burnt Street and Kirkwood Avenue, as well as three and possibly a fourth, State and Nationally significant endangered plant species under the Threatened Species Act 1995.

4. Avoidable resumption of privately owned homes,

5. Avoidable increase in noise, affecting nearby residents and associated mitigating measures such as high concrete walls, double glazing, inability to open windows etc.

6. Avoidable loss of existing visual amenity. The local area is a leafy bushland setting; this would be cleared to allow the construction of the new tunnel portal, associated infrastructure and Wakehurst Parkway road widening.

7. Avoidable creation of rat runs due to the proposed tunnel location blocking access to Judith Street which currently acts as the main traffic feed through North Seaforth to North Balgowlah.

8. The widening of Wakehurst Parkway would worsen the existing Fauna hazard without some mitigation initiatives. (Fauna Crossings).

Balgowlah Portal and Exhaust Stack

1 The resumption of at least 12 homes along Serpentine Crescent. There would appear to be other options available to the RMS rather than resuming these homes. We understand for example that the RMS is seriously considering an alternative to utilize the nearby road reserve close to proposed entry/exit rather than resuming people's homes.

2 Unacceptable Impacts of Exhaust Emissions. - Not only is the proposed exhaust stack within close proximity to existing houses and immediately adjacent to Seaforth Primary School, it is located at the low point of a valley that is known locally as a trapped low point. The prevailing winds are from the ocean (northeast and south east). The existing ridge to the west of the valley will block emissions from clearing from the trapped low point in all but relatively windy conditions. Exhaust fumes from the Balgowlah portal will be emitted from the Balgowlah exhaust stack continuously, 24 hours a day, 7 days a week. This will have the impact of concentrating exhaust emissions within this trapped low point. The trapped low point extends from Seaforth to Manly and up to Brookvale and North Curl Curl. The area includes North Balgowlah, Balgowlah, Manly Vale, North Manly, Freshwater, Queenscliff, Curl Curl, North Curl Curl and northern parts of Fairlight and Manly. This is a densely populated residential area containing several (at least 12) schools and numerous kindergartens and day care centres containing approximately 10,000 students. It was also noted in the leaked RMS document that there are concerns with "Plume Downwash entering nearby homes"

3 Seaforth Primary School is immediately adjacent to both the proposed Tunnel Portal and Exhaust Stack. The proximity of any school next to infrastructure of this nature is would be considered unacceptable by any community. Seaforth Primary would also be particularly susceptible to exhaust emissions from the tunnel exhaust stack as Seaforth Primary is downwind of the exhaust stack.

4 The Balgowlah Portal would be constructed within the existing Burnt Bridge Creek Watercourse. The riparian zone adjacent to this waterway has recently been rehabilitated by the local community and is highly valued by local residents and the nearby Seaforth Primary School. The construction of the Balgowlah Portal in this location would cause the loss of this highly valued environmental asset. The construction would interrupt the watercourse which would have to be piped. An alternative location which did not impact on an established watercourse would appear more appropriate

5 The Proposed Balgowlah Portal would be located at the low point in the valley. Most of the nearby residents overlook this area. The remaining houses that would be left (and not resumed) are very close to the proposed portal location. The impact to these local residents would include noise and loss of visual amenity.

6 As with the North Seaforth Portal, the impact of noise on nearby residents is a factor of the proposed close proximity of the tunnel portal to existing residents. Both the noise and associated mitigating measures, such as concrete acoustic screen walls, would result in a major impact to these nearby residents.

7 Nearby residents will be faced with two consequential losses associated with the proposed Portal location. Firstly, the outlook to the Vegetated watercourse corridor would be lost. Nearby residents currently enjoy an outlook onto a leafy bushland setting. This would be cleared as part of the Portal construction works. Secondly, the view that would present local residents in place of the leafy outlook they currently enjoy, would be either, high concrete acoustic screen walls or an outlook over a busy tunnel portal, or both. An alternative, more environmentally sensitive proposal could potentially mitigate these negative impacts.

ALTERNATIVE PROPOSAL

- NORTH SEAFORTH

We believe there is a possible alternative proposal which would potentially mitigate most if not all of the negative issues noted above. Our alternative proposal seeks to shorten the length of the Nth Balgowlah connection to a nominal distance of 500m to shorten it to the extent where it did not require an exhaust stack, and all exhaust emissions could be vented at the North Seaforth Portal, which in turn would be relocated at least 800m further north along the Wakehurst parkway well away from residential areas and schools. At this location the exhaust stack would be positioned on the ridge, where exhaust emissions can dissipate as intended. The Balgowlah Portal would be used as a fresh air intake only. The section of tunnel where ventilation flow is against the flow of traffic would only be 500m long, and only for the side of the tunnel where traffic flow exits the main tunnel to the Balgowlah Portal.

The proposal would also provide cost offsets as follows:

- Eliminate Exhaust Stack and plantroom Balgowlah Portal
- Provide more Cost Effective/Quicker Harbour Crossing Options (Bored option can be utilised instead of immersed tube).
- Tunnel Grade - Whilst our alternative proposal achieves a much flatter and safer grade. By reducing the Balgowlah spur to just 500m long compared to the RMS concept design (1km long), the extra length (500m) can be shifted into main tunnel where it is needed, to improve grade. The proposal allows the tunnel to start much deeper under Middle Harbour, and stay flatter for longer due to the flatter grade. Both these initiatives keep the tunnel deeper under ground level where the tunnel crosses Burnt Bridge Creek low point.

The flatter grade achieves a number of benefits in comparison to the RMS concept design. These include:

- Improved vehicle performance
- Reduction in exhaust emissions
- Less variance in vehicle speeds (especially in relation to heavy vehicles)

The proposal reduces overall tunnel grade, providing, improved vehicle performance, a reduction in exhaust emissions, less variance in vehicle speeds (especially in relation to heavy vehicles) and a safer, better performing tunnel as previously noted Environmental Benefits Though yet to be confirmed in relation to the environmental status of the proposed alternative portal site, the proposal would move the tunnel portal away from the known environmentally sensitive vegetated areas east of the Wakehurst Parkway between Burnt Street and Kirkwood Streets which contain

what is believed to be the southern extent of Duffy's Forest Communities as well as at least three and possibly a fourth threatened plant species.

The widening of Wakehurst Parkway would have worsened the existing Fauna hazard without some mitigation initiatives. The alternative proposal includes the creation of vegetated Fauna Crossings over the Tunnel Portal which provides substantial areas where animals, pedestrians and bikers can cross between the two parklands safely. The net result is a dramatic improvement even in comparison to the existing situation (before road widening).

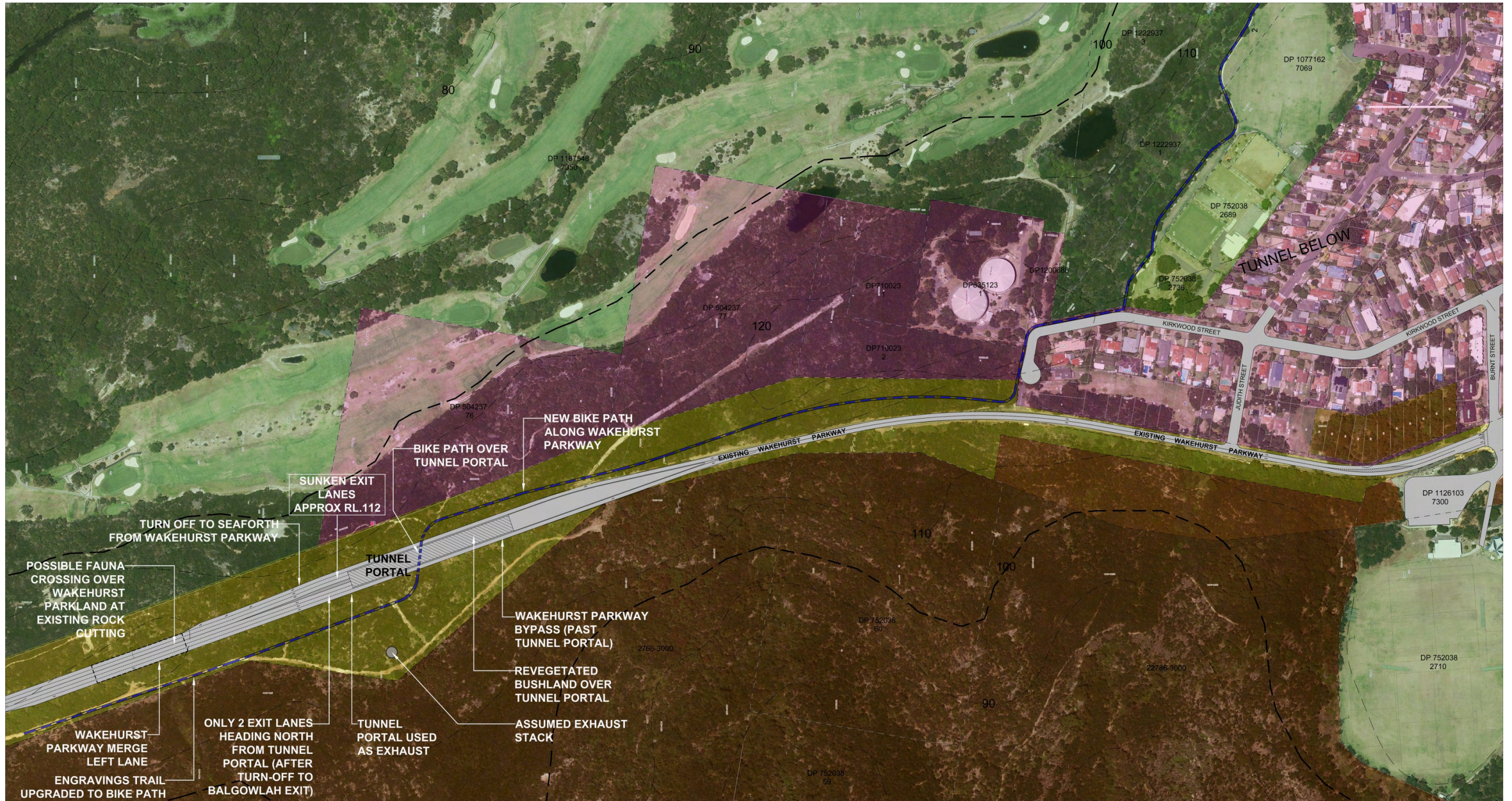
The proposal would also eliminate most (if not all) of the negative acoustic impacts associated with locating the Tunnel Portal where it is currently proposed in an urban setting. These include issues relating to noise, and the associated mitigating measures that would be employed (such as large acoustic walls etc.

Linking the Parks - The benefits of the vegetated Parkway crossing include:

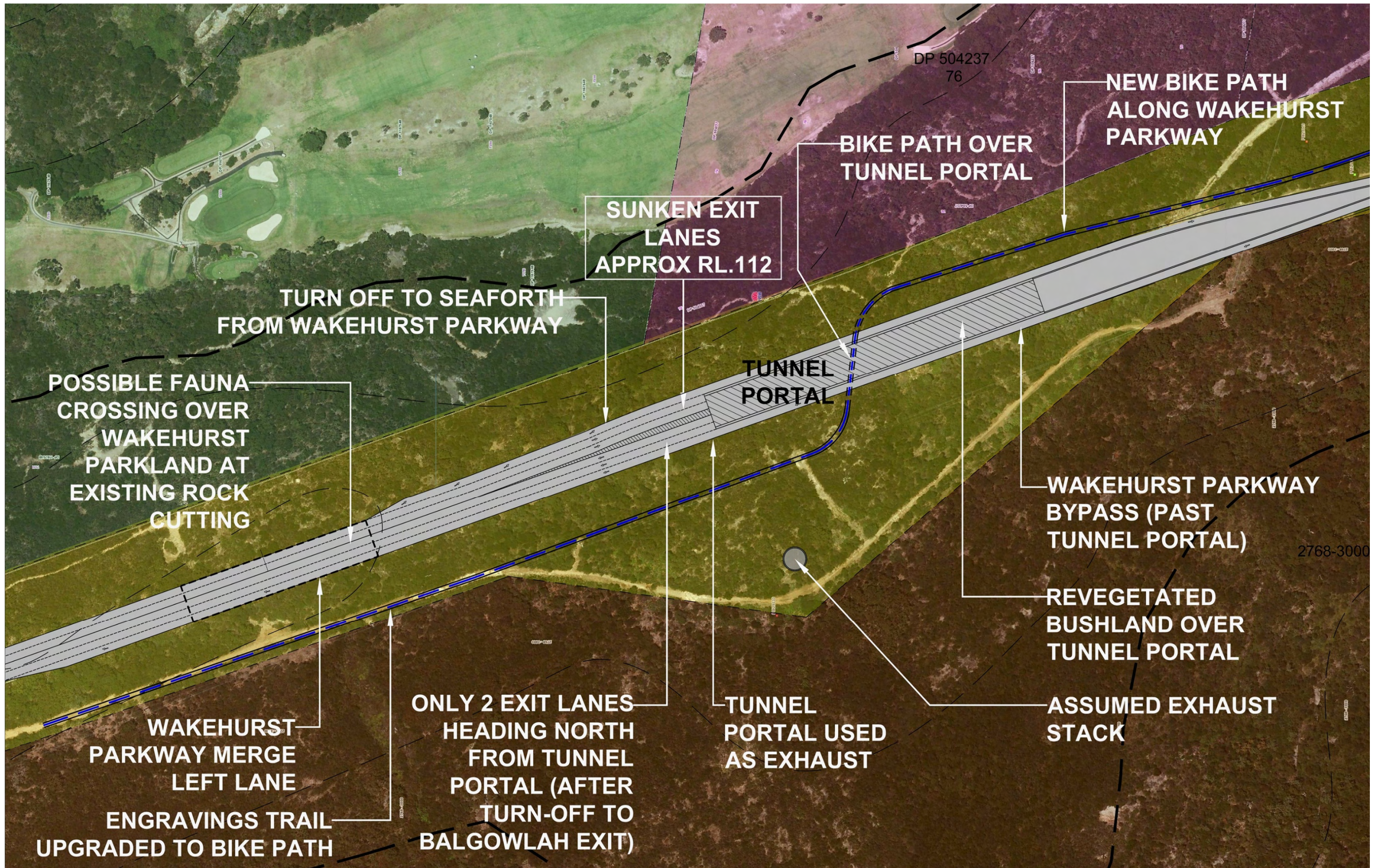
- The introduction of Substantive Vegetated links between the Garigal National Park and the Manly Warringah War Memorial Reserve to act as Fauna crossings
- The provision of bicycle paths linking the two parks.
- The potential provision of a bicycle path linking North Seaforth to Frenchs Forest
- The potential to link existing Mountain Bike trails both sides of Wakehurst Parkway.
- The potential to link the parks to allow better public access, amenity and utilization of the parks, particularly the existing National Park west of Wakehurst Parkway. Visual Amenity The "sinking" and re-vegetation of the tunnel portal will lessen the visual impact of the new infrastructure on the sensitive Garigal National Park and the Manly Warringah War Memorial Reserve parkland settings.

The proposal is likely to achieve a net retention and possibly an Increase in vegetated ground cover, through the strategy of sinking and landscaping the tunnel portal and sections of the Wakehurst Parkway to create vegetated Fauna Crossings.

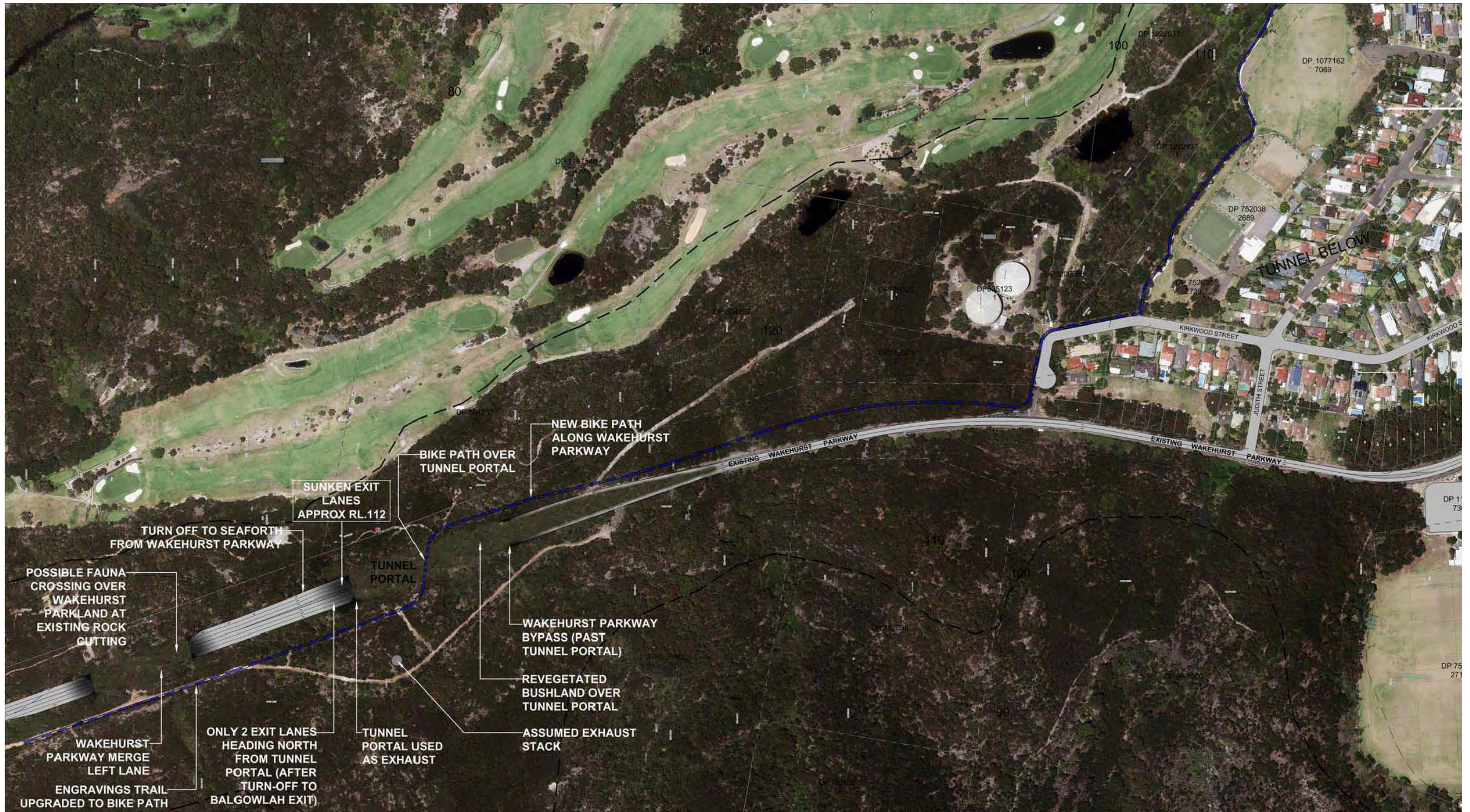
The proposal provides solutions to serious issues relating to tunnel exhaust and portal locations, tunnel grade and safety, disruption to personal and public infrastructure and destruction of environmentally sensitive bushland, and provides a public benefit windfall as part of the solution. It provides a much better outcome for the proposed infrastructure in the bushland setting



**ALTERNATIVE TUNNEL PORTAL AND EXHAUST STACK - NORTH SEAFORTH
(INCORPORATING VEGETATED FAUNA CROSSING)**



ALTERNATIVE PROPOSAL NORTH SEAFORTH PORTAL – CLOSE -UP



**ALTERNATIVE PROPOSAL NORTH SEAFORTH PORTAL
AERIAL VIEW SHOWING PROPOSED VEGETATED FAUNA CROSSING AND BIKE PATH**

BALGOWLAH PORTAL (SERPENTINE CRESCENT)

The proposal for the Balgowlah Portal seeks primarily to eliminate the proposed exhaust stack at this location. The elimination of the exhaust stack is considered necessary due to the portals location at the low point of the valley, and its proximity to homes, schools and day care centres. All exhaust emissions are proposed to be exhausted at the North Seaforth end, where the portal and exhaust stack would be relocated further north along the Wakehurst Parkway, well away from existing residential areas and sporting fields.

The RMS have indicated that the energy and on-going running costs required to stop and turn the airflow in a tunnel even as short as 500m long and redirect it in the opposite direction back to the main tunnel, would be excessive. Tunnels rely primarily on the movement of traffic within the tunnel to move air in the tunnel. The alternative proposal shown below, seeks to utilise a circular interchange which would use the flow of traffic entering and exiting the Tunnel Portal to turn the ventilation flow back into the main tunnel. The flow works to draw fresh air into the tunnel at the interchange (no exhaust).

The interchange would be constructed lower below the level of the existing Burnt Bridge Deviation, the Balgowlah Golf Course and the existing Burnt Bridge Creek. The tunnel would be constructed well below the level of the houses in Serpentine Crescent so these would be retained. The entry and exit ramps would alternatively be constructed within the existing Burnt Bridge Road reserve. The portal interchange would be constructed below ground level. This area would be covered and revegetated on completion of the works created a vegetated link between North Balgowlah and the Golf Course. The existing Burnt Bridge Deviation would reduce in size (due to the substantial decrease in through traffic) and pass over the new vegetated link. The relocated deviation could be constructed first to allow thru traffic to continue during the construction of the portal interchange below.

The proposal seeks to:

- Eliminate Exhaust Emissions from the Balgowlah Portal
- Avoid the need to resume private land and homes
- Sink the portal to screen it visually and negate the negative impacts of noise and poor visual amenity
- Retain and enhance the existing watercourse and natural bushland setting.
- Reinststate a vegetated link between North Balgowlah and Balgowlah, which was lost due to the construction of the Burnt Bridge Deviation.
- Reintroduce bicycle and pedestrian links and eliminate the existing underpass.



ALTERNATE OPTION- BALGOWLAH TUNNEL PORTAL (GROUND SURFACE LEVEL)



ALTERNATE OPTION- BALGOWLAH TUNNEL PORTAL (UNDERGROUND LEVEL)