

Harbour Board stipulated that the length of the structure should be increased to approximately 5,340 ft. to minimize detriment to St. Mary's Bay boat harbour. On the northern side the approaches consisted of a long causeway from Northcote to Stanley Bay, via Bayswater Point. An expensive feature of this scheme was that two bridges, totalling 1,700 ft. and possibly 2,000 ft. in length, had to be provided to preserve the tidal flow into and out of Shoal and Ngataringa Bays. A present-day estimate for the bridge and its approaches, by the Fanshawe Street - Northcote - Bayswater - Stanley Bay route, would be not less than £3,400,000.

Turning to the alternative of a tunnel, evidence was tendered to us respecting the estimated cost of a two-way vehicular tunnel on the same site as the bridge. The data available as to level of bedrock, while sufficient for an approximation, were not comprehensive enough to fix a firm figure, but the probable cost was stated by an experienced engineer to be of the order of £4,000,000, and this for a tunnel only 6,300 ft. long with 8-per-cent. grades. In our opinion, however, a better route, from the point of view of traffic distribution and city expansion, would be from Parnell to Devonport. As the depth of rock was unknown over the greater part of this route, the Government, at the request of the Commission, met the cost of surveys and borings, which, while not extensive enough for detailed design purposes, were sufficient to determine, with a reasonable degree of accuracy, the length and grades of a vehicular tunnel. Two types were considered:—

- (i) Bored entirely in rock.
- (ii) Part length bored in rock and the remainder prefabricated, floated to site, sunk, and jointed in a dredged channel.

An essential feature of a tunnel is that it must be at such a depth as will not cause interference with port development. Regard being had to this, and in the light of the information provided by the borings, the best route appeared to be as follows: the southern portal is located on Strand Road near the railway-station, about a quarter of a mile from the foreshore. Here there is room for a spacious plaza. This location is very suitable from the point of view of city traffic distribution. Passing under the railway-tracks near Campbell's Point overbridge, the route of the tunnel lies slightly to the west of the eastern tide deflector, in which position it will be well clear of future wharves. Crossing the harbour channel nearly at right angles, it passes under the northern foreshore at a level that ensures that there will be no interference with future wharves or quays. The northern portal is located on the foreshore of Ngataringa Bay close to the foot of Alison Avenue.

The invert of a tunnel bored in rock with adequate cover would be about 170 ft. below high-water level. The probable lengths of the two types of tunnel, allowing grades not exceeding 1 in 20, would be—

- (a) Bored in rock, 10,000 ft.
- (b) Part bored and part pre-cast, 9,300 ft.

It is emphasized that these figures are approximate only, and much more detailed investigation would be necessary before the precise length, or the most economical type, of tunnel could be decided upon; but they indicate that the probable cost of either type would be not less than £3,500,000, and possibly £4,000,000. This outlay would provide a single two-way tunnel with 23 ft. roadway; but for a considerably lesser sum it is possible, in our opinion, to provide a four-way bridge with more than treble the traffic-carrying capacity. Furthermore, the costs of maintenance, including drainage, lighting, ventilation, and traffic control, would be considerably higher for a tunnel than for a bridge. Various proposals for tunnels, accompanied by estimates of costs arrived at by comparisons with existing tunnels in other countries, were placed before the Commission by witnesses who had virtually no information as to the depth