

LINKING SYDNEY WITH NORTH SYDNEY.

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HISTORICAL.

To link Sydney with North Sydney, floating bridges, swing bridges, high level bridges, subaqueous bridges, tunnels, and subaqueous tube tunnels have been advocated.

In 1878 Mr. W. C. Bennett, then Commissioner for Roads and Bridges, stated that he favoured a floating bridge from Dawes' Point to Milson's Point to carry vehicles, passengers, and, if necessary, a railway train.

In 1879 Mr. T. S. Parrott prepared a sketch design of a truss bridge of seven spans from Dawes' Point to Milson's Point, the longest span being 500 feet.

In 1880 negotiations were opened between the Government and Mr. J. E. Garbett, representing a company which was prepared to construct a high-level bridge to the North Shore at a cost of £850,000 upon condition that the Government guaranteed, for a period of thirty years, an amount equal to $3\frac{1}{2}$ per cent. upon the cost of construction. On the 26th October, 1881, the late Sir Henry Parkes, then Premier, signed a Cabinet Minute to the effect that "the Ministers (nine) present agreed that Mr. Garbett's proposal, as explained in his letter, be accepted by the Government," and in March, 1882, Mr. Garbett deposited a sum of £5,000 as security. Owing to a change of Government, however, nothing further was done, and the deposit was returned in the following year.

Sir John Fowler prepared plans for a Suspension Bridge to Milson's Point for vehicular traffic, at an estimated cost of £400,000.

Tunnel connection to North Sydney was first proposed by Mr. C. O'Neill, M.Inst.C.E., in conjunction with Mr. Gipps, C.E. His proposal was made in January, 1885, and in 1887 the Government was asked to guarantee 4 per cent. on £450,000, the cost of the two tunnels proposed—one for railway traffic and one for road traffic.

In January, 1888, a deputation waited upon the late Sir Henry Parkes to urge the construction of a bridge as an undertaking fitting to mark the Centenary of the Colony.

Public agitation continued, and in response thereto, in March 1890, the Government appointed a Royal Commission to inquire into the proposed extension of the Railway into the City and the North Sydney Connection. Eight schemes were submitted for connecting North Sydney by bridge, whilst at least four witnesses favoured a tunnel.

The Royal Commission reported "that at present it was inexpedient to connect the North Shore with Sydney by means of a bridge or tunnel, but the Commission is of the opinion, upon the evidence before it, that, if it should be found necessary to connect North Shore with Sydney, it should be by means of a high-level bridge, and that if it were possible to throw a bridge across in one span, such plan should be adopted."

No action was taken on the report of the Royal Commission of 1891.

From 1896 to 1899 the North Sydney Connection was brought prominently forward by private enterprise. Four bills were under consideration by Parliament, two for communication by tunnel, Mr. J. Sulman, F.R.I.B.A., promoter; and two for communication by bridge, Mr. D. C. Simpson, M.Inst.C.E., being the promoter for one and Mr. William Kenwood for the other. No progress was made with any of these bills.

After two deputations had urged that the construction of the bridge be put in hand by the Government, or failing that, by private enterprise, the Hon. E. W. O'Sullivan, then Minister for Public Works, on the 4th January, 1900, called for competitive designs and tenders. None of the designs received were considered sufficiently satisfactory, consequently the acceptance of a tender could not be recommended.

On March 25th, 1901, the Hon. E. W. O'Sullivan appointed an Advisory Board, the Chairman of which was Mr. J. Davis, M.Inst.C.E., now Director-General of Public Works. This Advisory Board called for tenders, and on the 25th November, 1903, presented their report and recommended for selection the design and tender of Messrs. J. Stewart & Co., which was for a cantilever bridge, from Dawes' Point to McMahon's Point, having a main span of 1,350ft. between centres of piers; the northern shore arm was 580ft. long, and the southern shore arm 500ft. long. On the northern side were two approach spans, each of 270ft., but on the southern side there were no approach spans. The deck consisted of a wood-blocked roadway, 35ft. wide between kerbs, on the eastern side of the bridge; next to this a double line of tramway upon an open deck; and

next to the tramway, and adjacent to the western cantilever, a double line of railway, also upon an open deck. There was also a footway, 10ft. wide, on either side of the bridge, outside the cantilevers.

The designs and estimates for the approaches to the main bridge were made by the Public Works Department. The total estimated cost of bridge and approaches was as follows:—

	£
Main bridge, 3,030ft. long, Messrs. J. Stewart & Co.'s tender	1,365,050
Southern approach, including railway to connect with proposed City Railway at Crescent Street and roadway to Prince's Street at the intersection of the Argyle Cut	330,000
Northern approach, including railway to connect with existing line at Bay Road Station, and roadway to Blue's Point Road at the intersection of George Street	180,000
	<hr/>
	£1,875,050
Land Resumption	65,000
	<hr/>
Total estimated cost of bridge and approaches ...	£1,940,050

This included a total length of railway of 154 chains, and of roadway and tramway of 82 chains.

The investigation by the Advisory Board was very complete, and at the conclusion of their inquiry in November, 1903, the matter had reached such a stage that, with the condition laid down in the last paragraph of their recommendation, viz.: "That it be made a condition of the contract that before any portion of the work is commenced, full working plans are to be supplied by the contractors, and that these are to be submitted to and approved of by us." A tender for the bridge could then have been accepted.

In connection with these competitive designs and tenders, the name of the late Mr. Norman Selfe, M.Inst.C.E., should be remembered. Mr. Selfe and the Vereinigte Maschinenfabrick Augsburg and Maschinenbaugesellschaft Nurnberg were the authors of the design of Messrs. J. Stewart & Co., which was recommended for acceptance by the Advisory Board.

The Report of the Advisory Board was presented at a time of temporary financial depression, and no action was taken to accept the design and tender recommended by the Advisory Board.

The next progress was made on the 11th May, 1908, when the Royal Commission on "Communication between Sydney

and North Sydney" was appointed to make full and diligent inquiry into the expediency of providing increased and improved facilities of communication between Sydney and the suburbs on the northern side of Sydney Harbour, from the point of view of passenger, vehicular, and freight traffic, and to suggest what, in their opinion, is the best practical method of establishing direct communication between the northern and southern side of the harbour, which will, at the same time avoid obstruction to harbour navigation, and also the best route for such direct communication.

This Royal Commission presented its report on March 29th, 1909, and, inter alia, reported:—

"The best practical and most economical method of establishing direct communication, which will avoid obstruction to harbour navigation, is by subways. A depth of 40 feet of water at low water above the subways was provided for. The railway and tramway subways should permit of rolling stock of standard dimensions being used with electricity as a motive power.

"The following railway, tramway, and vehicular subway schemes are recommended for adoption:—

"Railway subway scheme from Lavender Bay, via Kirribilli Point (Beulah Street) and Fort Macquarie to Moore Street. Estimated cost, £753,000.

"Tramway subway scheme from Arthur Street, North Sydney, via Milson's Point and Dawes' Point, to loop at Barton Street, Circular Quay. Estimated cost £460,000.

"Vehicular subway scheme from Arthur Street, North Sydney, via Milson's Point and Dawes' Point, to connect at Pottinger Street with the new road proposed by the Sydney Harbour Trust Commissioners. Estimated cost, £502,000."

On 14th December, 1909, the Railway Subway Scheme, from Lavender Bay via Kirribilli Point and Fort Macquarie to Moore Street, was referred to the Parliamentary Standing Committee on Public Works. The cost estimated by the Royal Commission was £753,000, but the Departmental estimate, which provided for the Chief Commissioner's requirements was £1,101,476. Parliament expired by effluxion of time in 1910, before the Public Works Committee completed their inquiry.

At this time the Department considered a subway would give greater facilities for the railway traffic than the bridge, because, via the subway, trains from North Sydney could traverse not only the western side of the city, but also the eastern side, and could be taken direct to the Eastern Suburbs, Show Ground, Cricket Ground, &c., whereas by bridge it was thought that all passengers, except those for the western side of the city, would have to change trains at Wynyard Square.

After a deputation from the Master Carriers' Association had waited on the Acting Premier, asking that a bridge should be constructed for the vehicular traffic, the Honorable Arthur Griffith, Minister for Public Works, announced in Parliament on 19th July, 1911, that "Cabinet had that day decided that a definite proposal for a bridge to carry tramway, vehicular, and pedestrian traffic, but not a railway, should be submitted immediately to the Public Works Committee, and concurrently with that, a proposal for a subway to connect the North Sydney Railway system with the city system."

In pursuance of that announcement, on November 30th, 1911, the Minister for Public Works moved:—

- (a) "That it be referred to the Parliamentary Standing Committee on Public Works to consider and report upon the expediency of connecting Sydney and North Sydney by means of a bridge."

The bridge and approaches from Dawes' Point to McMahon's Point, to carry tramway, vehicular and pedestrian traffic only, at an estimated cost of £1,592,000, are as recommended by the Advisory Board, except that provision for railway traffic has been omitted. The estimated cost, when revised in 1912, amounted to £1,730,400.

The bridge proposed consisted of steel cantilevers, forming three spans, viz.: 500ft., 1,350ft., and 580ft.; also two deck girder spans of 270ft. each on the northern side, the clear waterway between main piers being 1,200ft., the central 600ft. of this waterway to have a clear headway above high water of 170ft., reduced to 150ft. near the main piers; the approaches to consist of reinforced concrete arch spans.

- (b) "That it be referred to the Parliamentary Standing Committee on Public Works to consider and report upon the expediency of constructing a subway from Circular Quay, via Fort Macquarie and Kirribilli Point to Lavender Bay, for the purpose of affording railway communication between Sydney and North Sydney."

The subway provides for a double track electric railway on the route recommended by the Royal Commission on the "Communication between Sydney and North Sydney," but with the station on the City side at Circular Quay instead of at Mære Street. The ruling grade is 1 in 39.16 on the City side, and 1 in 50 on the North Sydney side. The subaqueous tunnel is of the type recommended by the Royal Commission, having a depth of 40 feet of water over the top of the tunnel at low water. The estimated cost, exclusive of power, rolling stock, &c., is £1,046,474.

- (c) In December, 1911, the Honourable Arthur Griffith, Minister for Works, gave the Author, then Principal Designing Engineer, permission to submit to the Public Works Committee a proposal for a bridge from Dawes' Point to Milson's Point without any piers in the fairway.

ROUTE OF BRIDGE.

Three routes, linking the main avenues of traffic, are obviously feasible, viz. :—

- Dawes' Point to McMahon's Point.
- Dawes' Point to Milson's Point.
- Fort Macquarie to Kirribilli Point.

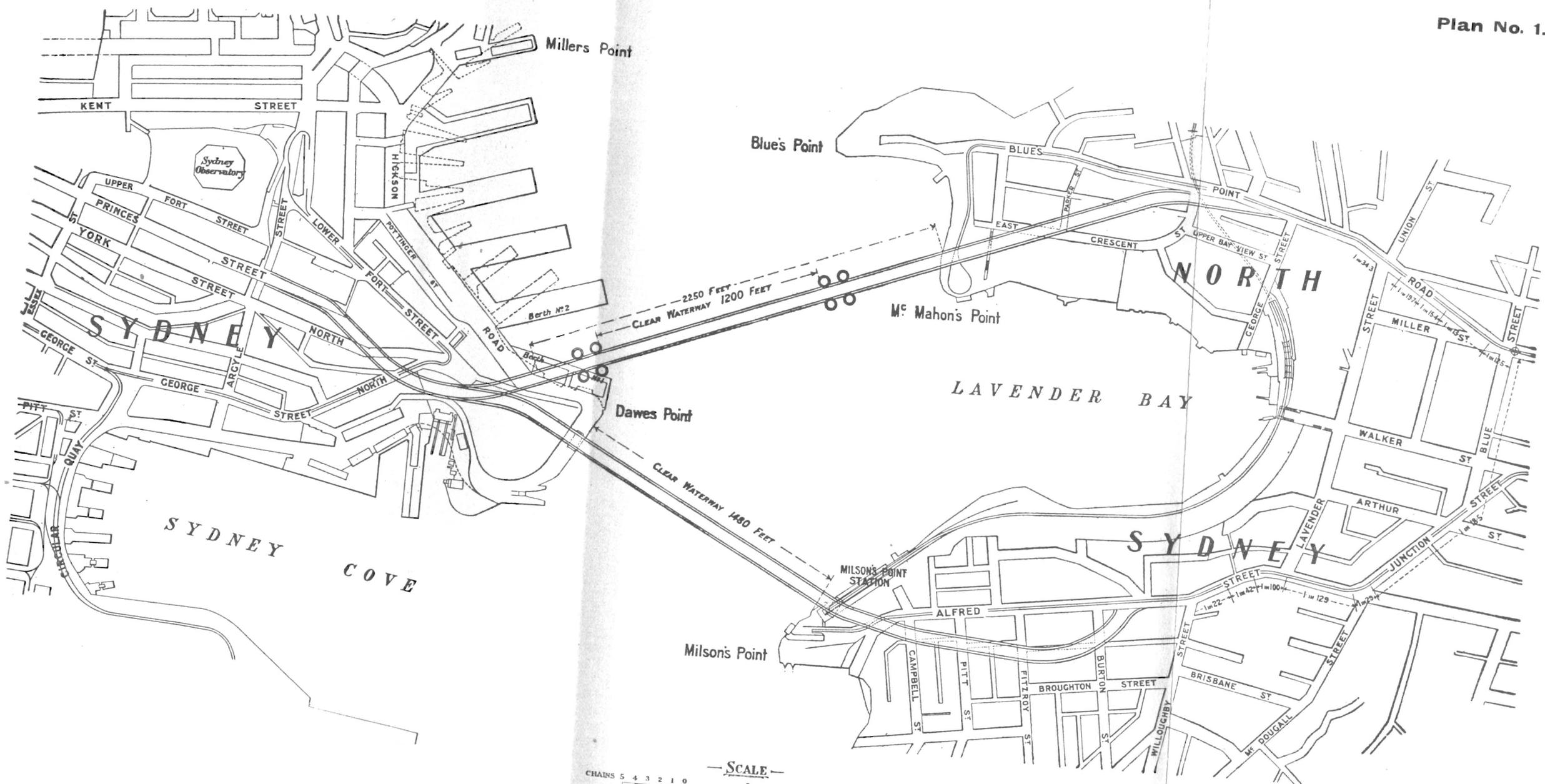
Dawes' Point to McMahon's Point.—In giving evidence before the Royal Commission appointed in 1890 to inquire into the proposed extension of the railway into the City and the North Shore Connection, Mr. Henry Deane, M.Inst.C.E., Acting Engineer-in-Chief, proposed a bridge from Dawes' Point to McMahon's Point. The late Mr. Norman Selve, M.Inst.C.E., also proposed a bridge on the same route. Similar evidence was given before the Royal Commission appointed in 1896.

In 1901 the Sydney Harbour Bridge Advisory Board, of which Mr. Deane was a member, adopted the route from Dawes' Point to McMahon's Point. In calling for competitive designs and tenders the Advisory Board proposed to place the two main piers in the harbour fairway, and fixed the clear span of the bridge at 1,200 feet.

At that time the wharves along Miller's Point were small, irregular-shaped wharves, which have since been replaced. The new wharves are shown on Plan No. 1, whilst the wharves existing in 1901 are shown dotted.

In the past decade there has been a great increase in the size of steamships, and the following table, compiled from a paper by Dr. Corthell, before the 12th International Congress of Navigation, Philadelphia, 1912, gives the average dimensions of the 20 largest steamships for each decade since 1851 :—

Year.	1851.	1861.	1871.	1881.	1891.	1901	1911.
Length	245 ft.	310 ft.	365 ft.	460 ft.	507 ft.	599 ft.	740 ft.
Beam	37 ft.	41 ft.	44 ft.	45 ft.	54 ft.	65 ft.	84 ft.
Draught (loaded)	19 ft.	22 ft.	24 ft.	24 ft.	27 ft.	32 ft.	34 ft.
Tonnage	1,700	3,000	4,200	4,900	6,980	14,150	29,000
Speed (knots) ..	9.2	10	12	15	17	19	20



— SCALE —
 CHAINS 5 4 3 2 1 0 5 10 15 CHAINS
 MAP OF SYDNEY AND NORTH SYDNEY SHEWING SCHEMES.

THE LARGEST STEAMSHIPS AFLOAT TO-DAY ARE AS FOLLOWS:—

Name of Ship.	Year when built.	Owners.	Length over all.	Breadth	Gross Tonnage.	Draught Loaded.	
			feet.	feet.		ft.	in.
"Lusitania" ...	1907	Cunard	785	88	32,000	32	6
"Mauretania" ...	1907	Cunard	790	88	32,500	33	6
"Olympic" ...	1910	White Star	883	92	45,000	34	6
"Aquitania" ...	1913	Cunard	902	97	47,000	34	0
"Imperator" ...	1912	Hamburg-America	905	98	50,000	35	0

The "Vaterland," launched in April last is yet larger than the "Imperator," whilst a still larger vessel is on the stocks.

At no very distant date vessels of similar tonnage may trade to this port. The White Star liner, the "Ceramic," is the largest vessel to do so at present, and her dimensions are:—Length 675ft. over all, beam 69ft., draught 34ft. 6in., tonnage 18,270.

The location of the design recommended by the Advisory Board is shown on Plan No. 1, and the elevation and cross-section on Plan No. 2. The conditions have changed since the recommendation was made, and the bridge, if built, must inevitably prove an obstruction to shipping. The Southern Pier would render valueless No. 1 berth, which the Harbour Trust estimate to be worth £94,600, with a rental value of £5,000 per annum, and would also prove a serious obstruction to No. 2 berth, whilst in view of the great increase in length of steamers during recent years, as shown by the preceding table, the Northern Pier would be a menace to navigation, and there would always be the danger of the bridge being wrecked by the collision of a large vessel with one of the piers.

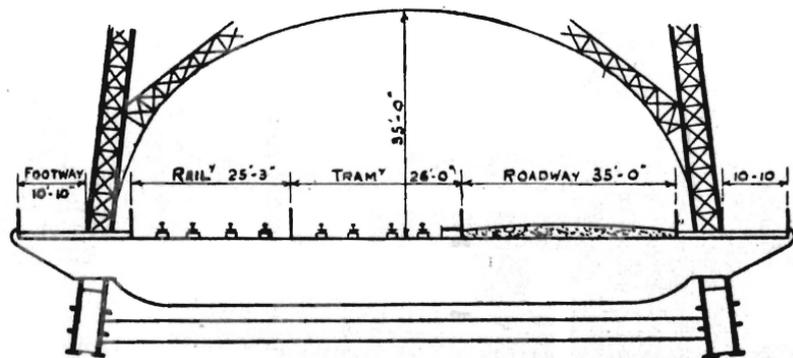
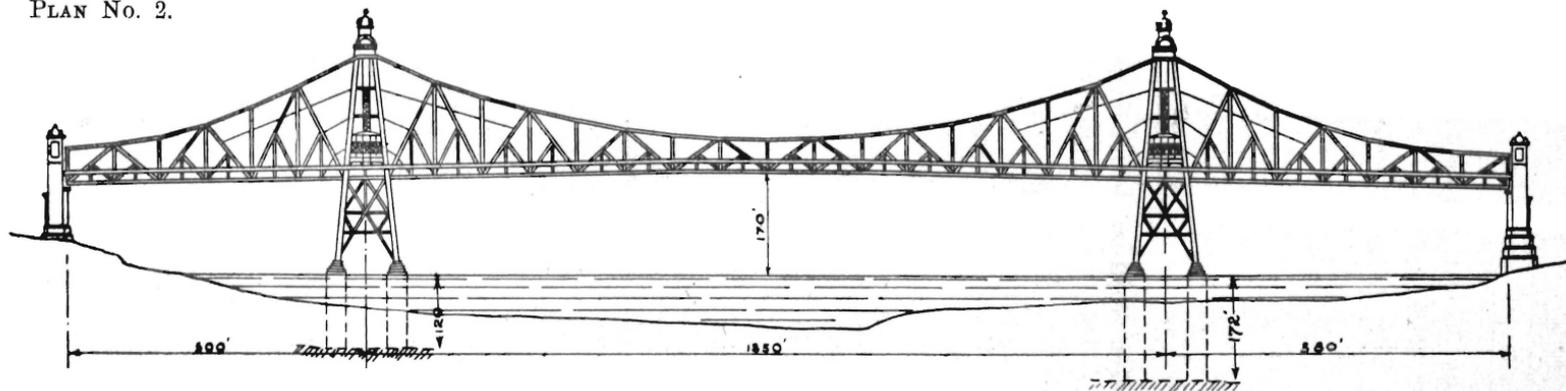
The distance from shore to shore is about 2,250 feet, and it has yet to be demonstrated that it is practicable to build a bridge to carry the heavy concentrated loads of a railway with a clear span of that length; in any case, the cost would be very great.

Dawes' Point to Milson's Point.—A bridge on this route would serve the thickly-populated parts of North Sydney better than a bridge to McMahon's Point, and with easier grades for the vehicular traffic. The clear span would be 1,600 feet, centres of piers. A railway bridge of this span is quite feasible, and would cost only half that of a bridge of 2,250 feet clear span. There would be no obstruction whatever to the fairway, as both piers are founded on solid rock on either shore, vide Plan No. 1.

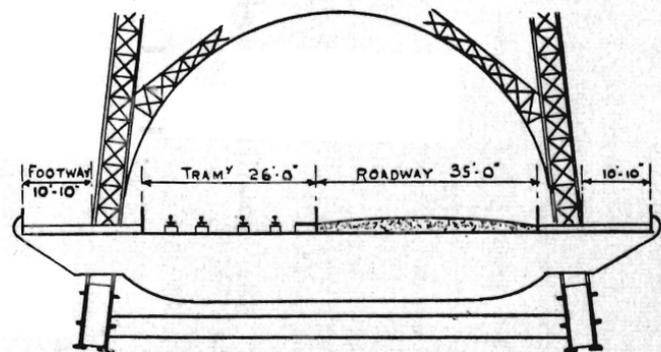
SYDNEY HARBOUR BRIDGE, DAWES' POINT TO McMAHON'S POINT.

Design Recommended by the Advisory Board, 1903.

PLAN No. 2.



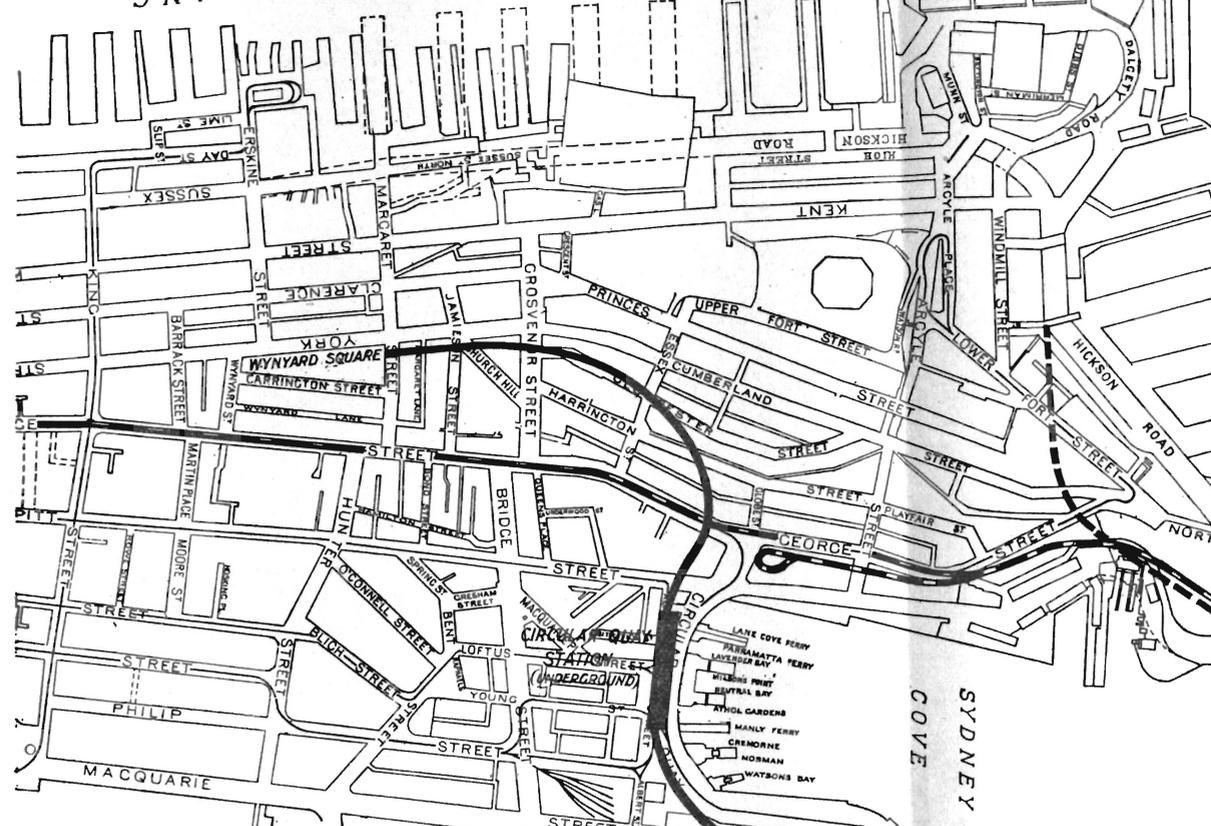
CROSS SECTION WITH RAILWAY,
as approved by Advisory Board.



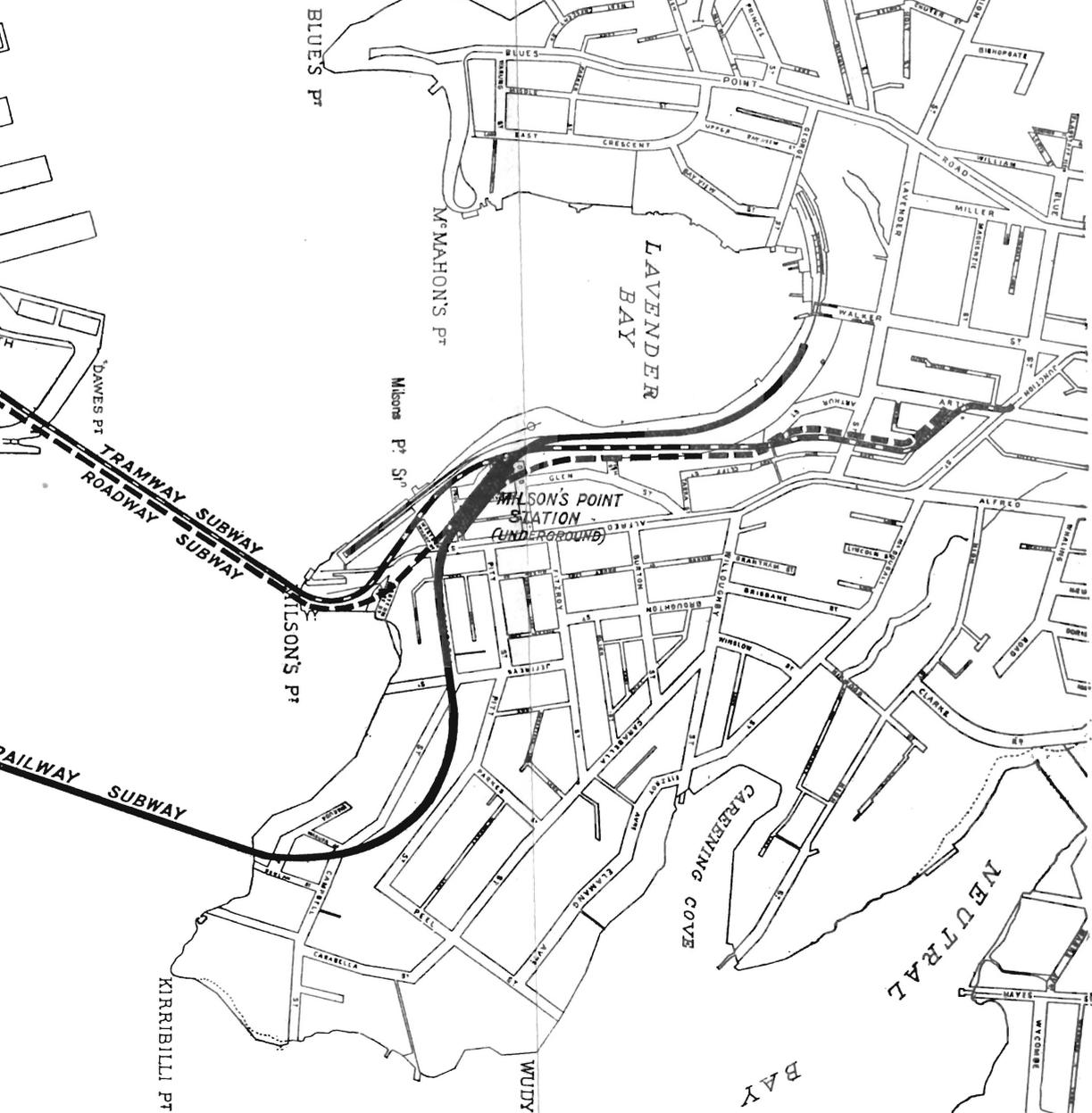
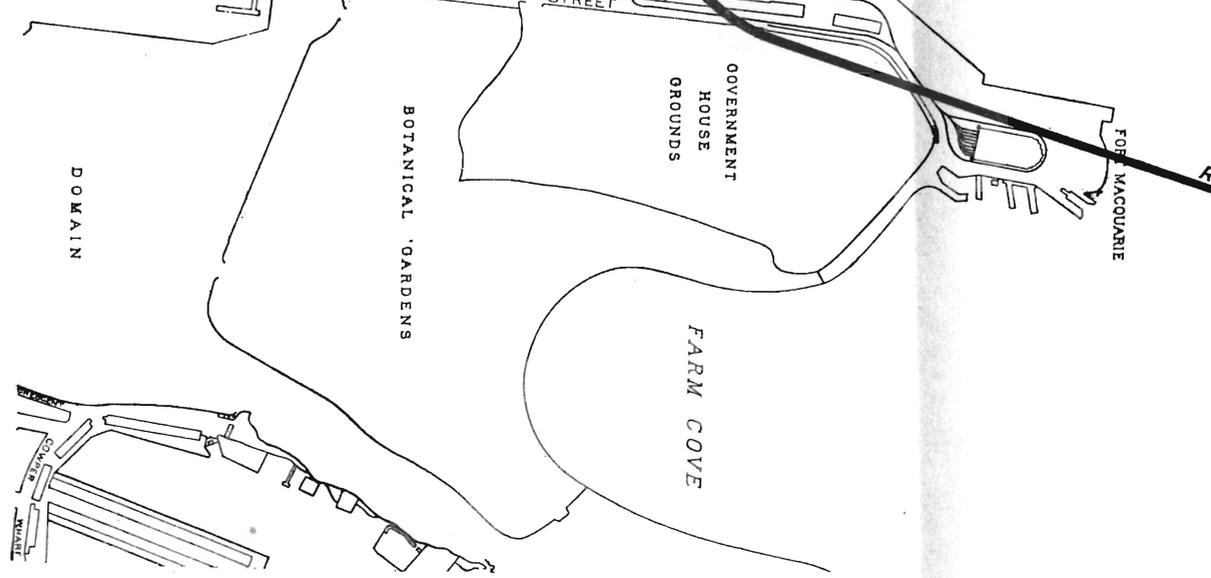
CROSS SECTION WITHOUT RAILWAY,
as Submitted to Parliament.



DARLING



— PLAN N^o 3 —
 — SHEWING —
LOCATION OF SUBWAYS AS RECOMMENDED
BY ROYAL COMMISSION ON COMMUNICATION
BETWEEN SYDNEY AND NORTH SYDNEY.



BERRYS BAY

LAVENDER BAY

NEUTRAL BAY

DOMAIN

BOTANICAL GARDENS

GOVERNMENT HOUSE GROUNDS

FARM COVE

SYDNEY COVE

RAILWAY SUBWAY

TRAMWAY SUBWAY ROADWAY SUBWAY

BLUES Pt

McMAHON'S Pt

MILSON'S Pt

MILSON'S Pt

KIRIBILLI Pt

WUDY

CARRING COVE

BAY

WILSON'S POINT STATION (UNDERGROUND)

CIRCUITRY STATION (UNDERGROUND)

