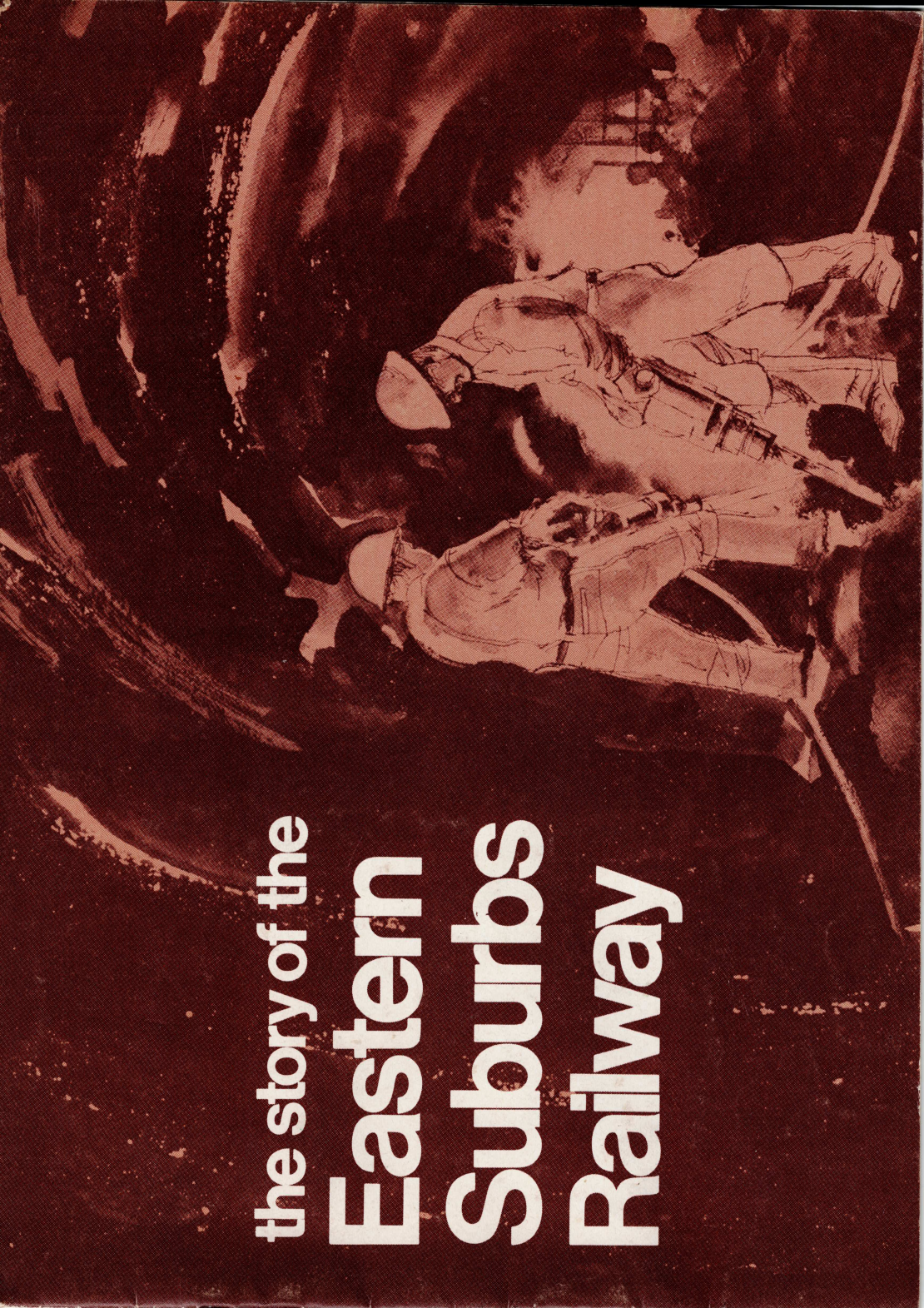
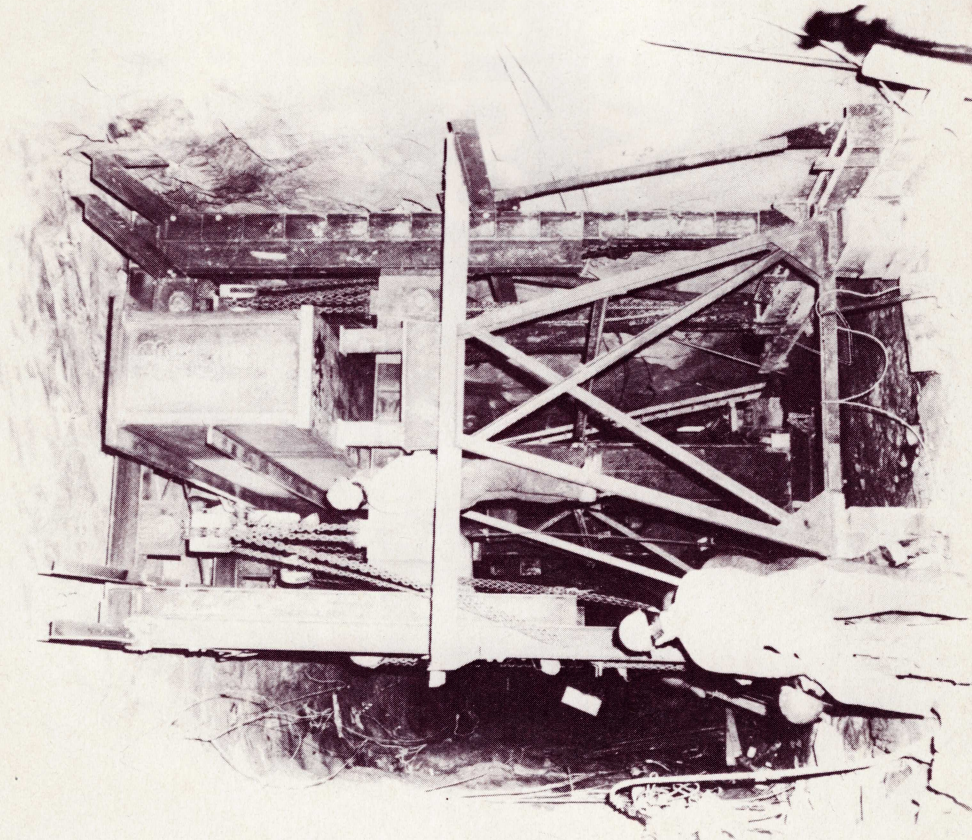


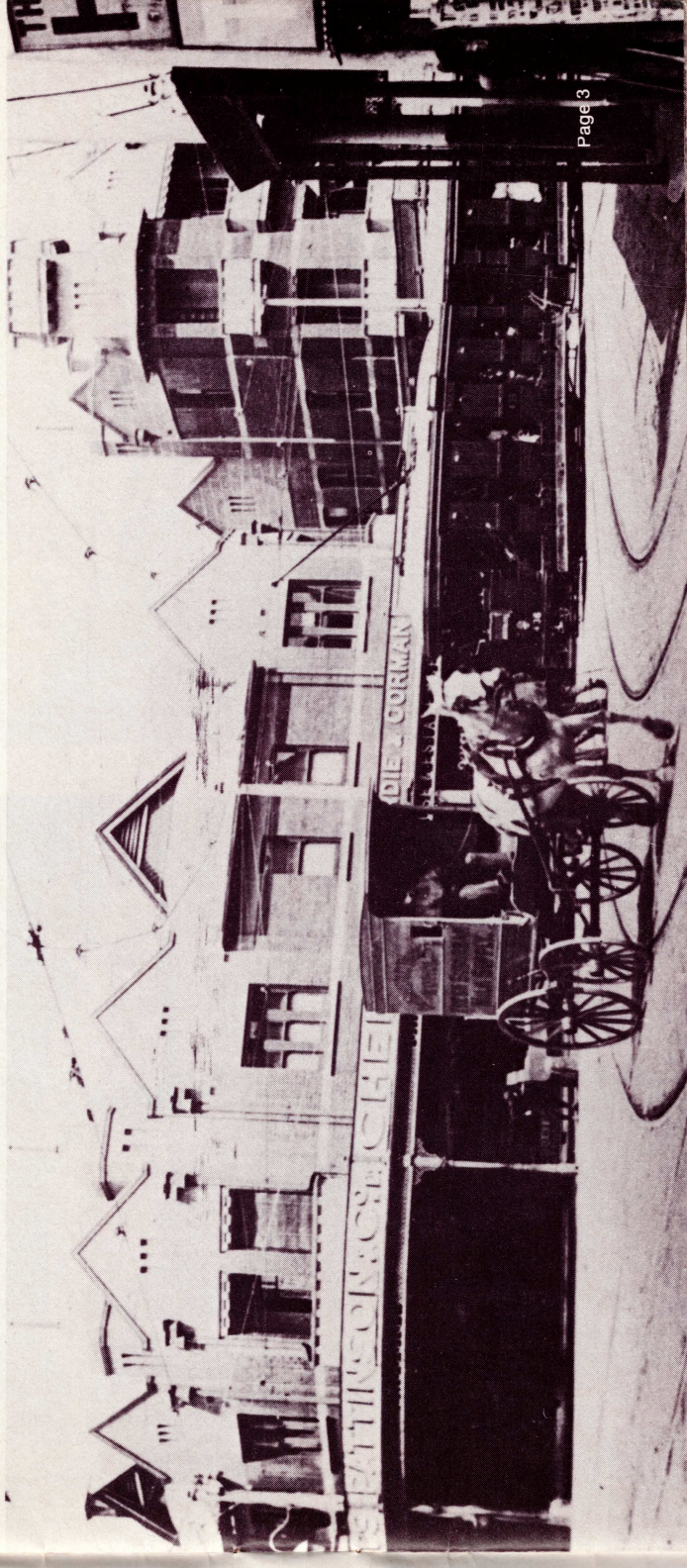
A sepia-toned illustration of two railway workers in a tunnel. The workers are wearing hard hats and work clothes, and are looking down at something on the ground. The tunnel is dark and rocky, with some light coming from the background.

the story of the Eastern Suburbs Railway



Early History

Bondi Junction, late last century.



The idea of a railway serving the Eastern Suburbs has inspired generations of planners and politicians and sparked off a score of Royal Commissions and committees of inquiry.

Back in the last century, the Sydney railway terminal was called Redfern Station, which was located on what today is the southern side of Devonshire Street (Redfern Station, as we know it, was called Eveleigh).

The first proposals for an Eastern Suburbs line were associated with demands that the rail terminal be extended into the city proper.

But in those years (and for many years after) Sydney provided only a quarter of the population of New South Wales, and the politicians of the day were aware of what this meant to them.

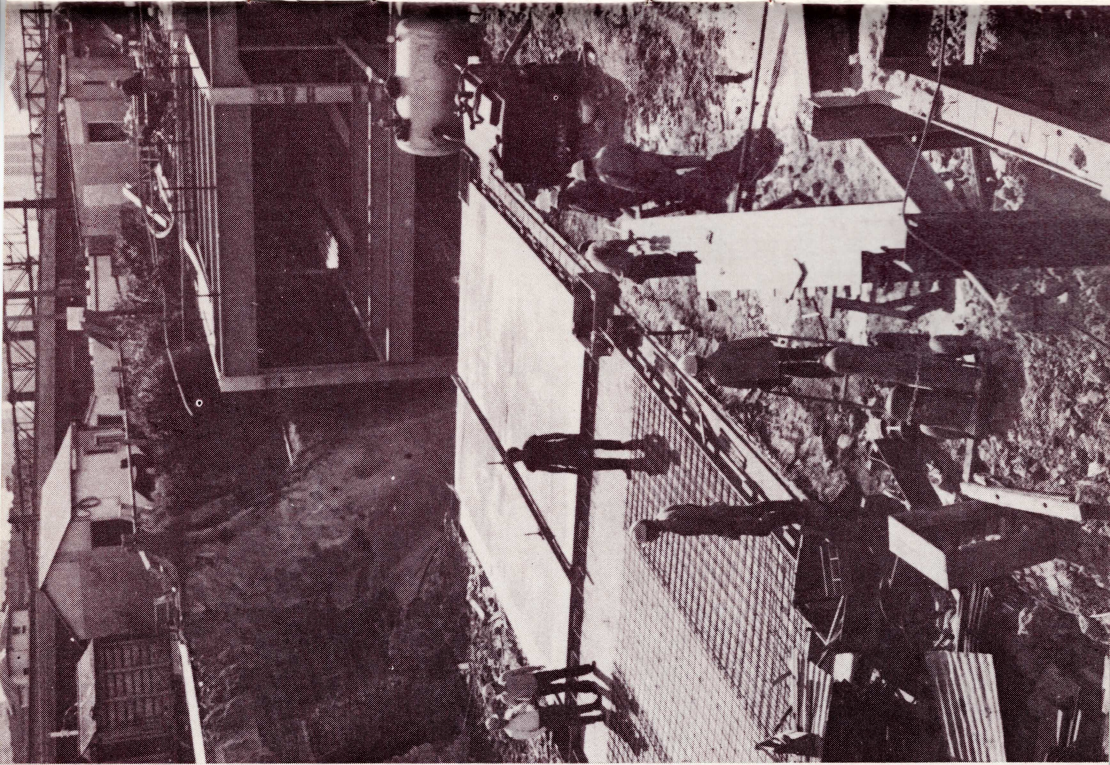
A typical view was that of John Sutherland, Minister for Works, when in 1868 he was asked to extend the railway from Redfern into the city. Although representing the electorate of Paddington (where the voters favoured a railway), he pointed out that the amount needed to build a railway from Redfern into the city proper would be enough to extend the Western line from Bathurst to Orange.

Sutherland's priorities were borne out by events: the railway reached Orange in 1877 but did not get to St James until 1926.

Strong opposition came also from powerful country interests and the first suburban railways could only get Parliamentary approval if they formed part of a line to the country.

The first suburban railway — nine miles from Redfern to Hurstville — was opened in 1884, and two years later it had reached Waterfall. The Strathfield/Hornsby Line was opened in 1886 and extended to the Hawkesbury shortly after. Both these lines were proposed to Parliament on the basis that they formed part of the Illawarra and Northern lines — but there was no way in which an Eastern Suburbs line could be part of a country service.

Central Station, work recommenced.



Another limiting factor was the small population of the Eastern Suburbs — and numbers are important if a city railway is to be viable.

In 1871 the boroughs of Paddington, Woollahra, Waverley and Randwick contained only 11,000 people. Twenty years later their population had risen to only 45,000.

Waverley, for example, had shown a population increase of 300 per cent to 9,000 over the ten years to 1891, living in 1,900 houses. But only one-fifth of its area had been built on. The first real attempt to persuade Parliament to provide public transport for the Eastern Suburbs came with a draft bill of 1873 to authorise the building of a horse-drawn tramway from Redfern to the city and to the Eastern Suburbs. This was passed on to a sub-committee for consideration and there it was lost: the fate of many a proposal over the years to come.

But given the cost-saving option of building a tramway system to link the city with the Eastern Suburbs, the Government of the day was quick to seize it.

Despite opposition from private transport operators The Tramways Extension Bill was passed early in 1880. The first line from Liverpool Street to Randwick Racecourse was opened in September, 1880, with an extension to Randwick in March, 1881 — the same month as the Darlinghurst-Ocean Street line came into service. The tramway network gradually spread across the suburbs, reaching Bondi Beach in 1894, Rose Bay in 1898 and Watson's Bay in 1909.

Despite the success of the trams, a rail link continued to be urged on a series of reluctant governments. In 1890 a Royal Commission proposed the building of a city terminal and the extension of four tracks into the city terminating at Circular Quay, with provision for an extension to the Eastern Suburbs. But no action was taken — nor was there any action after another Royal Commission made similar suggestions in 1896.

Tram operating in the Eastern Suburbs in the 50's.

Central Station was built in 1906, but the agitation for a city and eastern suburbs railway continued, and plans continued to be drawn up and pigeonholed.

In 1915 Parliament approved a proposal for a city and Eastern Suburbs railway drawn up by Dr J.J.C. Bradfield, the Chief Engineer, Metropolitan Railway Construction. This entailed the building of the present City Circle loop, with provision for a rail link off this to the Eastern Suburbs via a tunnel beneath the Domain and a viaduct over Woolloomooloo to Kings Cross.

There were to be stations at Glenmore Road, Paddington, at a site near Elizabeth Street, Paddington, Woollahra, Bondi Junction, Waverley, Little Coogee (near Frenchman's Road, Randwick), Coogee (near High Street and Belmore Road), Daceyville, Rosebery, and Waterloo, linking with the Illawarra line near Erskineville Station.

The visionary Dr Bradfield (planner of the Sydney Harbour Bridge) foresaw an extension from Bondi Junction to Watsons Bay and an inner loop between Central Station and Daceyville with stations at Moore Park (serving the Sydney Cricket Ground, Sports Ground and Showground), and at Randwick Racecourse.

During the 1920s work continued on the city railway to complete the Town Hall-Wynyard link in time for the opening of the Harbour Bridge but still the Eastern extensions languished, despite regular demands for the work to begin. After paying for the city railway, the governments of the day could not find the funds to extend the work.

In 1947 an Act was passed authorising completion of the City Circle and railway extensions into the suburbs, including the Eastern link which provided for a station at Martin Place with a line going on a viaduct over Woolloomooloo to Kings Cross and eventually to Bondi Beach. Another line was to go out from St James via Taylor Square and the Cricket Ground to terminate at Kingsford, with a further extension from Taylor Square via Paddington, Woollahra, Bondi Junction, Waverley, Bronte and Clovelly to Coogee.

Now a reality

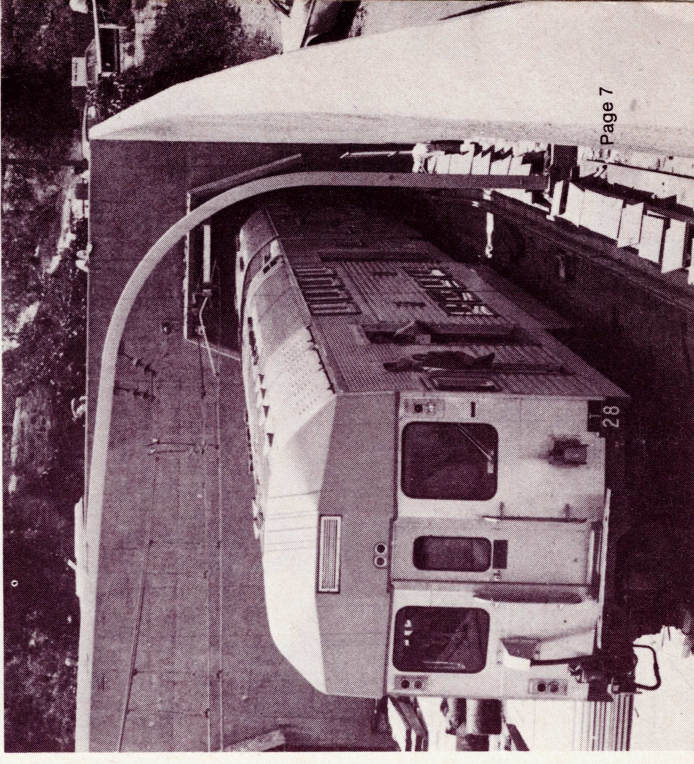
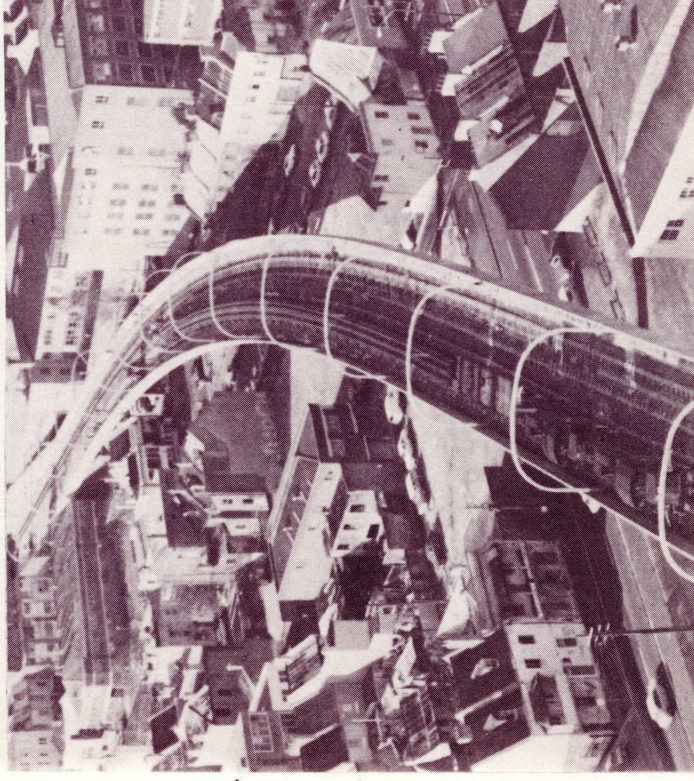
Work proceeded slowly until 1952 when a recession caused the Government to order a halt. By this time tunnels had been driven from the Domain to a point beneath Rowe Street, the Chalmers Street excavation had been completed; tunnels driven a short distance from a shaft in Prince Alfred Park, and some of the work at Erskineville and Redfern had been carried out.

In 1962 the Government commissioned a report from overseas experts De Leuw Cather and Company which recommended that the line be completed basically on the earlier route to Bondi Junction thence proceeding to Kingsford. Nothing was done on this report until 1967 when an Act covering work on the proposal was passed and work actually began.

In 1976 the Government abandoned the section Bondi Junction to Kingsford as recommended by the Urban Transport Advisory Committee and commissioned a report by an Eastern Suburbs Railway Board of Review. In November 1976 the Government accepted that Board's recommendation to proceed with the project with certain modifications to reduce costs.

The cost-saving decisions announced at this time included the elimination of the proposed station at Woollahra and reduction of station concourse areas at Martin Place and Bondi Junction.

Not all of the work of the planners of the past has been lost in the development of the new railway. The stations are close to the locations envisaged by the engineers and designers long ago, and the platforms at Town Hall Station which handle the Eastern Suburbs traffic were partly built by Dr Bradfield half a century ago as part of his city and suburban system to cater for a new line he envisaged to serve the western suburbs.



The Eastern Suburbs Railway, one of the largest engineering projects undertaken by the NSW Government in recent times, expands the operations of the Metropolitan rail network to serve the densely populated eastern suburbs of Sydney.

The main form of public transport for commuters from this area has up till now been provided by an extensive bus service since replacement of trams commenced in 1954. However, to keep pace with the increasing peak hour road traffic the new rail link offers a rapid-transit rail service which enables the movement of large numbers of passengers into and out of the city in the quickest possible time with reduced traffic congestion.

The Public Transport Commission has been responsible for construction of the whole project.

The section from Erskineville to, and including, the new Central Station was constructed by the Commission's own staff. From Central to Bondi Junction private contractors were employed for stations, tunnels and viaducts.

A number of consultants were engaged by the Commission to provide the necessary engineering and architectural design work. All track laying, signalling, sub-station installation and overhead wiring has been carried out by the Commission.

Route

From a connection with the existing metropolitan rail network at Erskineville on the Illawarra line, the new railway extends to Bondi Junction via Redfern, Central, Town Hall, Martin Place, Kings Cross and Edgecliff.

The line is all double track running completely underground in twin tunnels except for the Woolloomooloo and Rushcutters Bay viaducts and short on-grade sections at Edgecliff and Woollahra. The route distance from Erskineville to Bondi Junction is 10.5 kilometres.

Stations

New underground stations have been built at Redfern, Central, Martin Place, Kings Cross, Edgecliff and Bondi Junction. Initially Redfern Station will not be used as the railway will be at first operated as a shuttle service between Central and Bondi Junction. All of the new stations are provided with an Automatic Fare Collection system with ticket vending machines and automatic barriers.

Town Hall Station has been extended to include additional platforms. Major bus interchange terminals are provided over the stations at Edgecliff and Bondi Junction. These terminals offer passengers a direct transfer from buses to rail platforms via stairs and high speed escalators.

There are storage tunnels and facilities for terminating trains at Central, Martin Place and Bondi Junction.

The new stations, being the most modern in Australia, are bright and attractive with many sophisticated inclusions such as studded rubber platforms, special level adjusting P.A. sound equipment, excellent lighting, closed circuit T.V. surveillance equipment at Martin Place, Kings Cross, Edgecliff and Bondi Junction, and modern amenities and booking office facilities.

Brief details of stations

Central

The new platforms numbered 24 and 25, situated beneath Chalmers Street are served by four escalators.

The concourse provides access to the other electric train platforms, to country and interstate trains and to Broadway through the Devonshire Street tunnel.

The ceiling at Central is fitted with a metal-ribbed material in the station identification colour — green. Walls and columns are finished in green and white tiles and the concourse, like the platform, is paved with studded rubber.

Town Hall

The two ESR platforms numbered 4 and 5 were originally provided for during construction of the City Railway 50 years ago.

The previously uncompleted platform has been redecorated with yellow plywood ceilings, and columns have been faced with stainless steel. Four new escalators integrate the new platform with the existing Town Hall system.

Martin Place

The new station has been designed to cater for the large number of city workers who will use it during peak travelling times.

Immediately below Martin Place between Phillip and Macquarie Streets is the 'gallery' level and three escalators lead down to the concourse level between Elizabeth and Phillip Streets, and from here six escalators service the station platforms.

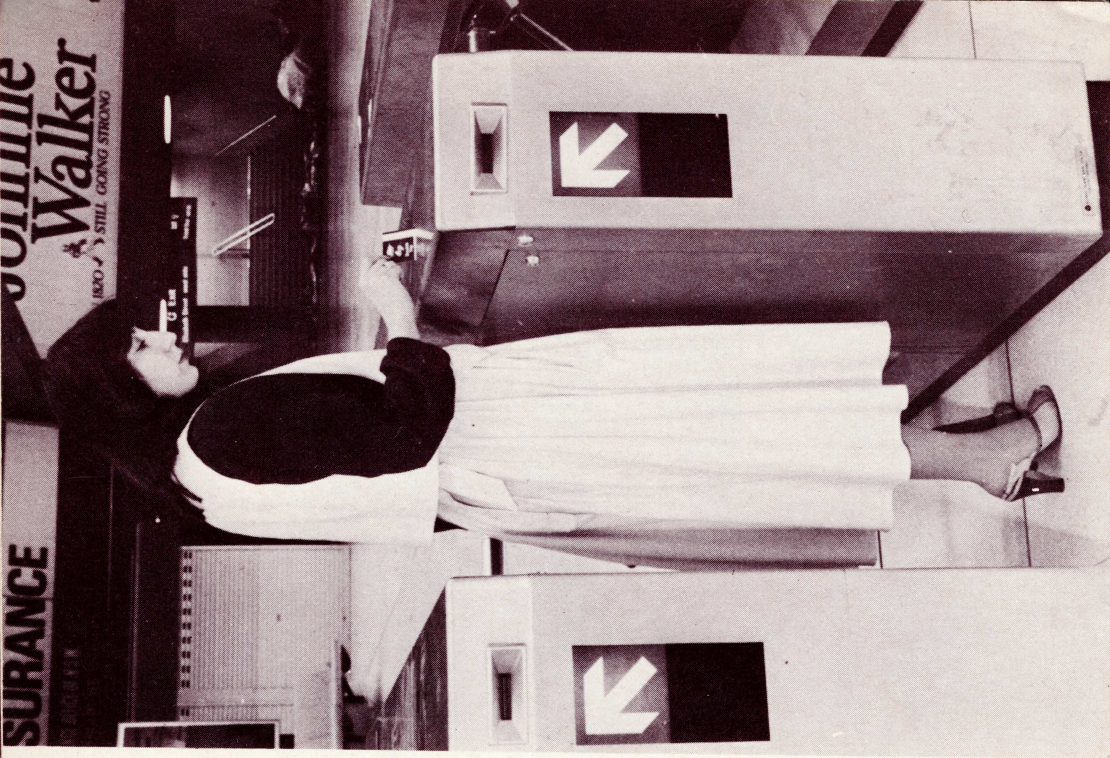
Ticket vending machines, barriers and booking offices are located on the concourse. Entry to the station is via stairs from Martin Place at Phillip, Macquarie and Elizabeth Streets. The predominant colour throughout is red, with extensive use made of white terrazzo and off-form finished concrete.

Platform and escalator shafts are finished with deep red moulded plywood ceilings coved at intervals for lighting, and hinged to allow access to the services located above them. Ventilating air for the station is drawn from the Domain through tunnels passing under Sydney Hospital.

Kings Cross

The station is below Victoria Street and the concourse is entered by an arcade from Darlinghurst Road via three escalators or by stairs on each side of Victoria Street. Four escalators provide access from concourse to platform level.

The new automatic turnstiles.



The concourse is paved with grey-green terrazzo forming a background for a colour scheme of orange which appears in the plywood ceilings and tiled columns. Walls are lined with white tile and precast terrazzo panels.

Booking office windows have surroundings of blue moulded panels which are used throughout the ESR system to identify ticket selling areas.

Edgecliff

Edgecliff is one of the two bus/rail interchange stations on the ESR, with an extensive bus deck above the station. The station is in a development project of the Church of England Glebe Administration Board, with the PTC owning strata title to its sections of the building.

From the bus platform, stairways lead to the gallery and thence by stairs and escalators to the concourse area at New South Head Road level. Both gallery and concourse are paved with terrazzo and walls are lined with buff-coloured exposed aggregate render. Columns are faced with attractive glazed tiles of deep blue — the basis for the station colour scheme.

Four escalators lead to the platform level which, like the concourse and gallery, is finished with ivory coloured plywood ceilings

Bondi Junction

This station is the other bus/rail interchange and terminus for the ESR line. The bus area is above the underground station and provides quick access for rail passengers.

Two escalators, complemented by stairs, operate between bus platforms and concourse which is lined with light grey exposed aggregate render. The ceiling is bright yellow metal slats with recessed lighting coves. Four escalators run from the concourse, through shafts with yellow moulded plywood ceilings to the rubber paved platform.

The light grey exposed aggregate walls form a backdrop to the deep orange glazed tiled columns.

Bright Lighting

Lighting at all the ESR stations, particularly platform edge illumination, is of the highest standards and well above required levels.

Extensive safeguards have been taken also to ensure a continued power supply for the lighting system.

Each station has two transformers and two power boards. If one board should fail, this will affect only every second light and escalator. There is no danger of an entire section of a station being plunged into darkness. Should a major failure cause all power to be cut off, a further safeguard is provided in the form of an emergency battery system with sufficient power for five hours.

Closed-circuit television

Closed-circuit television systems at Martin Place, Kings Cross, Edgecliff and Bondi Junction Stations assist staff in constantly monitoring platforms, automatic ticket barriers, arcades, galleries and concourses. This is an important safeguard and will enable staff to act promptly and correct any irregularities.

Television surveillance also is an effective deterrent against vandalism.

Tunnels

From Erskineville to Redfern twin box tunnels were constructed using the 'cut and cover' method.

Tunnels were driven by the conventional blasting method between Redfern and the Domain and under Kings Cross.

A 179-tonne tunnel boring machine known as the 'Mole' was used to tunnel the section from Edgecliff to Bondi Junction.

The tunnels have been finished with a concrete lining, varying in thickness from 200 mm to 600 mm. Tunnels are naturally wet areas and drainage has been provided by weep holes in the walls running into drainage systems beside the tracks. The water is directed into pump chambers located at the lower points of the system and pumps are automatically

activated as needed to discharge water into stormwater drains. There are four pumping stations on the ESR system. During construction it was necessary to support city building footings. Some of this work was extensive and involved major support with massive steel beams.

The railway was tunnelled up to 30 metres below ground level and this is illustrated on the 'interconnection' map where the line is shown to travel beneath the earlier constructed City Circle railway.

Track

Track on the ESR system is of Standard Gauge at 1435 mm and the rails have been continuously welded for a smoother ride. The sleepers are timber but they have been embedded in concrete and the rails are fixed to the sleepers with a new type 'Pandrol' clip fastening.

High frequency track circuits are used for signalling control and this method eliminates the need for the usual track block joints.

An expansion of approximately 120 mm is allowed for on the viaducts and the running lines are provided with expansion switches at both locations to accommodate for this movement.

Viaducts

Viaducts have been constructed at Woolloomooloo and Rushcutters Bay, and with the exception of a small open section at Woollahra, these are the only outwardly visible signs of the railway line.

The Woolloomooloo viaduct, a post-tensioned reinforced concrete structure of precast segmental construction, crosses the Woolloomooloo Valley as one continuous beam supported by nine concrete piers and two abutments. The Rushcutters Bay viaduct is of similar design with the addition of a spectacular portal frame structure passing over the roadway.

Bus interchange above Bondi Junction Station.

Noise on both viaducts has been minimised by the use of continuously welded rail with cork/rubber pads between the sleepers and rail base. Acoustic parapets to absorb sound have been built on either side of the viaducts.

Traction

As with the other metropolitan rail network, electric traction will be used with power being supplied by overhead wires at 1500 volt DC. A modern system of double contact wires has been used on the ESR enabling better current collection and reducing wear on wires and pantographs. Double-decked electric trains will be used and a four-car set of these carriages can carry 488 people seated and approximately 350 standing.

Services

Initially, and for a period of up to six months, a shuttle service is being provided between Central and Bondi Junction. After this period services will be integrated with the Illawarra line with the new underground Redfern Station being brought into service.

Illawarra line trains will then join the ESR line at Erskineville and trains of up to eight cars will operate on the line. Passengers travelling to or from other metropolitan lines will be able to change trains at Redfern, Central and Town Hall for connecting services with the Eastern Suburbs Railway.

The ultimate diversion of Illawarra trains into the Eastern Suburbs system will relieve pressure and improve reliability in the City Circle underground.

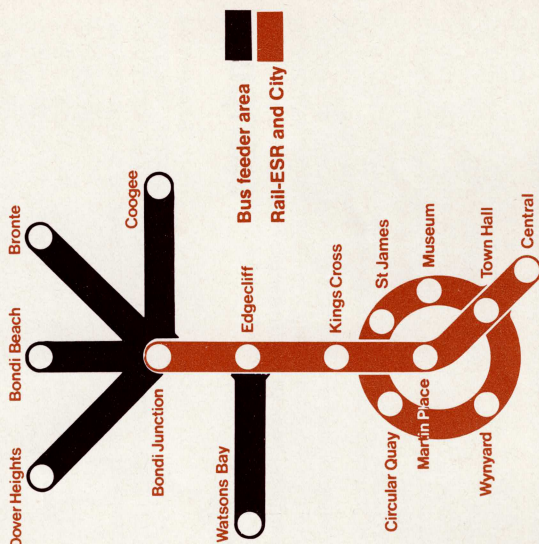
Journey times on the Eastern Suburbs Railway will be approximately 8 minutes between Central and Edgecliff, 11 minutes between Central and Bondi Junction and 7 minutes between Bondi Junction and Martin Place.

Train services being provided between Central and Bondi Junction offer a 5 minute frequency throughout the day, Monday to Friday from 7.30am to 6.30pm. Outside these

times a 10/15 minute service operates. Trains will not run on the ESR between midnight and 5.00am and between these times buses will run through to the city.

Basically, Eastern Suburbs bus services in the bus feeder areas operate to and from the interchange stations at Bondi Junction and Edgecliff, where passengers change to and from city trains.

New intermodal Bus/Rail ticket schemes have been introduced for travel between the bus feeder areas and the city. These include "Multi-Trip" (12 single rail and 12 single bus journeys), "Double-Trip" (two single rail and two single bus journeys) and "BusESRail" periodical tickets (Weekly, Quarterly and Yearly bus/rail combinations). Also, rail/bus singles and rail only and bus only tickets are available for travel as required.



Facts at a glance

Lowest point on the ESR

Below Hay Street — 13 metres below sea level.

Steepest grade

1 in 32.

Length of ESR system

10.5 km comprising
Box tunnels (cut and cover) 1.5 km
Arch driven tunnels 7.0 km
Viaducts and open sections 2.0 km

Longest escalator

Martin Place (Concourse to Platforms) 16 metre vertical rise measurement.

Bus/Rail Interchange Stations

Bondi Junction and Edgecliff have weather protected bus decks above railway station.

Rolling Stock

Double-decked suburban electric carriages operating from 1,500 volt D.C. via overhead wiring.

Service

5 minute frequency in daytime, peak and off peak Monday to Friday; every 10 minutes weekends and weekday nights; every 15 minutes weekend nights. Closed from midnight to 5.00am.

Fare Collection

Automatic fare issuing and collecting system featuring magnetically encoded tickets to activate turnstiles, as well as automatic ticket vending machines and automated booking office equipment.

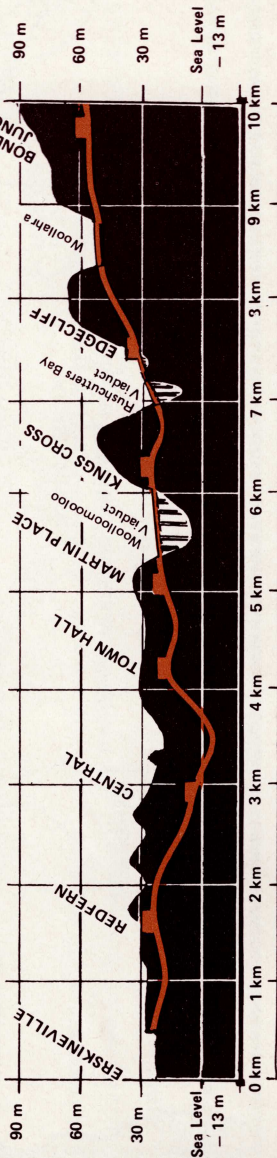
Expected Passenger Usage

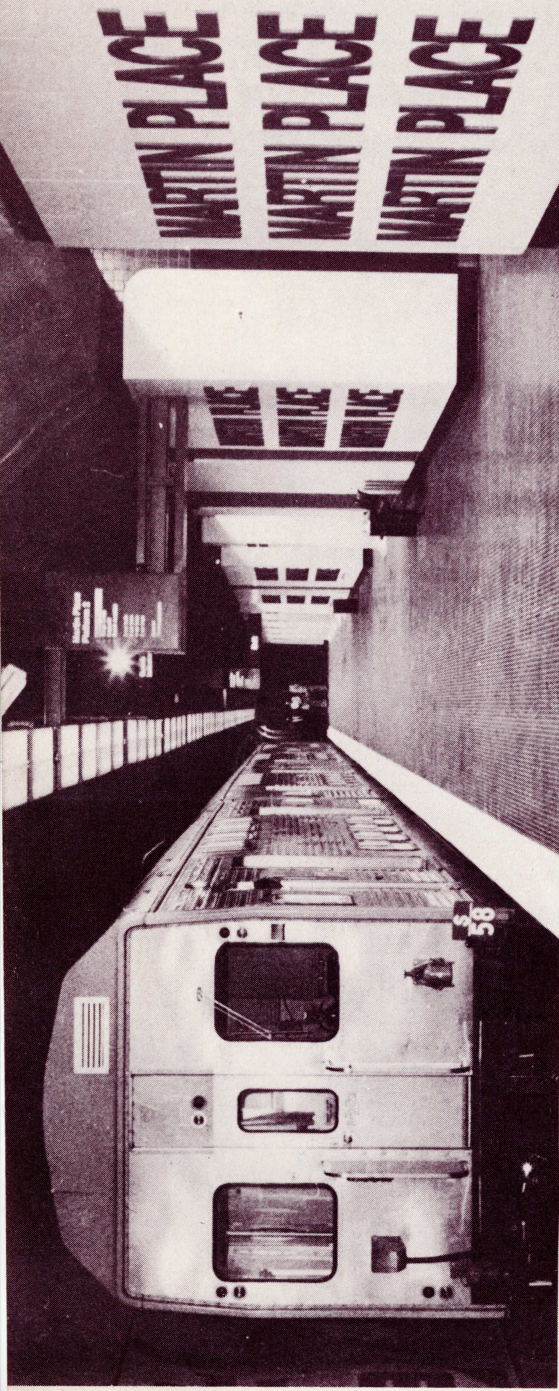
43,000 passenger journeys daily. 13 million per year.

Cost

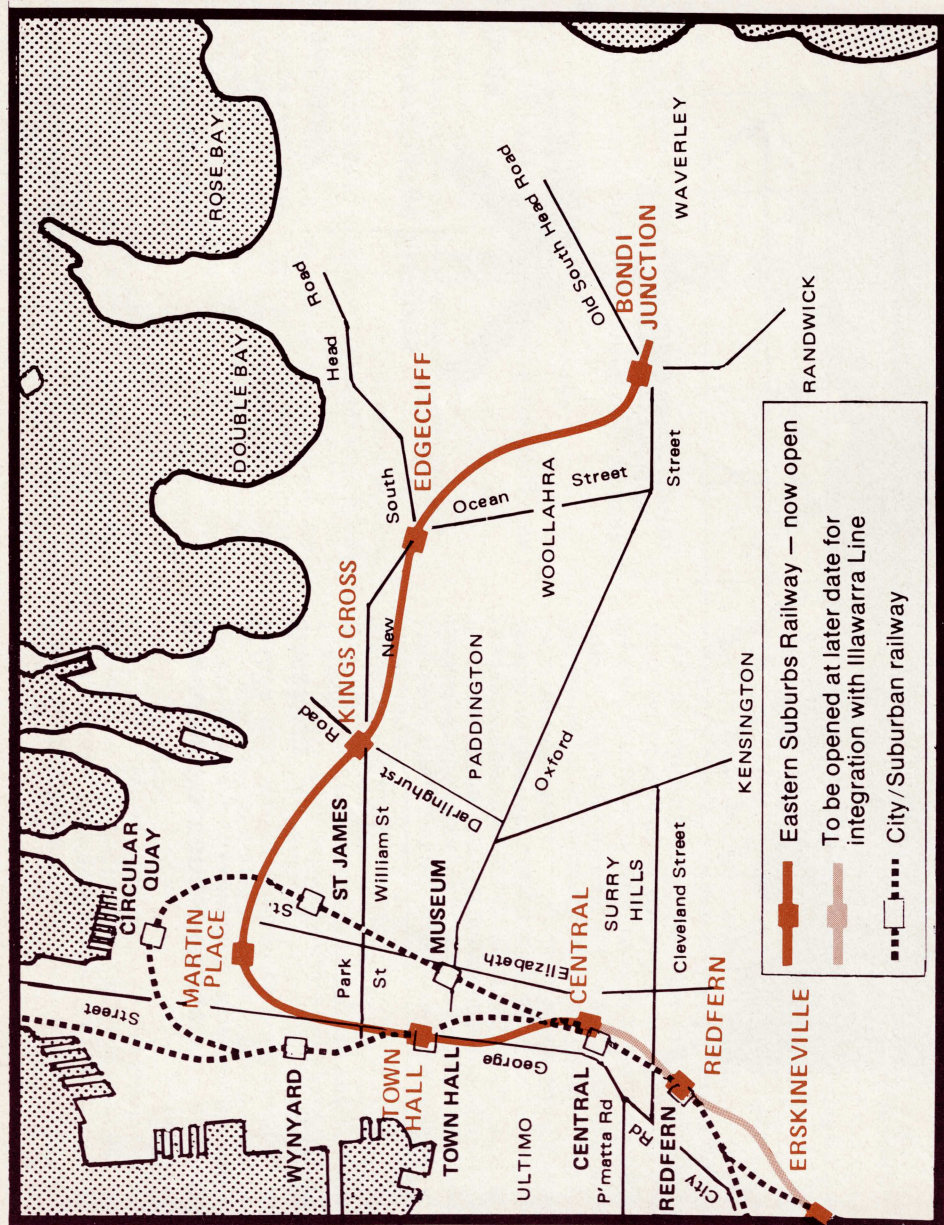
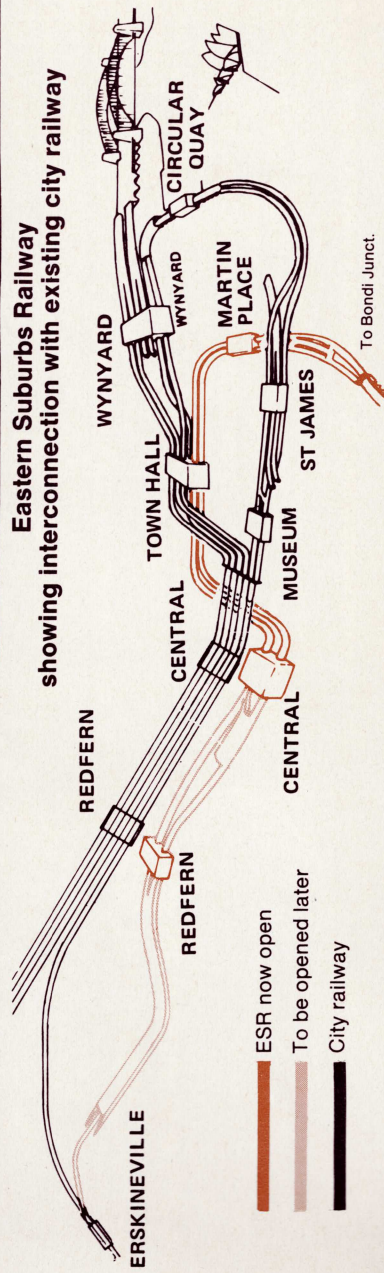
Break-up \$ million

Tunnels	50
Stations	46
Viaducts	6
Trackworks	7
Overhead wiring and signalling installations	14
Escalators (39)	9
Preparatory work, service diversions and road deviations	9
Design and Planning	15
Land resumptions	8
Trains	4
Total	168





Eastern Suburbs Railway showing interconnection with existing city railway



Main features of the ESR as a benefit to the community

The new line introduces a new concept in commuter travel with the main features being:

- A rapid-transit rail service which enables the movement of large numbers of passengers into and out of the city in the quickest possible time.
- A reduction of road traffic on the arteries leading into and within the city proper as many buses will terminate at the two interchange railway stations.
- A further reduction in road traffic as motorists recognise the speed and comfort of rail travel and switch to trains.
- A reduction of pollution of the atmosphere because of fewer vehicles using the roads.
- Conservation of fuel resources so vital to our Nation's future with the swing to pollution-free, energy-saving electric train travel.
- Improvement to the present Eastern Suburbs bus system which has become a modern co-ordinated intermodal bus-rail operation.
- Major relief to the congested City Circle rail system when ESR trains integrate with Illawarra Line services.

Whilst residents of the Eastern Suburbs are the main beneficiaries of the new railway, the benefits will ultimately flow throughout the whole Sydney community as suburban trains on other lines will operate more efficiently, and road traffic in the city and Eastern Suburbs will show a marked decrease. The passenger-carrying capacity of the Eastern Suburbs Railway is equal to that of an eight-lane highway — and without the environmental, pollution-creating, fuel-using problems caused by such a highway.

The new \$168 million Eastern Suburbs Railway has certainly been worth the wait.



**PUBLIC TRANSPORT COMMISSION
OF NEW SOUTH WALES**