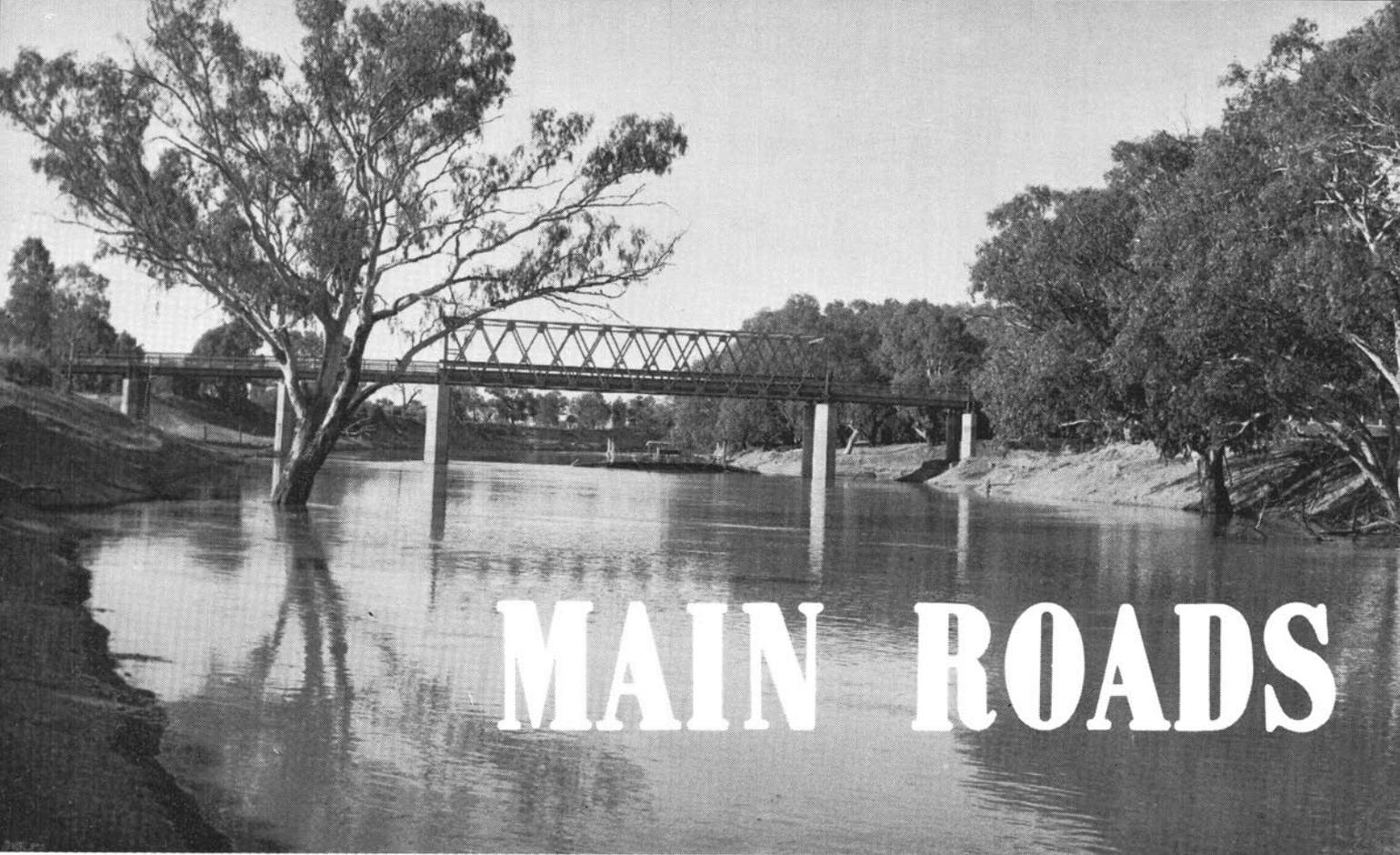


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MAIN ROADS

DECEMBER, 1964

JOURNAL OF THE DEPARTMENT OF MAIN ROADS NEW SOUTH WALES



MAIN ROADS

Bridge over the Darling River at Tilpa

DECEMBER 1964

Volume 30 Number 2

CONTENTS

	PAGE
Helicopter for Main Road Projects	33
Review of Year's Work	34
Grafton to Casino—Reconstruction of Trunk Road No. 83 ..	46
Four South Coast Towns	48, 49
Official Opening of New Gladesville Bridge	50
New Bridge over Parramatta River at Gladesville	52
Main Roads Funds	62
Sydney Harbour Bridge Account	62
Tenders Accepted by Councils	63
Tenders Accepted by Department of Main Roads	64

COVER SHEET

The new Gladesville Bridge being used by traffic

MAIN ROADS

DECEMBER 1964

JOURNAL OF THE
DEPARTMENT OF MAIN ROADS
NEW SOUTH WALES

*Issued quarterly by the
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J. A. L. Shaw, D.S.O., B.E.*

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Helicopter for Main Road Projects

The Department recently purchased a four-seater Bell Helicopter for use in certain phases of its activities.

The helicopter was delivered in October last and commenced service early in November. Its aircraft registration letters are VH-DMR and like all plant owned by the Department, it is painted the Department's familiar orange colour. The cost of the machine was £38,000.

Primarily the helicopter will be used on technical projects.



The aircraft will be of particular value in observations by senior engineering officers to determine or check road requirements in the city and urban areas of Sydney, Newcastle and Wollongong. It will also be valuable for the investigation and examination of routes for new roads in difficult country.

The helicopter will also be used for aerial photography and at times for short distance transport.

Considerable savings in time will be effected during inspections of works by senior officers.

During its first official flight, the Deputy Premier and Minister for Highways, the Hon. P. D. Hills, M.L.A., accompanied by the Commissioner for Main Roads, Mr. J. A. L. Shaw, and the Assistant Commissioner for Main Roads, Mr. R. J. S. Thomas, inspected several of the Department's current road and bridge projects in the Sydney metropolitan area and the work in progress on the Sydney-Newcastle Expressway.

Review of Year's Work

An Extract from the 39th Annual Report of the Commissioner for Main Roads, J. A. L. Shaw, D.S.O., B.E., on the work of the Department for the year ended 30th June, 1964

During the year, a further 714 miles of Main Roads were provided with a bitumen surface by the Department of Main Roads and Municipal and Shire Councils. Of this new bitumen surfacing, 252 miles were provided on State Highways and 462 on Trunk and Ordinary Main Roads.

The total length of dustless surface on Main Roads is now 10,760 miles, of which 3,200 miles, or almost 30 per cent., have been sealed in the last five years.

The first section of the Sydney-Newcastle Expressway being constructed for the Department by K. D. Morris & Sons Pty. Ltd.



The total mileage of Main Roads in New South Wales is 22,286, of which 11,526 have yet to be provided with a dustless surface.

Major road works completed during the year were:—

- Phillips Avenue—Ghost's Creek section of the north-south arterial road between North Wollongong and Ghost's Creek by-passing the principal shopping and business centre of Wollongong.
- New road route between Calga and Ourimbah via Peat's Ridge.
- Karuah-Bulahdelah section of the new route of the Pacific Highway between Twelve Mile Creek, near Raymond Terrace, and Taree.
- New Route, 6½ miles, of the Pacific Highway between Wardell and the Bruxner Highway near Ballina. Together with the bridge over the Richmond River at Wardell, this deviation eliminated the ferry crossing at Burn's Point from the route of the highway and also the ferry crossing at Wardell on the Wardell-Goonellabah Main Road.
- River Road—Belmore Road section of Henry Lawson Drive across Little Salt Pan Creek and Salt Pan Creek between Picnic Point and Peakhurst.
- Completion of the bitumen surfacing of the Wilberforce-Putty-Singleton Road.

Major road works in hand at the end of the year were:—

- Construction of two lengths totalling 5·8 miles, between the Hawkesbury River and Mount White, of the Sydney-Newcastle Expressway.
- Construction of four tunnels to carry public utilities under the first section of the Warringah Expressway from the northern end of Sydney Harbour Bridge to Cammeray.
- Reconstruction and bitumen surfacing of the Prince's Highway south of Eden.
- Rebuilding lengths of heavily trafficked State Highways, especially the Hume Highway, Pacific Highway and New England Highway to provide stronger and wider carriageways.
- Reconstruction and bitumen surfacing of State Highways in the western areas of the State.

In the County of Cumberland (Sydney Metropolitan area), road works in progress consisted mainly of



Work in progress on the Mount White interchange on the second section of the Sydney-Newcastle Expressway. This section is being undertaken by the Department by day labour

reconstruction and pavement widening to provide additional lanes for traffic, approaches to bridges, installation of median strips in six-lane carriageways and channelisation of intersections.

One hundred and eighteen (118) new bridges and box culverts of bridge size were built on Main Roads, Developmental Roads and at sites on unclassified roads where the Department was responsible for construction of crossings.

At the end of the year, a further 97 bridges and culverts of bridge size were under construction on Main and Developmental Roads.

The larger bridges completed during the year included structures over—

- Richmond River at Wardell on the Pacific Highway—to replace a ferry.
- Richmond River at Lismore on the Bruxner Highway—a new facility.
- Lane Cove River—Fig Tree Bridge—in replacement of an old two-lane bridge.
- Darling River at Pooncarie—to replace a ferry.
- Darling River at Tilpa—to replace a ferry.
- Sportsman's Creek on the Grafton-Casino Trunk Road—in replacement of a low-level bridge subject to flooding.

- Hunter River at Maitland—Belmore Bridge—in replacement of an old narrow iron bridge.
- Towamba River at Towamba—in replacement of an old low-level bridge subject to flooding.

Large bridges under construction at the 30th June, 1964 were over—

- Clarence River at Harwood near Maclean on the Pacific Highway—to replace a ferry.
- Clyde River at Nelligen on the Canberra-Bateman's Bay Trunk Road—in replacement of a ferry.
- Parramatta River between Gladesville and Drummoyne on Victoria Road—to replace an old two-lane opening bridge. (This bridge was subsequently opened to traffic on 2nd October 1964.)
- Darling River at Louth—in replacement of a ferry.
- George's River at Taren Point—to replace a ferry.
- North-Western Expressway at Huntley's Point—to give access to the new Gladesville Bridge for traffic travelling towards the City from Gladesville, Ryde and other areas to the west. (This overpass was subsequently made available to traffic on the 2nd October, 1964.)



New construction including a deviation of Main Road No. 167 and construction of a new bridge at Devil's Elbow near Liverpool

- South Arm of the Hunter River at Tourle Street, Newcastle—a new facility.
- Jugiong Creek on the Hume Highway in replacement of a single lane bridge.
- Salt Pan Creek on Henry Lawson Drive—a new facility. (This bridge was subsequently opened to traffic on the 11th September 1964.)
- Peel River at Tamworth on the New England Highway—in replacement of an old narrow bridge.
- Minnamurra River at Minnamurra on the Prince's Highway—to replace a single lane bridge.
- Moruya River at Moruya on the Prince's Highway in replacement of a timber bridge subject to flooding.
- Yass River near Yass on the Hume Highway—to replace a timber bridge on poor alignment and subject to flooding.
- Orara River at Ramornie on the Gwydir Highway—to replace a narrow low-level bridge on poor alignment.
- Tarban Creek on the route of the North-Western Expressway—a new facility.
- Hawthorne Canal, Haberfield—a new facility.
- Murrumbidgee River at Jugiong—a new facility.

PACIFIC HIGHWAY—NEW ROUTE BETWEEN TWELVE MILE CREEK, NEAR RAYMOND TERRACE, AND TAREE

The new route of the Pacific Highway between Twelve Mile Creek and Taree was completed with the

opening to traffic of the section between Karuah and Bulahdelah on the 24th December, 1963.

The section was designed for speeds of 50 miles per hour. The pavement width is 24 feet and has a dustless surface.

The Pacific Highway from Twelve Mile Creek (near Raymond Terrace) to Taree originally followed the route through Booral, Stroud, Gloucester and Krambach, a distance of 96 miles, and traversed much hilly country.

Some years ago, the Department decided to relocate the route of the highway between Twelve Mile Creek and Taree through Karuah, Bulahdelah and Nahiack, a distance of 79 miles. Construction of this length of road was undertaken progressively by the Department as funds became available.

The improved conditions provided by the new route of the Pacific Highway enable traffic to travel from Newcastle to Taree in about 2 hours 30 minutes as compared with 3 hours 10 minutes on the old route.

WOLLONGONG BY-PASS

During the year, the Department completed the construction of a new road to by-pass the principal shopping and business centre of Wollongong and thereby reduce traffic congestion on the Prince's Highway through the City.

The by-pass commences from the Prince's Highway at North Wollongong and rejoins it at Ghost's Creek, a little south of the junction with Mount Keira Road.

New bridge over the Mongarlowe River about nine miles east of Braidwood on the Canberra-Bateman's Bay Road, Trunk Road No. 51

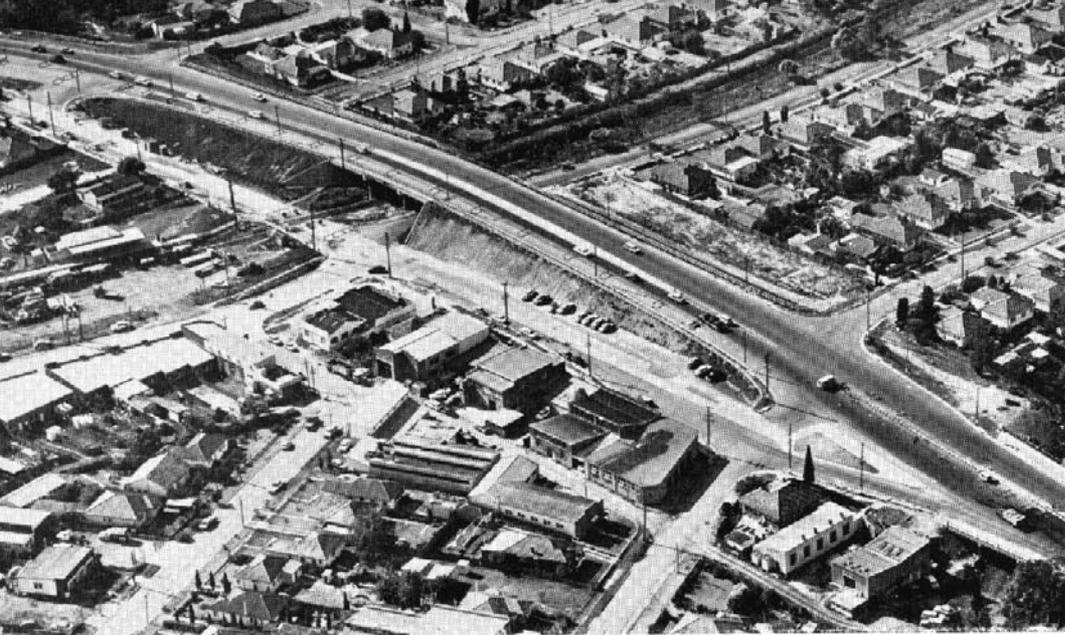


The new prestressed concrete bridge over the Clyde River at Nelligen on Trunk Road No. 51. The bridge, which will replace the vehicular ferry seen in the photograph, will be opened to traffic on 19th December, 1964



Reinforced concrete bridge over the Minnamurra River at Minnamurra on the Prince's Highway. It will replace the existing narrow bridge





Railway overbridge at Rydalmere on Main Road No. 165 which replaced a railway level crossing

Construction of a direct connection from the by-pass to Mount Ousley Road was also completed.

The by-pass, two miles in length, is part of a new north-south arterial road to be completed ultimately from Thirroul to Dapto.

A two-lane pavement has been provided on the by-pass, but wider earthworks and bridges have been constructed over most of the length to allow for the provision later of another two traffic lanes.

COMPLETION OF HENRY LAWSON DRIVE

The bridge over Salt Pan Creek, completed in September 1964, provided the final link in Henry Lawson Drive which connects Peakhurst and Lansdowne via Padstow, Picnic Point, East Hills and Milperra.

This circumferential route which for the greater part of its length follows the George's River, is facilitating the movement of traffic between Illawarra Suburbs and the South-Western and Western Suburbs of Sydney.

NEW BRIDGE OVER THE PARRAMATTA RIVER BETWEEN GLADESVILLE AND DRUMMOYNE

The new bridge over the Parramatta River between Gladesville and Drummoyne was officially opened on the 2nd October, 1964 by Her Royal Highness Princess Marina, Duchess of Kent.

The new bridge is 1901 feet 6 inches long overall. It includes a four-ribbed concrete arch with a span of 1,000 feet, and at each end of the arch there are four pre-stressed concrete girder spans each 100 feet long.

The arch with its clear span of 1,000 feet is the longest concrete arch span yet constructed in the world.

The arch is supported by massive concrete blocks, known as "thrust blocks", founded on sandstone on each side of the river.

The roadway is 72 feet between kerbs and is flanked by a footway, 6 feet wide, on each side of the bridge. At the Gladesville (or northern end) of the bridge, the roadway widens gradually over the approach spans from 72 feet to 120 feet to provide for the smooth routing of traffic.

The roadway rises on a grade of 6 feet in each 100 feet from each side of the river and the grades are

connected by a vertical curve 300 feet long over the centre of the structure.

The arch has a clearance of not less than 120 feet above water level for a width of 200 feet in the centre of the stream, the maximum clearance at the crown of the arch being 134 feet above water level.

The bridge was constructed for the Department by the contracting partnership of Stuart Bros., builders, of Sydney and Reed and Mallik, engineering contractors, of Salisbury, England, to a design undertaken for them by consulting engineers, Messrs. G. Maunsell and Partners of London and Melbourne. After acceptance by the Department of the tender for the bridge, an amended design, differing somewhat from that originally proposed, was submitted by the contractors. The design was checked both by the Department of Main Roads and the Civil Engineering Department of the University of Sydney. Subsequently, the advice of the Société Technique pour l'Utilisation de la Précontrainte was obtained on certain aspects of the design.

The cost of the new bridge and the road and bridge works comprising the approaches will be of the order of £4.5m.

ROAD IMPROVEMENTS BETWEEN THE NEW GLADESVILLE BRIDGE AND THE CITY

The benefit which the new Gladesville Bridge, over the Parramatta River, gives to traffic will not be fully realised until the bridge over the nearby Tarban Creek, which will provide a direct link between the new Gladesville Bridge and the recently completed Fig Tree Bridge over the Lane Cove River, is completed by September 1965.

To assist in handling the increased volume of traffic using the new bridge, the Department of Main Roads had already widened and reconstructed Victoria Road to provide a six-lane divided carriageway from the southern end of the new bridge to White Bay nearer the City. The cost of this work was of the order of £400,000.

In addition, the Department, in conjunction with the Sydney City Council and Leichhardt Municipal Council, has carried out or is undertaking a number of other works to provide increased road capacity for through traffic between Drummoyne and the City.

These works comprise—

- (a) erection of large advance direction signs advising traffic of alternative routes by-passing the City at—
 - (i) Lyons Road, Drummoyne;
 - (ii) Dowling Street, Rozelle; and
 - (iii) Commercial Road, White Bay.
- (b) provision of an additional lane in the median strip to facilitate right-turning movements at Moodie Street, Rozelle.
- (c) improvement of the intersection of Victoria Road and Commercial Road by providing additional lanes on both the Rozelle and City approaches and by providing an easier left-turn for traffic in Victoria Road proceeding towards the City.
- (d) widening of the western approach to the Glebe Island bridge to provide a separate right-turn lane for traffic turning into Sommerville Road.
- (e) widening of the bridge over White's Creek on Commercial Road at the western end of Rozelle Bay.
- (f) construction of a new road, including a bridge over Johnston's Creek, to connect Commercial Road, The Crescent and Crescent Street to Ross Street, Glebe, around the southern side of Harold Park.

These works will cost about £200,000.

In addition to the works mentioned, the Department of Main Roads, in conjunction with other authorities

concerned, is investigating means of improving traffic conditions between Glebe Island Bridge and the City on the route over Pymont Bridge.

TAREN POINT BRIDGE OVER GEORGE'S RIVER

The bridge over the George's River near its mouth between Rocky Point, Sans Souci, and Taren Point, is expected to be completed about the end of March, 1965.

The structure, which is being built by John Holland (Constructions) Pty. Ltd. to a design prepared by the Department is 1,662 feet long and will accommodate six lanes of traffic and two footways.

The contract price for the construction of the bridge is £1,454,146.

The bridge and its immediate approaches will form the first section of the Southern Expressway.

The new crossing of the George's River will replace a ferry service and will relieve peak hour and weekend traffic congestion at Tom Ugly's Bridge which is about one mile upstream.

The approaches are being constructed by the Department by day labour.

NEW BRIDGE OVER MIDDLE HARBOUR AT ROSEVILLE

In June, 1964 the Department accepted a tender for the construction of a new prestressed concrete bridge 1,229 feet long over Middle Harbour at Roseville.

Work in progress on the new bridge over Middle Harbour at Roseville and its approaches



The successful tenderer is John Holland (Constructions) Pty. Ltd. who contracted to complete the bridge in 74 weeks.

The new Roseville bridge, which will be about a quarter of a mile upstream of the existing bridge, will replace a narrow two-lane bridge. The carriageway will be 67 feet wide between kerbs, providing in the first place for five lanes of traffic, with a footway on the upstream side.

The new bridge was designed by the Department which had sought advice from a consulting architect to ensure that the general appearance of the bridge would be in harmony with its surroundings.

The alignment of the new route between East Roseville and Forestville will be of a high standard. To secure this, the bridge itself will be curved both horizontally and vertically.

The approaches are being constructed by the Department by day labour. The northern or Forestville side of Middle Harbour presents especial difficulties and the approach involves heavy excavation work through a steep rocky hillside.

METROPOLITAN EXPRESSWAYS

Engagement of Consultants

In 1960 the Department engaged the firm of De Leuw, Cather and Company, consulting engineers, of Chicago and San Francisco, to advise on the layout of sections of the expressway system in the inner Sydney Metropolitan area.

In a report to the Department in November, 1961, on the layout of sections of the expressway system in the inner Sydney Metropolitan area, the consultants advised that, while there should be some modification in detail of the Department's proposed expressway system, the expressway routes planned should be retained.

The consultants suggested that the system of expressways and surface roads proposed by the Department might be augmented by—

- A north-south expressway between Naremburn and Tempo involving another crossing of Sydney Harbour.
- An east-west expressway from Woollahra, through Waterloo, to Fivedock with an extension north to Drummoyne.

In December, 1962 the consultants were instructed to make more detailed investigations in regard to their suggestions.

The consultants have advised that their report on the proposed additional east-west and north-south expressways will be submitted to the Department in December, 1964.

In April, 1964 the consultants were asked by the Department to undertake the additional task of preparing the geometric design of—

- The Western Distributor between Sydney Harbour Bridge and the City markets area.
- The major interchange at Ultimo between the Western Distributor and the Southern Expressway.

North-Western Expressway

In September, 1963 the Deputy Premier and Minister for Highways, the Hon. P. D. Hills, M.L.A., announced that it had been decided to proceed with the construction of the section of the North-Western Expressway from Druitt Street, City, across Darling Harbour railway goods yard to Fig Street, Pyrmont, and over Wentworth Park to Bridge Road, Glebe, a distance of approximately one mile.

The detailed design of this length of expressway is being undertaken by the Department. It is expected that construction will be completed within four years and extended to Annandale, by tunnel, a year later.

With the opening to traffic of the new Gladesville Bridge over the Parramatta River in October, 1964, further progress was made with the construction of the length of the North-Western Expressway between Victoria Road, Drummoyne and Burns Bay Road, Lane Cove. Completion of the bridge over Tarban Creek by September, 1965 will enable the full length of this section of the expressway to be brought into use.

Southern Expressway

The first section of the Southern Expressway will comprise the bridge now being built over George's River between Rocky Point, Sans Souci and Taren Point and a short length of road from the southern end of the bridge to Taren Point Road near Toorak Avenue. This length will include an overpass across the expressway to link Woodlands Avenue with Taren Point Road.

Warringah Expressway

The first section of the Warringah Expressway extends from the northern end of Sydney Harbour Bridge to Miller Street, Cammeray, a distance of 1½ miles.

Work on the construction of this section of the expressway commenced during the year following the acceptance in May, 1964 of a tender of £255,292 1s. 0d. submitted by Thiess Bros. Pty. Ltd. for the construction of four tunnels to carry public utilities under the route of the expressway.

Electricity, telephone cables, gas and water pipes, etc., will be accommodated in the tunnels.

Plans and specifications for the construction of the expressway formation, pavement and bridges have been completed by the Department's consultants, De Leuw, Cather and Company, and tenderers for the work will be invited in November, 1964. Construction of this length of the expressway is expected to take about three years.

SYDNEY-NEWCASTLE EXPRESSWAY

A tender for the construction of the first section of the Sydney-Newcastle Expressway was accepted by the Department of Main Roads in March, 1963.

The amount of the accepted tender was £2,011,996 18s. 2d. and was submitted by K. D. Morris and Sons Pty. Ltd., of Brisbane, who contracted to complete construction in April, 1965.

The contract price is subject to variations from time to time due to alterations in wage rates and materials

Top to Bottom

Hume Highway. State Highway No. 2, about 4 miles north of Tarcutta following reconstruction and bitumen surfacing

Bruxner Highway, State Highway No. 16, reconstruction at Bugden's Hill 6 miles west of Lismore

Great Western Highway. State Highway No. 5, about 8 miles east of Bathurst following reconstruction and bitumen surfacing

New England Highway, State Highway No. 9. Reconstruction and bitumen surfacing about 17 miles south of Tamworth

costs and to any changes which may be ordered during the course of the work.

The work covered by the contract extended from the northern end of the Peat's Ferry Bridge over the Hawkesbury River to a point approximately 1.5 miles south of Mount White, a distance of 4.8 miles. Of this length 0.6 miles was for a temporary connection to join the expressway route to the existing dual carriageway near Mount White on the route of the Pacific Highway.

Resulting from a decision to proceed quickly with the construction of the expressway route through the Mount White area, the Department undertook with its own day labour forces, construction of a length of 1.6 miles with the object of completing it concurrently with the length under construction by contract. This eliminated the need for the temporary connection mentioned above.

This section of 1.6 miles, estimated to cost £872,000 includes the construction of an interchange at Mount White which will be the first point north of the interchange at Mooney Mooney where vehicles will be able to join or leave the expressway route.

Plans and specifications for the next section of the expressway from the interchange at Mount White to Calga, a distance of 3.55 miles, are being prepared and this work will be proceeded with at an early date.

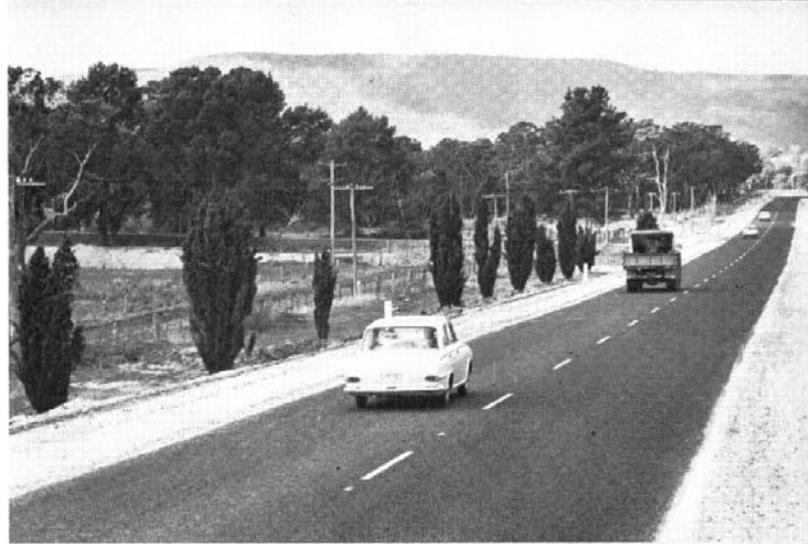
It is expected that the length of the expressway between the Hawkesbury River and Calga, a distance of nearly ten miles, will be completed by December, 1966.

The next major section of the Sydney-Newcastle expressway to be put in hand will be south of the Hawkesbury River on the length from Peat's Ferry Bridge to a point between Berowra and Mount Kuringgai. This will be commenced by day labour in the first half of 1966.

North of Calga conditions for traffic have already been considerably improved by the completion of a new road route between Calga and Ourimbah via Peat's Ridge.

Portion of the new route follows an existing road from Calga to Peat's Ridge, 9.2 miles, which was reconstructed by the Department to provide a wider two-lane carriageway, easy curves and good visibility. The balance of the road from Peat's Ridge to Ourimbah, a distance of 11 miles, was constructed to expressway standards by the Department by day labour and contract.

The new route, 20 miles in length, enables through traffic to by-pass the winding section of the Pacific





Top to Bottom

Channelised intersection at the junction of Victoria Road, (Main Road No. 165) and Kissing Point Road, Ermington

Pacific Highway, widening to six lanes near Asquith

Six-lane divided carriageway on the Great Western Highway, Prospect

Widening and provision of a six-lane divided carriageway on the Hume Highway, Enfield



Highway on each side of Mooney Creek and also to avoid the closely settled areas from Gosford to Ourimbah.

The new route is not only of benefit to through traffic by saving about 20 minutes in travelling time, but also reduces the volume of traffic on the Pacific Highway between Calga and Gosford with advantage to drivers travelling to Woy Woy, Gosford, Terrigal and other places in the area.

IMPROVEMENT OF TRAFFIC MOVEMENT BETWEEN THE CITY AND DOUBLE BAY

In June, 1964, the Department received from De Leuw, Cather and Co., consulting engineers, of Chicago and San Francisco, the results of an investigation into means of improving the movement of traffic between the City and Double Bay and Rose Bay along the southern foreshores of Sydney Harbour.

In commissioning this investigation, the Department of Main Roads was not seeking an alternative to the already approved Eastern Suburbs Expressway route from the City to the vicinity of Bondi Junction generally on the line of Moore Park Road, Paddington and Grafton Street, Woollahra. Rather the Department's objective was the improvement of the flow of traffic between the City and Double Bay, and particularly through the King's Cross area.

The consultants considered six possible routes to Double Bay and reported favourably upon two viz.—

- A road, partly in tunnel and partly over the waters of Elizabeth and Rushcutter's Bays, commencing at Cowper Street Wharf Road, Woolloomooloo and terminating in William Street, Double Bay.
- Tunnelling under King's Cross to provide for four lanes of traffic.

The Department decided to adopt the scheme for tunnelling under King's Cross from the eastern end of William Street to New South Head Road near McLachlan Avenue. Associated with the construction of the twin bore tunnel facility will be the further widening of New South Head Road (Main Road No. 173) from Rushcutter's Bay to Edgecliff Post Office.

ROADS OF ACCESS TO KINGSFORD SMITH AIRPORT (SYDNEY INTERNATIONAL AIRPORT)

(i) *Access roads in the immediate vicinity of the Airport*

The Department has undertaken to improve access at the northern boundary of the Airport, and proposes to complete this work by 1968 to coincide with the



establishment of the international passenger terminal on its new site.

The Department also has in hand detailed investigations in regard to the provision of access from the south to the new passenger terminal area with the object of providing a road link from General Holmes Drive at Kyeemagh to West Botany Street, Arncliffe, with a spur road and bridge across Cook's River into the terminal area.

(ii) *Route from the City to the Airport*

Investigations have been commenced into the location and levels of an improved road to run from the City to the Airport. The route is along Dowling Street, then along the western side of the Australian and The Lakes Golf Courses, to Wentworth Avenue which is followed to the Airport. There will be a divided carriageway over most of the length and overpasses at some of the intersections.

LEVY ON COUNCILS IN THE COUNTY OF CUMBERLAND FOR WORKS ON MAIN ROADS

The Main Roads Act provides for Municipal and Shire Councils in the County of Cumberland to contribute to the cost of constructing and maintaining Main Roads in that area.

Until December, 1963 the provisions of the Main Roads Act required these Councils to pay to the Department a contribution as levied by the Commissioner on the unimproved capital value of rateable land in their respective areas, but not exceeding one-half penny in the pound.

In December, 1963, the terms of the Main Roads Act were varied to provide the Commissioner with an alternative power to fix a ceiling for contributions by Councils within a range of percentages, from 10 per cent. to 15 per cent. of Councils' rate incomes.

For the calendar years 1963 and 1964, the Commissioner decided that the percentage would be 12 per cent.

As a result of this limit, a number of Councils in the County of Cumberland are now contributing less to the Department than in recent years. The reductions in contributions by these Councils range from £800 to £43,000 for the year 1963.

ROADS IN THE INNER AREA OF THE CITY OF SYDNEY

In December, 1963, the provisions of the Main Roads Act were extended to the inner area of the City of Sydney (i.e. the "original" city).

The effect of the amendment of the Act is to—

- Permit proclamation of existing and proposed expressways in the inner area of the City of Sydney as Main Roads;
- Allow extension of certain Main Roads in the outer area of the City of Sydney towards the centre and bring the Main Roads system to significant junction points within the City; and
- Place the Sydney City Council on the same basis as other Councils in the County of Cumberland in respect of contributions for the construction and maintenance of Main Roads.

The approval of the Executive Council will be sought in the near future to the proclamation of certain existing roads in the inner area as Main Roads.

LOAN FUNDS

An amendment of the Main Roads Act which became operative in December, 1963, confers on the Commissioner for Main Roads the power to borrow money for specified works and to provide for the repayment of such loans from the County of Cumberland Main Roads Fund and the Country Main Roads Fund.

The power conferred on the Commissioner is similar to that already vested in other Government Authorities and Instrumentalities.

Some loans have already been obtained this year from banks and other lending organisations and the funds so obtained will assist the Department to carry out some important works earlier than would otherwise be practicable.

CLEARWAYS

In the annual report for the year ended 30th June, 1963 the Department expressed concern that the best traffic value was not being obtained from the more important arterial Main Roads in the Sydney Metropolitan area.

The opinion was put forward that consideration would need to be given to ensuring that these roads are freed of all standing vehicles, not only in peak hours, but also during other hours of the day and night when traffic is heavy.

It was stated that, with a view to subsequent discussion with other Authorities concerned with the movement of traffic, the Department of Main Roads was carrying out investigations as to the desirability of declaring certain roads as "clearways" to ensure that the smooth flow of traffic over the full width of the roads is not impeded by standing vehicles.

Following an extensive investigation of traffic volumes, journey times and conditions, preparation of a schedule of Main Roads, which it is considered should be declared "clearways", is nearing completion.

Following completion, the schedule will be discussed with the Traffic Advisory Committee.

TRAFFIC ADVISORY COMMITTEE

In September, 1964 following discussions with the Minister for Highways, the Hon. P. D. Hills, M.L.A., it was announced by the Minister for Transport the Hon. J. M. A. McMahon, M.L.A., that the State Government had set up a Traffic Advisory Committee.

The Commissioner for Main Roads is a member of the new Committee. The other members of the Committee are—

The Commissioner for Motor Transport (Chairman)—
Mr. D. R. Coleman.

The Commissioner of Government Transport—
Mr. S. B. Berry.

The Commissioner of Police—
Mr. N. T. W. Allen.

The Committee is to meet regularly and has power to co-opt or consult any other authority concerned with problems under consideration.

The functions of the Committee will be State-wide. In the first place, its activities will be chiefly directed to investigation of ways and means to ensure the best use of existing roadways.

STATE PLANNING AUTHORITY

On the 1st June, 1964, the Cumberland and Northumberland County Councils and the Town and Country Planning Advisory Committee were replaced by the State Planning Authority. The Commissioner was a member of this Advisory Committee.

The Authority, established by the State Government under the State Planning Authority Act, 1963 has control of town and country planning throughout New South Wales. The Commissioner for Main Roads is a member of the Authority.

The other members of the Authority are—

Mr. N. A. W. Ashton	..	Chairman.
Mr. R. J. Thomson	..	Deputy Chairman.
Professor J. H. Shaw	..	Associate Professor of Town Planning, Uni- versity of New South Wales.
Mr. E. C. Holt	Under Secretary, Min- istry of Transport.
Mr. C. J. Barnett	Assistant Under-Secretary, Department of Local Government.
Mr. E. L. Beers	Secretary, Metropolitan Water, Sewerage and Drainage Board.
Alderman R. S. Luke	}	Local Government Assoca- tion of New South Wales.
Alderman H. G. Coates		
Councillor J. R. Black	}	Shires Association of New South Wales.
Councillor E. K. Vickery		
Alderman H. Jensen		

The Chairman and Deputy Chairman are full-time members of the Authority and the other ten are part-time members.

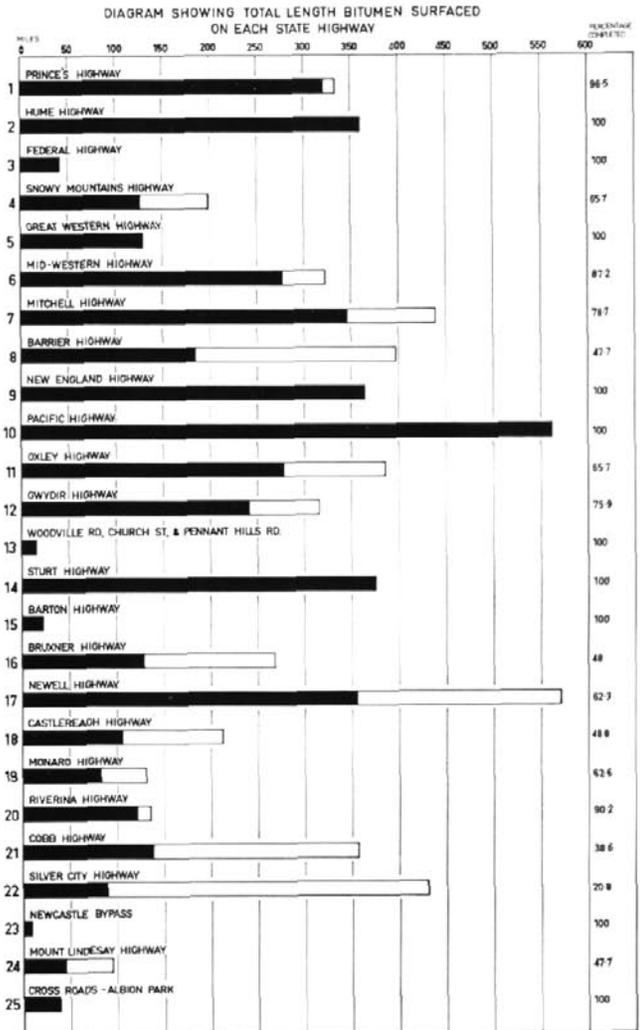
HELICOPTER FOR MAIN ROAD PROJECTS

During the year arrangements were made by the Department for the purchase of a helicopter to facilitate certain phases of the Department's field and design activities.

The helicopter, a four-seater Bell Machine (model 47J2A) was received from the United States of America in October, 1964. It is orange in colour, as are all plant items owned by the Department, and has the identification letters of VH-DMR.

The machine will be used primarily for technical projects requiring observation by senior engineering officers to determine or check road requirements in the inner City and urban areas of Sydney, Newcastle and Wollongong.

It will be used also to investigate and examine routes for new roads in difficult country.



At times, the helicopter will be used for aerial photography and for short distance transport.

COMMONWEALTH AID ROADS ACT

The Premiers of the Australian States met the Prime Minister and other representatives of the Commonwealth Government in conference in March, 1964, to discuss the re-enactment of the Commonwealth Aid Roads Act as from the 1st July, 1964.

Proposals put forward by New South Wales for incorporation in the new Act were designed to—

- (i) obtain a total amount for all States more realistically related to the expenditure required to meet the road needs of Australia as determined by the needs survey carried out by the National Association of Australian State Road Authorities;
- (ii) ensure that the proportions in which the total amount granted by the Commonwealth to the States were related as closely as possible to the needs of the individual States.

The proposal by New South Wales to amend the formula for the division of Commonwealth aid amongst the States was not accepted by the Commonwealth Government. The old formula was retained and this means that some States will continue to receive from the Commonwealth a greater percentage of their estimated road needs than Victoria and New South Wales.

The terms of the new Act provide for a basic grant of £330m. to be paid to the States over the five years commencing on 1st July 1964. In addition, the Commonwealth will allocate an additional £45m. in that period provided the States make matching contributions.

The total amount to be made available by the Commonwealth to the States over these five years, i.e. £375m. will be £25m. more than it is estimated would have been paid in the same five year period had the provisions of the previous Act been continued. So far as New South Wales is concerned, the share of this £25m. will be an additional £1.4m. per annum for expenditure on roads, including Main Roads, in the State. Actually, in total money terms, New South Wales will receive approximately £105m. in the five year period of the new Act which is £35.5m. more than was received in the previous five years.

It has been estimated that in the five years commenced 1st July, 1964, the Commonwealth Government will receive about £421m. as proceeds of fuel taxes. Of this amount £375m. will be allocated to the States and £28m. will be spent on roads in Commonwealth Territories and £17m. in grants to the States for special works such as "beef" roads; a total of £420m. i.e. practically the whole of the fuel taxes.

However, the amounts available under the new Act, together with funds received by the States from other sources, such as State Motor Vehicle Taxation will be approximately two-thirds only of the amount required to meet Australia's road needs.

NEEDS OF THE MAIN ROADS SYSTEM

As indicated earlier in this Review, progress has been made in the improvement of Main Roads by the extension of dustless surfaces; by rebuilding, strengthening, widening and deviating long lengths of pavement; and by the construction of bridges to replace old bridges, to provide new crossings and to replace ferries.

These improvements have removed many "trouble" spots which have impeded the flow of traffic on Main Roads in the past, and while many favourable comments have been received from the travelling public in regard to the widespread activities of the Department throughout the State, it is nevertheless true that many more works ought to be put in hand to meet present needs and those expected to arise in the near future.

In country areas there are many miles of gravel or earth roads which need to be reconstructed and provided

with a dustless surface; hundreds of bridges are required at sites not previously bridged; hundreds of existing bridges are too narrow or have badly aligned approaches; many roads require widening; re-aligning or regrading to provide safer travelling conditions and reduce transport costs; existing bitumen and concrete pavements need strengthening in order to carry the increasing volume of heavy loads, and railway level-crossings on roads carrying heavy volumes of traffic need to be eliminated.

Similarly, in order to cope with traffic congestion in the Sydney metropolitan area there are many pavements which need widening to the full width between kerbs; some roads need widening beyond their present boundaries; expressways are necessary to carry the main streams of through traffic; wider bridges are needed at some water crossings and additional bridges or viaducts are required both over land as well as water.

It may well be said that the Department is concerned both with "lifting the farmer out of the mud and getting the urban dweller out of the muddle".

Programmes of works required to meet road needs must be planned over a period of years and must be based on a factual statement of their nature, cost and related priority. In other words, expenditure and investment of resources should be related to needs.

The needs of the Main Roads System for the ten year period, 1964-1974, have already been established by actual survey.

To meet the assessed needs of traffic on the Main Roads System during the ten-year period, an amount of £907m. would be required. This amount includes provision for the construction of expressways in and between the urban areas of Wollongong, Sydney and Newcastle.

The continued growth in the number of registered motor vehicles and the increase by the State Government in December 1962, of one-third in the rate of motor vehicle taxation have provided a significant increase in the funds available to the Department. However, despite this, the funds which currently appear likely to be available from the normal sources are estimated at £530m. (including Commonwealth Aid).

Thus, the deficiency in funds over the ten-year period is seen to be £377m.

Through traffic surveys and land-use and population studies etc., the Department is fully aware of the dimensions of the road problem in this State. It has forecast what will be needed. It has comprehensive plans for road and bridge works and knows the priorities of them, but it must have the assurance of substantially increased income over a reasonably long period.

Given this, the Department could proceed boldly to construct good roads to eliminate the costly maintenance, hazard and high operating costs of bad roads.



A section of the reconstructed road 40 miles north of Grafton

GRAFTON TO CASINO

Reconstruction of Trunk Road No. 83

TRUNK Road No. 83 extends northwards from its junction with the Gwydir Highway (State Highway No. 12) at South Grafton to the Mount Lindesay Highway (State Highway No. 24) approximately three miles north-east of Woodenbong, a total distance of 118.5 miles. The length between Grafton and Casino is 63 miles. This section traverses the City of Grafton, Shires of Copmanhurst, Woodburn and Tomki and the Municipality of Casino.

The road passes through generally dairying and grazing country. The greater proportion of traffic using this road is connected with tourism or commerce between Grafton, Casino and Lismore.

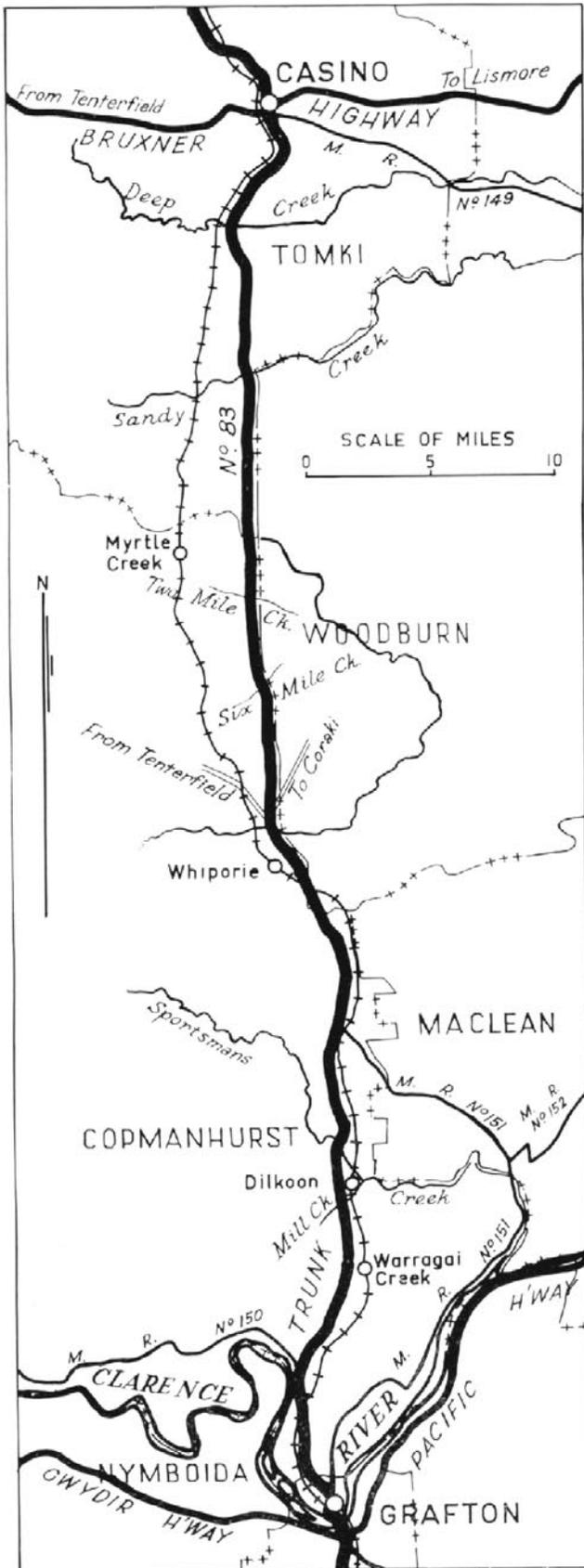
For some time the Department has been aware of the need to reconstruct the road between Grafton and Casino and provide it with a bitumen surface. Sections of the existing road are subjected to inundation by floodwaters and the reconstructed road, when completed, will provide a flood-free route between Grafton and Casino. It will also provide an all-weather alternative route to the Pacific Highway north of Grafton.

Construction by Copmanhurst Shire Council

The first reconstruction work undertaken by the Copmanhurst Shire Council was the length from 43.0 miles to 44.7 miles north of Grafton. The Council is now engaged on the reconstruction of the length from 2.2 miles to 15.5 miles north of Grafton. This work is being carried out partly by day labour and partly by contract. The sections 4.53 miles to 11.21 miles and 11.61 miles to 11.89 miles have been reconstructed and bitumen surfaced by the Council, while the section 11.89 miles to 15.5 miles will be commenced shortly. Construction still to be undertaken by Copmanhurst Shire Council includes the intermediate section from 11.21 miles to 11.61 miles, from Grafton, a new bridge over Warragai Creek at 11.3 miles north of Grafton,



Reconstruction of a deviation between 15 miles and 19 miles north of Grafton



and bridges over Mill Creek, 14.8 miles north of Grafton and 15.2 miles north of Grafton.

Construction by Department of Main Roads

The reconstruction and bitumen surfacing from 15.5 miles to 43.0 miles north of Grafton is being undertaken by the Department of Main Roads partly by day labour and partly by contract. The Department is meeting the full cost of work on this section. Four sections already completed including bitumen surfacing are the lengths from 15.5 miles to 19 miles, 36.05 miles to 37.05 miles, 37.05 miles to 38.25 miles and 39.57 miles to 43.0 miles north of Grafton.

The work between 15.5 miles and 19 miles north of Grafton involved the construction of a deviation which eliminated a railway level crossing at Dilkoon and a section of road subject to periodic flooding. It included the construction of a bridge 120 feet long over Dilkoon Creek and a steel and concrete 14 span bridge, 552 feet long, over Sportsman's Creek. The bridgework was carried out by Oswyn Hails Pty. Ltd. under contract to the Department whilst the roadworks were undertaken by the Department with its own forces.

Work is at present in hand on reconstruction and bitumen surfacing between 30.0 miles and 39.0 miles north of Grafton and it is expected that this section will be completed later in 1964.

The Department has also recently commenced by contract the construction of a bridge at Selection Flat, between Six Mile Creek and Two Mile Creek.

New bridges planned for future construction include Sheep Creek at 21.52 miles north of Grafton; a bridge at 27.9 miles north of Grafton; Two Mile Creek at 43.0 miles, and Deep Creek, 57.42 miles north of Grafton. In addition, overbridges are required to eliminate the railway level crossings at Whiporie and Koolkhan.

Construction by Tomki Shire Council

The recent completion of a section 2.78 miles long by Tomki Shire Council completes the length from 48.3 miles north of Grafton to Casino. This work is located at the southern end of the completed work in the Shire of Tomki.

The remaining section, from 44.7 miles to 48.3 miles north of Grafton, is at present under reconstruction by Tomki Shire Council by day labour.

A new bridge over Sandy Creek, which was completed in 1962 by the Tomki Shire Council by day labour. Council also constructed by contract a bridge over Myrtle Creek, which was opened to traffic on 5th November 1964.

The speed design standard adopted for this route is 50 miles per hour, increasing to 60 miles per hour where costs are not appreciably affected. The formation width of the reconstructed sections is 28 feet and the pavement is 20 feet wide. However, in cuttings 6 feet wide side drains are located outside this formation thus making an overall formation width of 40 feet.

At present 37 miles of the 63 miles between Grafton and Casino has been provided with a bitumen surface and it is the Department's intention to proceed with this work until completed.



The south coast beach resort of Kiama

FOUR COAST

The central township and beach area of the City of Wollongong



the township of Nowra showing the bridge over the Shoalhaven River

SOUTH TOWNS



Bateman's Bay and the bridge over the Clyde River





Her Royal Highness Princess Marina, Duchess of Kent

OFFICIAL OPENING

Inspecting the guard of honour formed by the final year students
of Riverside Girls' High School



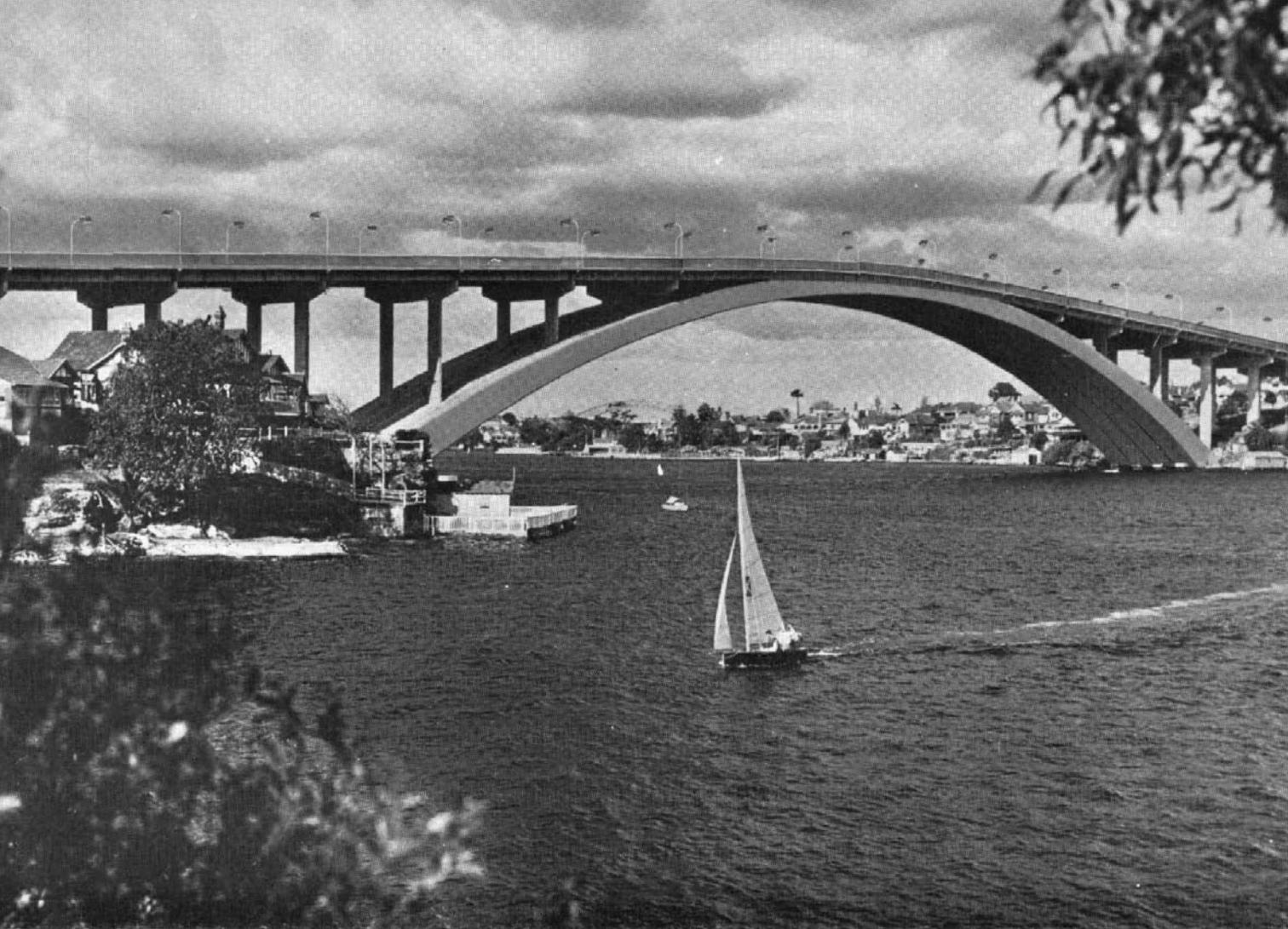


The plaque which was unveiled by Her Royal Highness at the opening ceremony

NEW GLADESVILLE BRIDGE

Her Royal Highness addressing the guests and cutting the ribbon to declare the bridge open





New Bridge over Parramatta

THE OLD BRIDGE

The old iron opening-span bridge over the Parramatta River connecting Drummoyne and Gladesville and the original bridge over Iron Cove, or Long Cove as it was then called, were both built mainly to shorten the distance to the City from farms and market gardens.

Construction of both bridges was commenced in April, 1878 but twelve months later work on Iron Cove Bridge was suspended to allow efforts to be concentrated on Gladesville Bridge, which was opened to traffic in 1881.

With the opening to traffic of Iron Cove Bridge in November, 1882 and the building of a road to link this and the Gladesville Bridge with existing bridges closer

to the City at Glebe Island and Pyrmont, the time of the journey from farm to market was shortened considerably.

Prior to construction of the old Gladesville Bridge, access across the Parramatta River in the locality was by ferry.

Until Sydney Harbour Bridge was opened to traffic in March 1932, the old Gladesville Bridge provided the only roadway across the waters of Port Jackson and the Parramatta River between the entrance to the Port and crossings of the river at Parramatta.

The old Gladesville Bridge, which consists of a series of lattice truss spans and is 896 feet long, is to be demolished.

BRIDGE STATISTICS

The Longest Concrete Arch Span Bridge in the World.

LENGTH: 1,901 feet 6 inches including a four-ribbed concrete arch with a clear span of 1,000 feet and, on each side of the arch, four pre-stressed concrete girder spans, each 100 feet long.

WIDTH: The roadway is 72 feet between kerbs.

CLEARANCE: The underside of the arch is more than 120 feet above high water level for a width of 200 feet in the middle of the arch, the maximum clearance being 134 feet.

GRADE: The roadway rises on a grade of 6 feet in each 100 feet from either side and the grades are connected by a vertical curve 300 feet long over the centre of the structure.

FOOTWAYS: There is a footway, 6 feet wide on each side of the roadway. Inner and outer protective barriers flank each footway. The inner protective barriers divide the footways from the vehicular roadway, providing complete safety for pedestrians and preventing splashing from vehicles in wet weather.

LIGHTING: Steel standards set in the line of the outer protective barriers carry lanterns with 400-watt lights over the roadway.

QUANTITIES OF MATERIALS: Concrete 42,500 cubic yards (78,700 tons). Steel reinforcement 2,200 tons. High tensile steel wire strand and steel bar 236 miles (361 tons).

iver at Gladesville



THE NEW BRIDGE

GENERAL

The new bridge over the Parramatta River between Gladesville and Drummoyne not only replaces a two-lane opening-span bridge which is inadequate for traffic and is approaching the end of its useful life, but also forms part of the future North-Western Expressway which will serve a large section of the northern area of the Sydney Metropolis.

The recently completed Fig Tree Bridge over nearby Lane Cove River and a bridge being constructed over Tarban Creek between the new bridge and Fig Tree Bridge will also be incorporated in the expressway. The aerial photograph on page 60 illustrates how this length of the expressway will appear when completed.

These three bridges and the road works associated with them will greatly increase Sydney's cross-harbour facilities by providing a favourable route for part of the traffic which would otherwise use Sydney Harbour Bridge about three and a half miles to the east.

Following the invitation of tenders both overseas and in Australia, a contract for the construction of the new bridge was awarded by the Department of Main Roads to the partnership of Stuart Brothers, builders, of Sydney and Reed and Mallik, engineering contractors, of Salisbury, England.

The contractors were also responsible for the preparation of the design of the bridge which was undertaken for them by consulting engineers, Messrs. G. Maunsell and Partners of London and Melbourne.

After acceptance by the Department of Main Roads of the tender for the bridge, an amended design, differing somewhat from that originally proposed, was submitted by the contractors.

The new design provided for the arch to be built on fixed falsework whereas in the original design part of the arch was to have been built on floating falsework towed into position.

The original design provided for an arch span of 910 feet. The amended design increased the span to 1,000 feet and eliminated the necessity for deep-water excavation for arch foundations on the Gladesville (or northern) side of the river.

The design was checked both by the Department of Main Roads and Professor J. W. Roderick and associates of the staff of the Civil Engineering Department of the University of Sydney.

Subsequently, the advice of the late Monsieur Freyssinet of Société Technique pour l'Utilisation de la Précontrainte of Paris, was obtained on certain aspects of the design.

Professor J. W. Roderick of the University of Sydney assisted the Department as a general consultant during the construction of the bridge.

The Société Technique pour l'Utilisation de la Précontrainte of Paris acted as consultants in connection with the jacking of the arch ribs. Monsieur Guyon or Monsieur Jensen of that organisation was present and assisted with advice as each of the four arch ribs was jacked into position.

Associate Professor D. Campbell-Allen of the University of Sydney acted as a special consultant on concrete.

Associate Professor R. L. Aston of the University of Sydney acted as a special consultant to the Department on the required precision surveying during the arch construction.

The design of the special inner and outer protective barriers along each footway was prepared in accordance with advice and sketches provided by Mr. D. C. Maclurcan of the Sydney firm of architects, Fowell, Mansfield and Maclurcan. Mr. Maclurcan also provided the outline design of the footbridge across the Victoria Road connection to the bridge.

DESCRIPTION

The new bridge is 1,901 feet 6 inches long between abutments. It includes a four-ribbed concrete arch with a span of 1,000 feet and, on each side of the arch, four prestressed concrete girder spans each 100 feet long.

The arch with its clear span of 1,000 feet is the longest concrete arch span yet constructed in the world.

The arch is supported by massive concrete blocks, known as "thrust blocks", founded on sandstone on each side of the river.

The roadway is 72 feet wide between kerbs and is flanked by a footway, 6 feet wide, on each side of the bridge. At the Gladesville (or northern) end of the bridge, the roadway widens gradually over the approach spans from 72 feet to 120 feet to provide for the smooth routing of traffic.

The roadway rises on a grade of 6 feet in each 100 feet from each side of the river and the grades are connected by a vertical curve 300 feet long over the centre of the structure.

The arch has a clearance of not less than 120 feet above water level for a width of 200 feet in the centre of the stream, the maximum clearance at the crown of the arch being 134 feet above water level.

CONSTRUCTION

Construction of the bridge involved the following main operations—

- Excavation for foundations of—

Arch thrust blocks of concrete on each side of the river at the shore-line and partly below water.

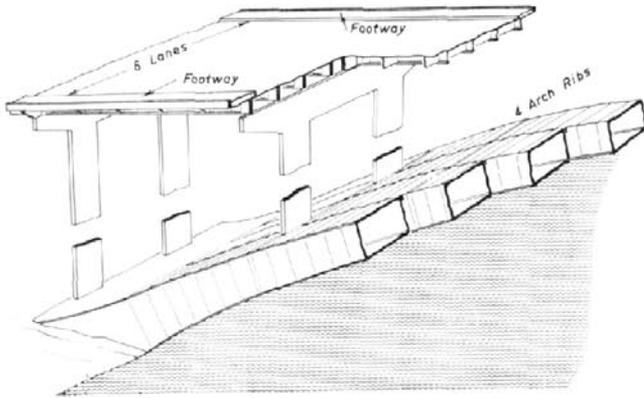
Abutments at the ends of the bridge.

Shore pier columns of the approach spans on each side of the river.

- Concreting of the arch thrust blocks, the abutments and columns.

- Driving of falsework piles in the river and erection of steel falsework to support the hollow concrete blocks and diaphragms forming each of the four arch ribs.

- Casting of the hollow concrete box units and diaphragms and the erection of the four arch ribs one at a time.



The four separate arch ribs, the columns and the deck of the bridge shown diagrammatically

- Jacking each rib to raise and lift it off the falsework.
- Casting of concrete deck beams on each side of the river.
- Erection of the deck beams to form the roadway over the arch.
- Paving of the concrete roadway and final completion of the structure.

FOUNDATIONS

Preliminary work on the foundations for the thrust blocks of the arch began in December, 1959 with the construction of coffer-dams on both banks of the river.

Approximately 2,100 cubic yards of earth and 6,400 cubic yards of sandstone were excavated for the two thrust blocks and for the foundations of the abutments and approach piers of the bridge.

ARCH THRUST BLOCKS

The thrust blocks at each end of the arch are of mass concrete and bear on steps cut in the solid sandstone of the river banks.

The maximum bearing pressure on the sandstone will not exceed 15 tons per square foot.

Tests to destruction of rock samples from the site showed that failure did not take place under a load eight times as great as this.

This high factor of safety is necessary to insure against any foundation failure, which would be calamitous in a structure of this type, and takes into account variations in the quality of the sandstone across the foundation areas.

Concrete in the thrust blocks was placed in layers with an average thickness of about five feet and compacted by vibrators.

The bulk of the concrete in the thrust blocks was of such strength that a force of over 100 tons would be required to crush a cylinder 6 inches in diameter by 12 inches high (over 6,000 lbs. per square inch). Where the thrust blocks widened out so that the area available to take the thrust was greatly increased, concrete of lesser strength was used, but it had a strength of at least 2,500 lbs. per square inch.

Approximately 14,500 cubic yards of concrete were used in the construction of the thrust blocks.

The construction of the thrust block on the Gladesville side was completed on the 22nd August 1961, and on the Drummoyne side on the 30th October, 1961.

ABUTMENTS

The abutments at the two ends of the bridge are of reinforced concrete and of box-type with earth filling. They are founded directly on sandstone.



Excavation for the arch thrust blocks on the Gladesville side

Completed arch thrust blocks on the northern river bank and steel falsework being erected



COLUMNS

The deck is carried on pairs of prestressed concrete thin-walled columns. The wall thickness is two feet except in the tall columns at the ends of the arch where the wall thickness was increased by six inches.

On top of each pair of columns there is a reinforced concrete headstock.

Pier columns to support an approach span nearing completion



FALSEWORK FOR ARCH RIBS

To support the hollow concrete box units and diaphragms which make up each of the four ribs in the arch, it was necessary to provide falsework during construction.

The falsework consisted of steel tubular columns on steel tubular pile trestles carrying spans of steel beams 60 feet long and a steel truss span 220 feet long over an opening left for navigation in the Gladesville (or northern) half of the falsework. These units were tied together and anchored at each end to the thrust blocks. The piles were taken down to rock in the river bed.

At the centre of the falsework, the steel columns formed a braced tower extending the full width of the bridge. The pile trestles had cross members just above water also extending the full width of the bridge.

The rest of the falsework was wide enough to support one rib at a time only. After completion of the first rib, the falsework was moved sideways on rails on the members of the pile trestles to support, in turn, each of the other three ribs.



Falsework completed and ready to support the arch units

Machinery installed on the central tower lifted the concrete box units and diaphragms from water level and moved them into position.

The tower also served as a stay to prevent movement sideways of the individual arch ribs after they became self-supporting and until they were tied together.

A large floating crane was used to lift the long steel tubular columns and trusses into position.

The erection of the falsework was completed in November, 1961.

THE RIBS OF THE ARCH

The hollow box units and diaphragms which comprise each rib of the arch were manufactured at Woolwich,

three miles downstream from the bridge site, where a casting yard was set up on the water front.

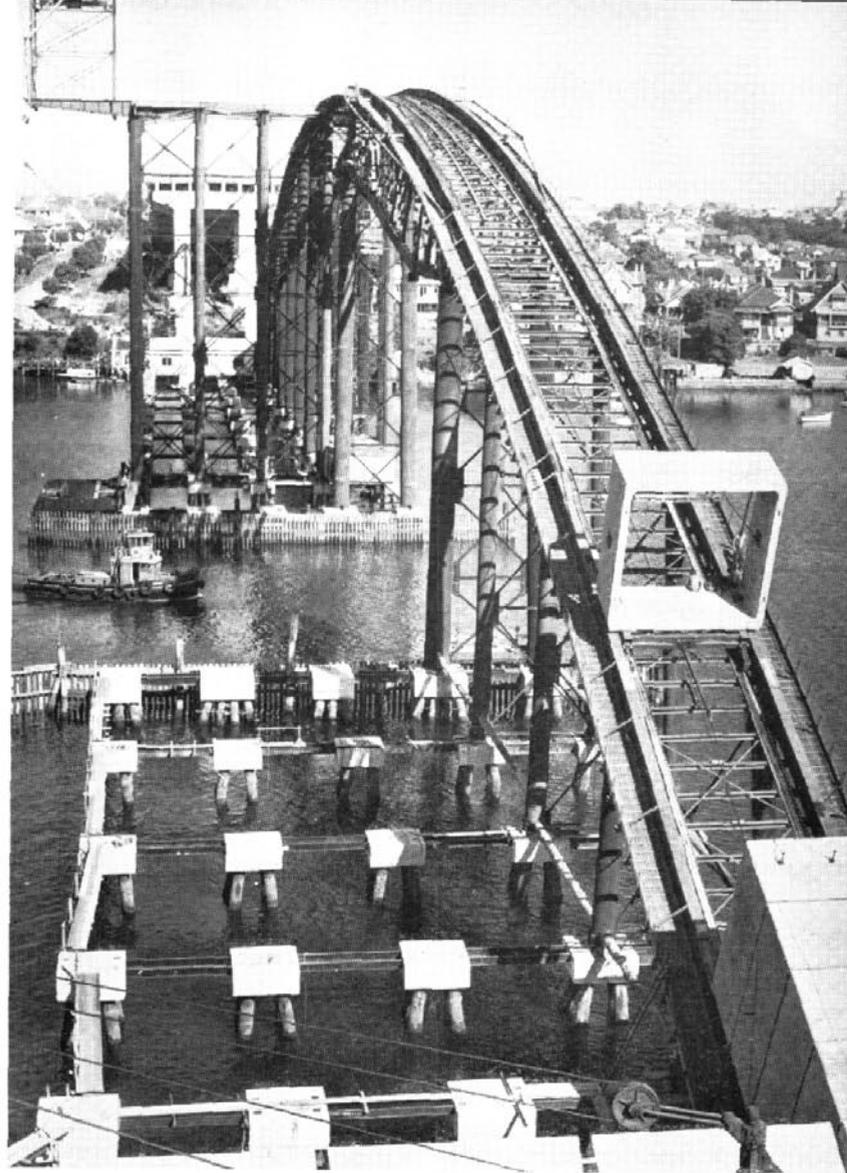
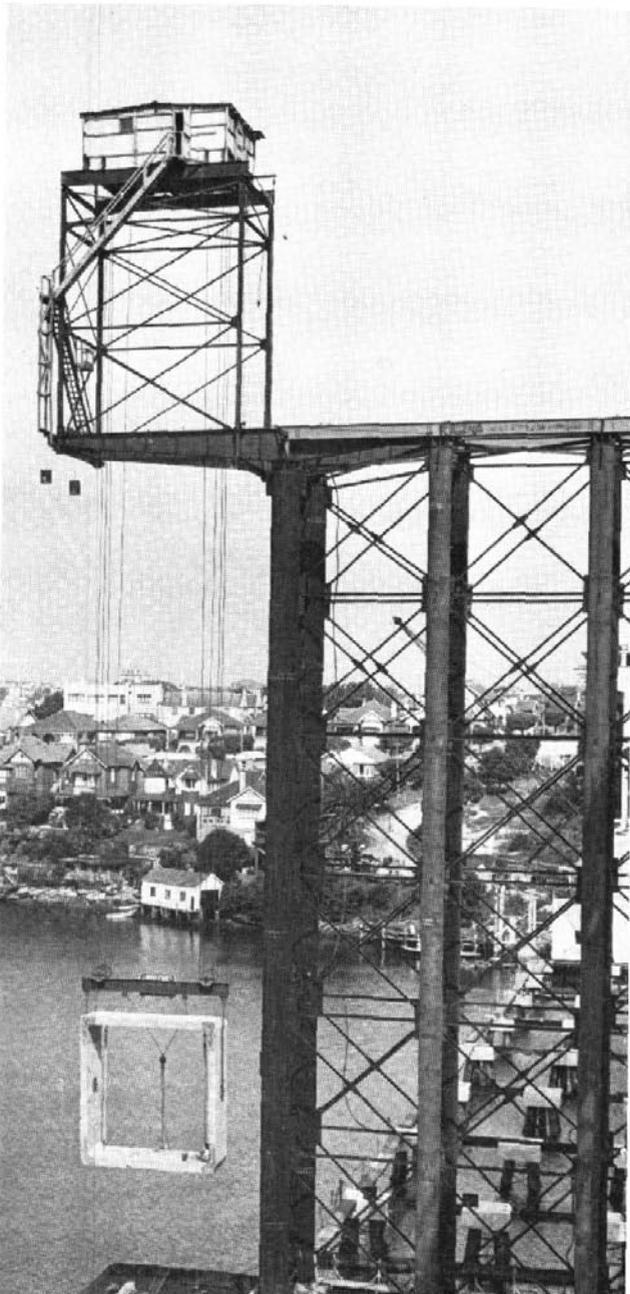
The casting yard was laid out to accommodate at one time all the units for one rib of the arch, i.e., 108 box units and 19 diaphragms.

Each box unit weighs 50 tons and is 20 feet wide with depths decreasing from 23 feet at the thrust block to 14 feet at the crown of the arch, measured at right angles to the axis of the arch. The length of the box units along the arch varies from 7 feet 9 inches to 9 feet 3 inches.

The diaphragms are solid components, except for an opening to allow subsequent access through the rib and are generally 2 feet thick measured along the arch.

After the units were manufactured, they were loaded on lighters and towed to the bridge site.

A concrete box unit being hoisted to the top of the falsework



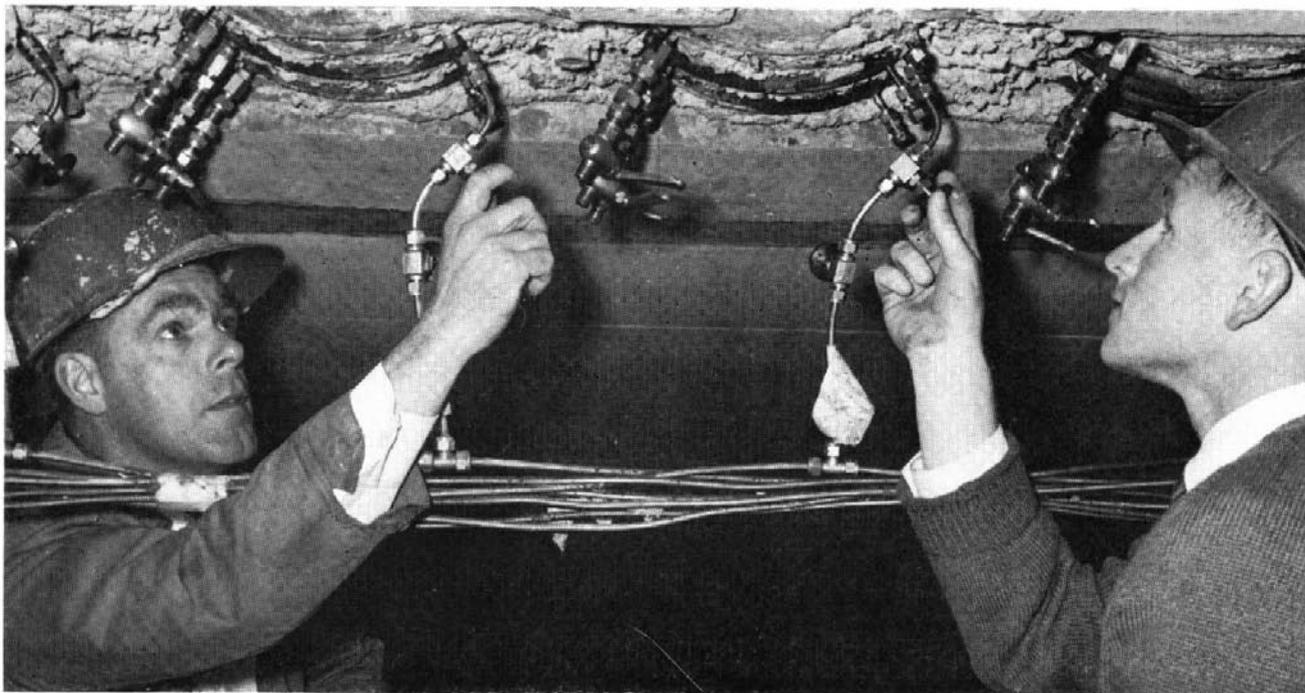
A concrete box unit being winched into position on the falsework

THE ARCH RIBS

The hollow concrete box units and diaphragms were lifted from lighters to the crown of the falsework and winched down on bogies to their correct positions on the falsework. The first box unit was placed on the Drummoyne side on the 23rd February, 1962 and on the Gladesville side on the 14th March, 1962. The last box unit in the first rib of the arch was placed in position on the 31st July, 1962.

The diaphragms are spaced at intervals of 50 feet to serve the dual purpose of tying the four ribs together transversely and of supporting the slender columns which carry the roadway over the arch.

When the units had been moved into position on the falsework, the gap of three inches between them was filled with concrete. At two points in each rib, four layers of Freyssi flat jacks were inserted. There are 56 jacks in each layer. The rib was then compressed longitudinally by inflating the jacks with oil one layer at a time, the oil being replaced with grout and allowed to set before inflation of the next layer of jacks was carried out. The inflation of the jacks increased the distance between the units adjacent to the jacks and



Inflating the jacks with oil during compression of an arch rib

The four ribs of the arch have been completed and are self-supporting



hence the overall length of the arch along its centre line. This caused it to rise and lift off the falsework making it self-supporting. The falsework was then moved sideways to carry the components of the next rib.

The last box unit was placed in the arch on the 31st May, 1963.

The first rib of the arch became self-supporting in September, 1962, the second in January, 1963, the third in March, 1963 and the fourth and final in June, 1963.

DECK BEAMS

Prestressed concrete beams for the spans of the bridge deck were manufactured at casting yards at each end of the bridge. There are 143 deck beams in the bridge.

Each deck beam, 65 tons in weight, was lifted by a special launching truss and placed in position on its seating.

In February, 1964 the last deck beams were launched into position to form a continuous base for the six-lane-road over the longest concrete arch span in the world.

COMPLETION OF WORK

As the erection of pier columns and deck beams was completed, the concrete deck between the beams and the concrete footway cantilevers were cast in place.

The falsework was removed from under the arch.

Finally, the footways, hand-railing and light standards were erected, and an asphaltic-concrete wearing course was laid on the roadway.

TESTING OF MATERIALS

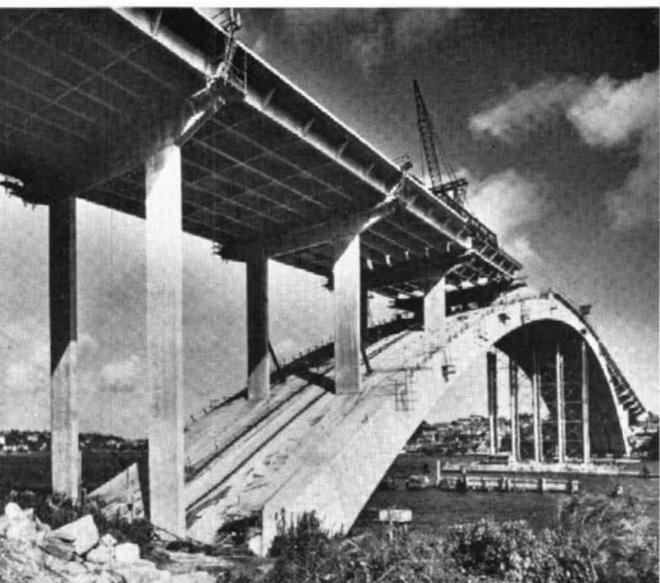
Because of the importance of controlling the quality of materials, and in particular concrete, used in the bridge, special arrangements for testing were set up.



Precast deck beams



A deck beam being launched into position
Placing of deck beams nearing completion



The underside of the four arch ribs after removal of the falsework

A concrete testing laboratory was established at the bridge site. Here, samples were stored in a "fog room" under conditions of constant temperature and humidity until tested.

Equipment installed in the laboratory included a 200-ton capacity testing machine, capping equipment, diamond saw, drying oven and mixing unit for investigation of the concrete materials and mixes used in the project.

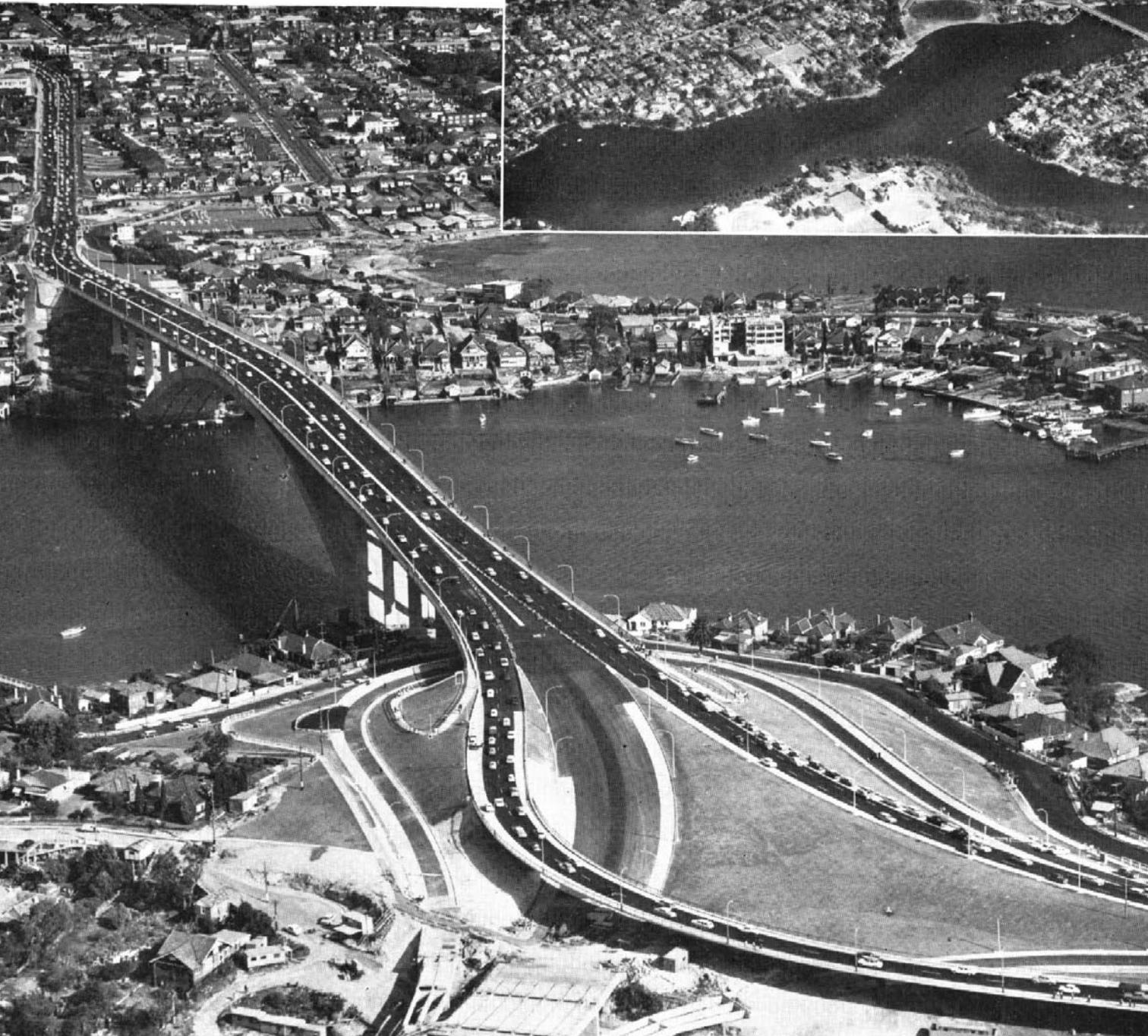
In addition to continuous day-to-day testing of concrete aggregate, cement and concrete, the research staff of the Department of Main Roads carried out special long-term creep and shrinkage tests in the concrete used in the project so that appropriate allowances could be made when the ribs of the arch were placed in compression and freed from the falsework.

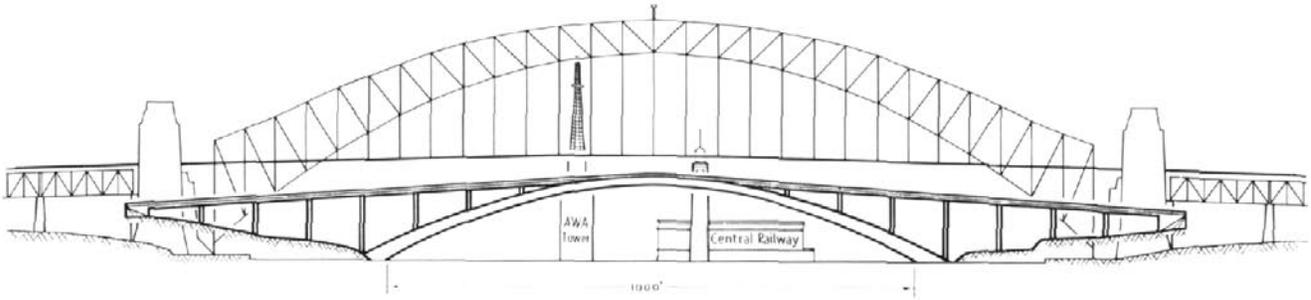
Testing of sandstone was also carried out at the laboratory at the bridge site.

Testing of steel reinforcement and high tensile steel bar and steel wire strand was undertaken at the Department's Central Testing Laboratory.

An impression of how the North-Western Expressway will appear between Drum-moyne and Lane Cove, when the bridge over Tarban Creek is completed

Traffic using the new Gladesville Bridge





The new bridge compared with Sydney Harbour Bridge, Sydney Central Railway Station Tower and the Amalgamated Wireless (Australasia) Tower

MAINTENANCE

The amount of maintenance required on the new bridge will be very small and will consist mainly of repainting of hand-rails and resurfacing of the roadway on the deck of the bridge.

So far as the life of the bridge is concerned, there is no limit, under normal conditions, to the number of years for which the structure should last.

APPROACHES

The Drummoyne (or southern) approach to the new bridge now connects with Victoria Road. Ultimately, this approach will connect with further lengths of the North-Western Expressway to be constructed from the City.

The next section of the North-Western Expressway to be constructed will be from Drutt Street, across Darling Harbour railway goods yard to Fig Street, and over Wentworth Park to Bridge Road, Glebe.

Preparation of the design for this section of the North-Western Expressway is in hand.

At the Gladesville (or northern) end of the new bridge, the North-Western Expressway will pass over Tarban Creek across which a bridge is now being built and connect with the recently completed Fig Tree Bridge.

Traffic travelling from the City to Gladesville, Ryde and other areas to the west will leave the bridge on a new road connecting with Victoria Road on the northern side of the river.

Traffic travelling towards the City from Gladesville, Ryde and other areas to the west will gain access to the new bridge via an overpass, the Huntley's Point Overpass, beneath which the main route of the North-Western Expressway will pass before crossing Tarban Creek. The Huntley's Point Overpass also spans the link road being provided to enable traffic from these areas to join the expressway for north-bound travel.

Spanning the Victoria Road connection to the bridge on the northern side of the river, an overbridge has been provided for pedestrians.

COST OF WORKS

The cost of the new bridge and the cost of the road and bridge works comprising the approaches will be of the order of £4.5m.

Commissioners, Assistant Commissioners, and Officers of the Department associated with the design and construction of the new bridge over the Parramatta River at Gladesville.

COMMISSIONERS

H. M. Sherrard, prior to 20-4-62
J. A. L. Shaw, from 20-4-62

ASSISTANT COMMISSIONERS

J. A. L. Shaw, prior to 20-4-62
R. J. S. Thomas, from 20-4-62

PRINCIPAL ENGINEERING OFFICERS

Chief Engineer C. A. Hawkins, prior to 14-5-62
T. M. Coulter, from 14-5-62
Deputy Chief Engineer. F. W. Laws, prior to 12-5-62
H. G. Macready, from 14-5-62 to 5-4-63
G. V. Fawkner, from 22-4-63
Bridge Engineer A. J. Clinch, prior to 21-12-62
F. C. Cook, from 21-12-62
Associate Bridge Engineer. W. K. Bate

OFFICERS DIRECTLY CONCERNED WITH THE DESIGN OF THE NEW BRIDGE

Designing Engineer for Bridges. S. C. Robertson
Assistant Designing Engineer for Bridges. A. Middlehurst
Design Staff V. Karmalsky, A. Smith, A. Fried, K. Forrester, K. M. Anderson

OFFICERS DIRECTLY CONCERNED WITH THE CONSTRUCTION OF THE NEW BRIDGE

Assistant Bridge Engineer (construction). F. C. Cook, prior to 21-12-62
L. Evans, from 1-1-63
Materials and Research Engineer. E. F. Mullin, prior to 11-3-63
L. R. Browne, from 5-3-63
Supervising Engineer (Materials & Research). A. Leask
Principal Testing Officer. N. W. West

ENGINEER UNDER THE CONTRACT AND OFFICERS EMPLOYED IN CONNECTION WITH THE SUPERVISION OF THE CONTRACT

Engineer under the Contract. R. W. P. Hirt (Metropolitan Engineer).
Assistant to Engineer under the Contract. G. V. Fawkner, prior to 28-5-62
A. F. Schmidt, from 21-5-62
Supervising Engineer Resident Engineer on site. B. J. Pearson
E. A. McKenzie
Inspectors C. R. Brealey, G. W. Barty
C. W. Broughton
R. Cooper
Testing Operator on Site (Concrete Samples).
Surveyor B. P. Cox

MAIN ROADS FUNDS

Receipts and Payments for the period from 1st July, 1964 to 30th September, 1964

	County of Cumberland Main Roads Fund	Country Main Roads Fund
	£	£
RECEIPTS—		
Motor Vehicle Taxation (State)	738,077	2,952,306
Charges on heavy commercial goods vehicles under Road Maintenance (Contribution) Act, 1958 (State)	251,777	1,007,110
Commonwealth Aid Roads Act, 1964	538,053	2,082,464
From Councils under Section 11 of Main Roads Act and/or for cost of works	947,576	15,000
Other	140,681	126,379
Total Receipts	£ 2,616,164	6,183,259
PAYMENTS—		
Maintenance and minor improvement of roads and bridges	625,771	2,089,677
Construction and reconstruction of roads and bridges	1,093,789	2,419,493
Land Acquisitions	353,057	96,910
Administrative Expenses	147,852	286,279
Loan charges, payment of interest, exchange, management and flotation expenses	28,045	129,595
• Miscellaneous	311,393	414,010
Total Payments	£ 2,559,907	5,435,964

* Includes transfers to Special Purposes Accounts in respect of finance for Operating Accounts, Suspense Accounts and Reserve Accounts.

SYDNEY HARBOUR BRIDGE ACCOUNT

Receipts and Payments for the period from 1st July, 1964 to 30th September, 1964

<i>Receipts</i>		<i>Payments</i>
	£	
Road Tolls	476,916	Cost of collecting road tolls
Contributions—		Maintenance and minor improvements
Railway Passengers	37,178	Interest, exchange and management expenses on loans
Omnibus Passengers	4,585	Alterations to other structures
Rent from properties	14,425	Administrative expenses and Miscellaneous charges
Miscellaneous	266	Transfers to Expressways Fund
		Provision of traffic facilities
	£533,370	£508,056

TENDERS ACCEPTED BY COUNCILS

The following tenders (in excess of £3,000) were accepted by the respective Councils for Road and Bridge Works for the three months ended 30th September, 1964.

Council	Road No.	Work or Service	Name of Accepted Tenderer	Amount		
				£	s.	d.
Abercrombie	T.R. 54 M.R. 252	Construction of one 3 cell 6 ft. x 5 ft. reinforced concrete box culvert at 23.5 m. on M.R. No. 252 and 19.4 m. on T.R. No. 54.	H. G. & L. G. Wicks	4,653	12	0
Abercrombie	T.R. 54		R. Ryden Construction Pty. Ltd.	20,106	19	8
Bogan	S.H. 8	Supply and delivery of 2,005 cubic yards of aggregate to section 32 m.-38.9 m. west of Nyngan.	J. L. Johnston Pty. Ltd.	7,125	0	0
Bogan	T.R. 57	Supply and spread 8,000 cu. yds. of gravel between 7 m. and 29 m. south of Nyngan.	A. T. & L. M. Hughes	3,666	13	4
Boomi	M.R. 507	Supply and delivery of 13,056 cubic yards of selected mudstone between 0 m. and 3.25 m. east of Mungindi.	Cec. Swords Pty. Ltd.	3,834	11	8
Boomi	S.H. 12	Supply and delivery of 15,784 cubic yards of gravel between 22.8 m. and 26.2 m. west of Moree.	G. T. Muggleton	6,600	2	0
Burrangong	T.R. 78	Supply and delivery of 24,650 gallons of bitumen to various sections.	Boral Road Services Pty. Ltd.	4,018	17	1
Burrangong	M.R. 241	Supply and delivery of 1,040 cu. yds. of aggregate to stockpiles.	Assoc. Aggregate Industries Ltd.	3,440	13	4
Cobar	D.R. 1279	Clearing and grubbing approximately 39.5 m. between "Keewong" and "Warbreccan".	W. Kuhyk	4,800	0	0
Coolah	T.R. 77 T.R. 55	Supply and delivery of 1,990 cubic yards of aggregate to stockpiles.	N. C. & A. D. Bennett	6,250	0	0
Coolah	T.R. 77 T.R. 55		Bitumen surfacing various sections	Shorncliffe Pty. Ltd.	4,194	9
Concord	S.R. 2059	Construction of new road including bridge over stormwater channel, across St. Luke's Park between Gipps Street and Queens Road.	J. R. E. Taylor Constructions Pty. Ltd.	22,537	12	0
Eurobodalla	M.R. 560	Construction of 8 cell 5 ft. x 5 ft. reinforced concrete box culvert at Hanging Rock Creek 1.56 m. from Bateman's Bay.	R. Orford	4,330	0	0
Gilgandra	S.H. 18	Supply and delivery of 1,301 cubic yards of aggregate to various stockpiles.	N. C. & A. D. Bennett	5,697	15	6
Gilgandra	T.R. 77	Reconstruction and provision for culverts at 19 m. and 22 m. from Gilgandra.	J. A. Burrell	4,095	0	0
Goodradigbee	M.R. 278	Construction of 2 cell 9 ft. x 6 ft. reinforced concrete box culvert 8.9 m. from Yass.	H. G. & L. G. Wicks	3,323	16	0
Hume	M.R. 282	Bitumen surfacing between 23.5 m.-28.5 m. from Cumboroona to Toonalock.	Allen Bros. Pty. Ltd.	5,184	14	4
Liverpool Plains	T.R. 72	Supply and delivery of 2,000 cubic yards of aggregate to stockpiles between 29.5 m. and 34.5 m. south of Gunnedah.	Pioneer Quarries (Tamworth) Pty. Ltd.	5,080	18	0
Liverpool Plains	T.R. 72	Supply and delivery of 22,300 gallons of bitumen between 29.5 m. and 34.5 m. south of Gunnedah.	Boral Road Services Pty. Ltd.	3,670	4	2
Manilla	M.R. 357	Construction of 3 cell 10 ft. x 6 ft. reinforced concrete box culvert, including earthworks, gravelling and ancilliary works 3 m. west of Manilla.	W. H. Marshall	4,953	10	8
Manilla	T.R. 63	Bitumen surfacing between 10.8 m. and 13.2 m. north of Manilla.	Shorncliffe Pty. Ltd.	5,464	6	11
Merriwa	M.R. 209	Reconstruction between 5.55 m. and 7.93 m. east of Merriwa.	J. G. Hennessy Pty. Ltd.	18,959	4	3
Monaro	M.R. 394	Reconstruction and gravelling between 24 m. and 26.8 m. from Bibbenluke Shire boundary.	M. J. Dowthwaite & Co. Pty. Ltd.	13,003	14	0
North Sydney	Warringah Expressway	Excavation for new road from Bent Street to the low level of Alfred Street.	Rail and Road Constructions Pty. Ltd.	6,453	0	0
Stroud	M.R. 289	Construction of 2 span reinforced concrete bridge 40 ft. long over Valley Creek 6.15 m. from Trunk Road No. 90.	F. H. Compton & Sons Pty. Ltd.	9,304	7	5
Tallaganda	T.R. 51 T.R. 79 M.R. 271	Supply and delivery of 1,363 tons of aggregate to stockpiles.	Ready Mixed Concrete (Canberra) Pty. Ltd.	4,760	13	0
Tallaganda	T.R. 51 T.R. 79 M.R. 271		Bitumen surfacing of 93,754 sq. yds. at several locations.	Allen Bros. Pty. Ltd.	6,265	14
Taree	S.H. 10	Construction of 5 span reinforced concrete bridge 165 ft. long over Browns Creek at Taree.	S. Turner & Sons Pty. Ltd.	28,821	0	0
Uralla	S.H. 6 S.H. 14 S.H. 21	Supply and delivery of 3,400 cubic yards of aggregate to stockpiles.	Mobile Crushing Co.	7,480	0	0
Wakool	M.R. 319 M.R. 388		Hauling and spreading 56,720 cubic yards of sandy loam between 17 m. to 20 m. and 20.5 m. to 25 m. north of Barham on M.R. 319 and between 0.72 m. to 6.19 m. and 14.2 m. to 15.5 m. on M.R. 388.	Robin Keath Pty. Ltd.	5,953	0

COUNCIL TENDERS—continued

Council	Road No.	Work or Service	Name of Accepted Tenderer	Amount
Walcha ..	D.R. 1282 ..	Construction of 2·37 m. of road including drainage, fender posts and approximately 30,000 cubic yards of excavation in earth and rock.	H. G. Watson	£ s. d. 12,784 4 0
Waradgery ..	S.H. 21 S.H. 14 M.R. 514	Supply and delivery of aggregate to stockpiles ..	G. Stevenson & Co., Griffith.	9,155 7 6
Wellington ..	M.R. 233 ..			

TENDERS ACCEPTED BY THE DEPARTMENT OF MAIN ROADS

The following tenders (in excess of £3,000) for Road and Bridge Works were accepted by the Department during the three months ended 30th September, 1964.

Work or Service	Name of Accepted Tenderer	Amount
State Highway No. 1—Princes Highway, Shire of Imlay. Supply and delivery of steelwork for construction of a 6 span steel and reinforced concrete bridge, 686 feet long over the Wallagaraugh River at Timbillica.	Kelly and Lewis Pty. Ltd.	£ s. d. 76,545 0 0
State Highway No. 1—Princes Highway, Shire of Imlay. Erection of steelwork and final completion of a 6 span steel and reinforced concrete bridge 686 feet long over the Wallagaraugh River at Timbillica.	Transfield Pty. Ltd.	113,862 0 0
State Highway No. 7—Mitchell Highway, Shire of Darling. Construction of headwalls to culverts between 27·60 m. and 47·10 m. south of Bourke.	J. Fisher & G. Lienesch. . . .	3,247 0 0
State Highway No. 10—Pacific Highway, Shire of Tintenbar. Delivery to site and driving of piles for bridge over Emigrant Creek, 3·40 m. south of Ballina.	Pile Driving Corporation	7,833 0 0
State Highway No. 17—Newell Highway, Shire of Talbragar. Supply and delivery of steelwork for construction of a 5 span steel and reinforced concrete bridge, 332 feet long over the Talbragar River at Troy.	John Lysaght (Aust.) Ltd.	31,819 0 0
State Highway No. 17—Newell Highway, Shire of Talbragar. Erection of steelwork and final completion of a 5 span steel and reinforced concrete bridge, 332 feet long over the Talbragar River at Troy.	Transfield Pty. Ltd.	60,099 15 0
State Highway No. 17—Newell Highway, Municipality of Narrabri. Construction of 3 span steel and reinforced concrete bridge 190 ft. long over Doctor's Creek at Narrabri.	Central Constructions Pty. Ltd. ..	25,564 0 0
Trunk Road No. 83, Shire of Copmanhurst. Supply and spraying of 47,980 gallons of bitumen on new construction.	Boral Road Services Pty. Ltd. ..	8,917 14 8
Main Road No. 167—Municipalities of Bankstown and Liverpool. Construction of a reinforced concrete bridge 280 ft. long over George's River at Milperra.	E. S. Clementson Pty. Ltd.	250,486 4 11
Main Roads Nos. 170 and 194. Municipality of Botany. Supply and delivery of 84 precast pretensioned bridge units 34 ft. 8 in. long for bridge over Stormwater channel, adjacent to General Holmes Drive.	Hawaiian Australian Concrete Pty. Ltd.	6,444 0 0
Main Road No. 286—Shire of Snowy River. Construction of 3 reinforced concrete box culverts, one 4 cell 5 ft. x 5 ft. over Garden Gully (6·7 m.) and one 3 cell 12 ft. x 12 ft. over Sawpit Creek (9·18 m.) and one 4 cell 10 ft. x 9 ft. over Wragger's Creek (16·43 m.) west of Jindabyne.	Gromat Constructions Pty. Ltd. ..	29,779 3 0
Main Road No. 328—Municipality of Ku-ring-gai and Shire of Warringah. Construction of 14 span prestressed concrete bridge 1,385 ft. long over Middle Harbour at Roseville.	John Holland (Constructions) Pty. Ltd.	819,111 0 0
Secondary Road No. 2073—Municipality of Leichhardt and City of Sydney. Supply and delivery of 58 precast, pretensioned concrete bridge units for bridge across Johnston's Creek Canal near Harold Park.	Hawaiian Australian Concrete Pty. Ltd.	11,078 12 0
County Road—City of Parramatta. Construction of a reinforced concrete and prestressed concrete bridge 448 ft. long over the Parramatta River at Aston Street, Camellia.	Reed and Mallik & Stuart Bros. Pty. Ltd.	255,044 12 0
Warringah Expressway—Municipality of North Sydney. Construction of public utility tunnels and adjustments to stormwater drains.	Thiess Bros. Pty. Ltd.	255,292 1 0
Southern Expressway—Shire of Sutherland. Construction of a single span reinforced and prestressed concrete overbridge 176 ft. long at Woodlands Road.	F. T. Eastment & Sons. Pty. Ltd. ..	56,333 0 0

MAIN ROADS STANDARD SPECIFICATIONS

Note: Drawings are prefixed by letter "A", instructions are so described; all other items are specifications or forms (Revised schedule September, 1963)

ROAD SURVEY AND DESIGN

Design of two-lane rural highways (Instruction) (1960)	Form No. 355, 355A, 355B
Design of urban roads (Instruction)	369
Design of intersections (Instruction)	288
Design of acceleration and deceleration lanes (Instruction)	402
Design of kerb-lines and splays at corners (Instruction)	499
Design of subsoil and subgrade drainage (Instruction)	513
Horizontal curve transitions for 30, 40, 50 and 60 M.P.H. design speeds. (1963.)	A 1488, A, B and C.
Method of setting out horizontal curve transitions	A 1487

STREET DRAINAGE

Concrete converter	A 1418
Concrete kerb and gutter, light type	A 221
Gully grating	A 190
Gully pit, Specification (245) and Drawings; gully pit with grating (A 1042); kerb inlet only (A 1043); grating and extended kerb inlet (A 1352); extended kerb inlet only (A 1353).	243
Integral concrete kerb and gutter	A 3536
Mountable type kerb with reflectors	A 3491
Perambulator lamp	A 134A
Vehicle dish crossing	371B
Waterway calculations for urban drainage (Instruction) (Reprint of part of M.R. Form No. 371)	

CULVERTS

(a) Cast in place reinforced concrete box culverts—	
Reinforced concrete culvert	206
Single cell, height of opening 4 ft. to 12 ft.	A. 1014-20B
Two cell, height of opening 4 ft. to 12 ft.	A 1023-30A
Three cell, height of opening 4 ft. to 7 ft. (A 1033-36); 8 ft. (A 1038); 9 ft. (A 1040); 10 ft. to 12 ft. (A 4843-45).	A 4846-54
Four cell, height of opening 4 ft. to 12 ft.	A 4994-97
Reinforced concrete box culverts with concrete wearing surface and concrete handrailing, heights of opening 3 ft. to 12 ft. 1, 2, 3, and 4 cells.	A 3732
Posts and handrails for culverts	A 3847
(b) Precast reinforced concrete box culverts—	
Culverts with height of opening 12 in., 18 in., 24 in., and 30 in.	138
Precast concrete box culvert	25
(c) Pipe culverts—	
Pipe culverts and headwalls	25
Drawings are available for the following pipe culverts—	
(a) Single row of pipes—15 in. to 6 ft. dia.	A 142
(b) Double row of pipes—15 in. to 6 ft. dia.	A 1153
(c) Treble row of pipes—15 in. to 3 ft. dia.	303
Inlet sump for pipe culverts 3 ft. dia. or less	
Straight headwalls for pipe culverts 15 in. to 24 in. dia.	
Supply and delivery of precast concrete pipes	

BRIDGES

Concrete work for bridges	350
Concrete end posts for concrete bridges	A 279
Concrete handrail for concrete girder bridges	A 279A
Concrete end post and handrailing for prestressed concrete bridge units.	A 4932-33
Data for bridge design	18
Design of forms and falsework for concrete bridge construction (Instruction).	495
Erection of precast, prestressed concrete bridge units	557
Erection of precast, prestressed concrete piles	558
Erection of precast, prestressed concrete bridge girders	561
Extermination of termites in bridges (Instruction)	326
Field erection of steel work using high tensile (friction-grip) bolts	262
Foundations for bridges and culverts	563
High tensile (friction-grip) bolts, nuts and washers	261
General notes on Assembly of bridge construction specifications (Instruction)	599
Manufacture of precast or cast-in-place, prestressed concrete bridge members	556
Manufacture of rubber bearings for bridge units and girders	562
Miscellaneous works for bridge construction contracts	571
Proforma specification for bridge construction (Instruction)	599A
Protection of steelwork by metal coating in shop	579
Protective treatment (Field) of steelwork—metal spraying and painting	584
Protection angles for bridges or culverts with concrete wearing surfaces.	A 1272
Prestressed concrete bridge drawings—	
(a) Bridge units for square and skew crossings, 25 ft. to 35 ft. spans	A 4910-12
(b) Bridge girders pretensioned or post-tensioned, 40 ft. to 70 ft. spans.	A 5540-49
(c) Reinforced concrete deck for precast, prestressed concrete bridge girders 24 ft. and 28 ft. between kerbs 40 ft. to 70 ft. spans.	A 5550-59
(d) Formwork slabs for prestressed concrete bridge girders	A 5560
(e) Embedded rods for deck formwork for prestressed concrete bridge girders.	A 5685
(f) Details of cast-in-place deck for prestressed concrete bridge units 25 ft.-35 ft. spans.	A 4931
(g) Prestressed concrete piles—12 in. x 12 in.—35 tons (A 4764); 14 in. octagonal—45 tons (A 4943); 16 in. octagonal—50 tons (A 4944); 16 in. octagonal—75 ft.—85 ft. (A 5611).	
(h) Test load diagrams for prestressed concrete piles—12 in. x 12 in. (A 5601); 14 in. octagonal (A 5605); 16 in. octagonal (A 5606); 16 in. octagonal 75 ft.—85 ft. (A 5612).	
(i) Test loads for prestressed concrete bridge units	A 5514
(j) Flexural tension test loads for precast prestressed concrete bridge girders.	A 5538
(k) Principal tension test loads for precast prestressed concrete bridge girders.	A 5539
Reinforced concrete bridge drawings—	
(a) Flat slab bridges, 24 ft. and 28 ft. between kerbs; 20 ft.-30 ft. spans.	A 4862-71
(b) Piers with spread footings for flat slab bridges, 20 ft.-30 ft. spans.	A 4967-75
(c) Reinforced concrete piles, 35 and 45 tons	A 1207-8
Reinforced concrete piles for bridge foundations (precast)	564

Reinforced concrete cylinders for bridge foundations	Form No. 565
Steel bridge drawings—Riveting details (A288); Welding details	A 2916
Standard bridge loading (Instruction)	A 4
Steel channel handrail for roadway and footway on bridges, two and three rail.	A 3476A, B and C
Substructure of bridges	567
Superstructure of bridges	568
Timber beam bridge	164
Timber bridge drawings—	
(a) Timber beam bridge, 24 ft. between kerbs	A 5593
(b) Timber beam bridge, details of construction	A 5594
(c) Low level timber beam bridge, 12 ft. between kerbs	A 3470
(d) Running planks	A 1216
(e) Longitudinal deck sheeting	A 5576
Waterway diagram (0 to 200 acres)	A 26
Waterway calculations for bridges and culverts (Instruction) (1963)	371A

BITUMINOUS SURFACES

Bitumen sealing field book	400
Cutting back R.90 bitumen and pre-coating of aggregate (Instruction) (1962).	93B
Cutting back bitumen—proportioning chart (1963)	466A
Cut-back chart for bitumen seal coats (1962)	466
Fantail aggregate spreader	A 2976
Gate attachment for lorries with fantail spreader	A 1414
Notes on preparation of specification, M.R. Form No. 93	93A
Standard performance requirements for mechanical sprayers for bituminous materials (for capacities not less than 400 gallons)	272
Surfacing and resurfacing with bitumen	93
Supply and delivery of cover aggregate for bitumen seal coats	351
Supply and laying of asphaltic concrete paving mixtures	612
Tar or bitumen penetration macadam surface course—	
2 in. thick	230
3 in. thick	66

FENCING

Chain wire protection fencing	144, A 149
Corrugated guard rail	A 5595
Location of protection fencing (Instruction)	246
Ordnance fencing	143, A 7
Post and wire fencing	141
Drawings; plain (A 494); rabbit-proof (A 498); for use in cattle country (A 1705); flood gate (A 316).	
Removal and re-erection of fencing	224

FORMATION, INCLUDING EARTHWORKS AND RURAL DRAINAGE

Cross sections, one way and two way feeder roads	A 1101-2
Flat country cross sections, type A, B, C and D	A 4618-21
Formation	70
Standard rubble retaining wall	A 114
Standard mass concrete retaining wall	A 4934
Standard cantilever retaining wall	A 4935
Subsoil drains	528

PAVEMENTS

Broken stone base course	72
Cement concrete pavement	125, A 1147
Galvanised iron strip for deformed joint	A 380
Gravel pavement	71
Preformed expansion joint fillers	610
Supply and delivery of gravel	254A
Supply and delivery of ready mixed concrete	609
Waterbound macadam surface course	65

ROADSIDE

Concrete mile post, Types A and D	A 1337-8
Concrete kerb mile block	A 2815
Roadside fireplace	A 467
Standard i'erting for mile posts	A 1366
Steel mould for concrete mile posts	A 1420

MATERIALS

Bitumen emulsion (anionic)	305
Design of non-rigid pavements	76
Residual bitumen and fluxed native asphalt (1960)	337
Roads on which pavement is to be designed for heavy loading (Instruction).	76A
Tar	296
White paint for guide posts (1963)	618

TRAFFIC PROVISION AND PROTECTION

Provision for traffic. (1962)	121
Drawings; general arrangement (A 1323) (1962); details of temporary signs (A 1325) (1962).	
Supply and delivery of guide posts	252
Erection of guide posts (Instruction)	253

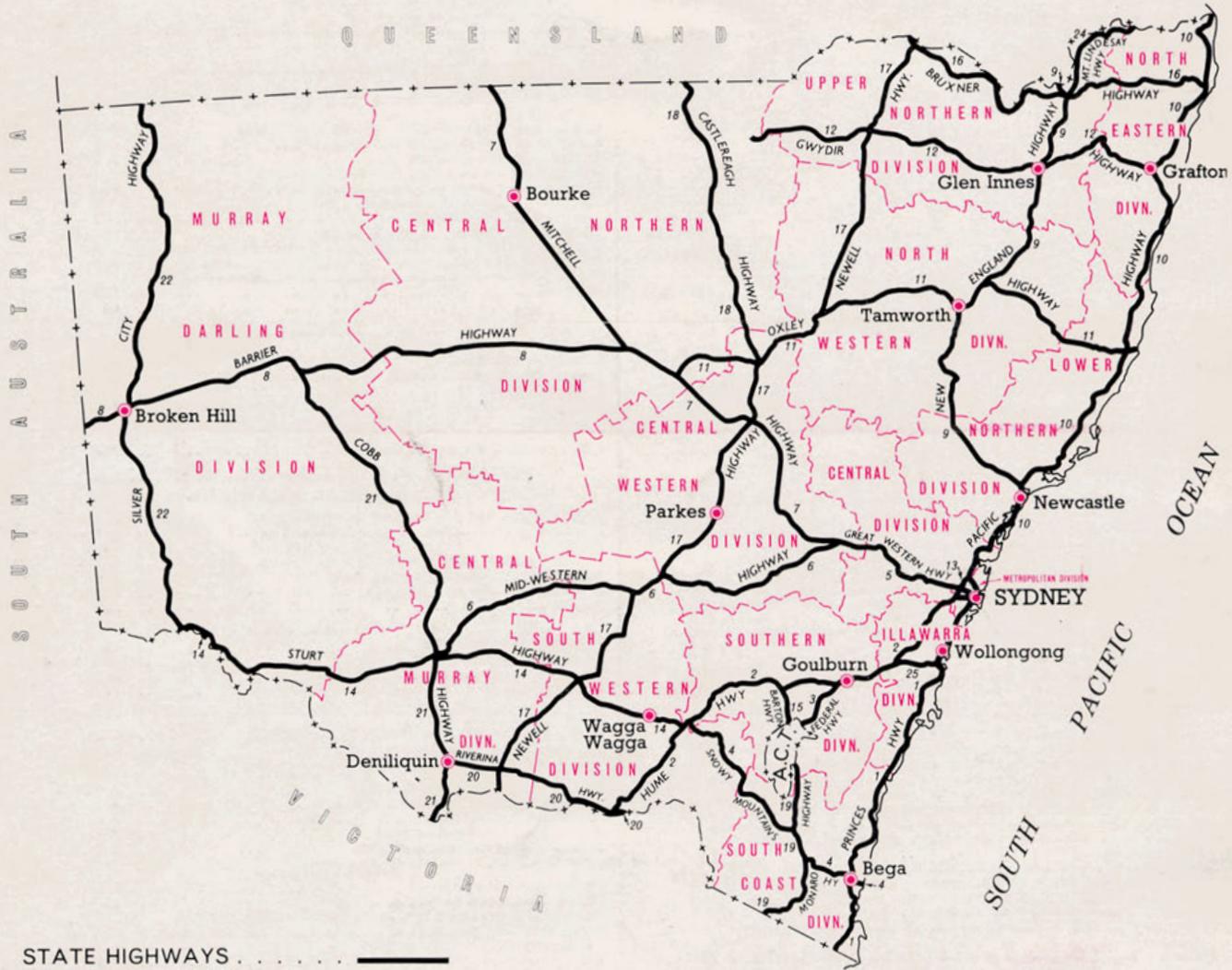
CONTRACTS

Bulk sum tender form, Council contract	39
Bulk sum contract form, Council contract	38
Cover sheet for specifications, Council contract	342
Caretaking and operating ferry	498
Duties of superintending officer (Instruction)	193
General conditions of contract, Council contract	24B
Schedule of quantities form	64

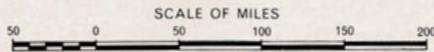
MANUALS AND BULLETINS

Bulletin relating to Miscellaneous activities on Main Roads.	
Control and guidance of traffic at Works in Progress.	
General Conditions of Assistance to Councils.	
Guide to Main Roads Administration for use of Aldermen and Councilors.	
Highway Bridge design, Specification of State Road Authorities.*	
Manuals, No. 1—Plant*; No. 2—Survey and Design for Main Roads Works*; No. 3—Materials*; No. 4—Roadside Trees*; No. 5—Explosives*; No. 6—Bridge Maintenance*; No. 7—Road Maintenance*.	
Proclaimed Main Roads (Schedule of gazetted descriptions).	
Policy for geometric design of rural roads—State Road Authorities*.	
Tables for the use of road designers (1962)*	

State Highway System of the State of New South Wales



STATE HIGHWAYS ———
 DIVISIONAL BOUNDARIES - - - - -
 DIVISIONAL OFFICES ●



Area of New South Wales, 309,433 square miles.
 Length of public roads within New South Wales, 131,032 miles.
 MILEAGE OF MAIN AND DEVELOPMENTAL ROADS, AS AT
 30th JUNE, 1964

State Highways	6,533
Trunk Roads	4,163
Main Roads	11,590
Secondary Roads (County of Cumberland only)	132
Tourist Roads	136
Developmental Roads	3,018
	<hr/>
	25,572

UNCLASSIFIED ROADS, in Western part of State,
 coming within the provisions of the Main Roads Act, ... 1,030
TOTAL 26,602