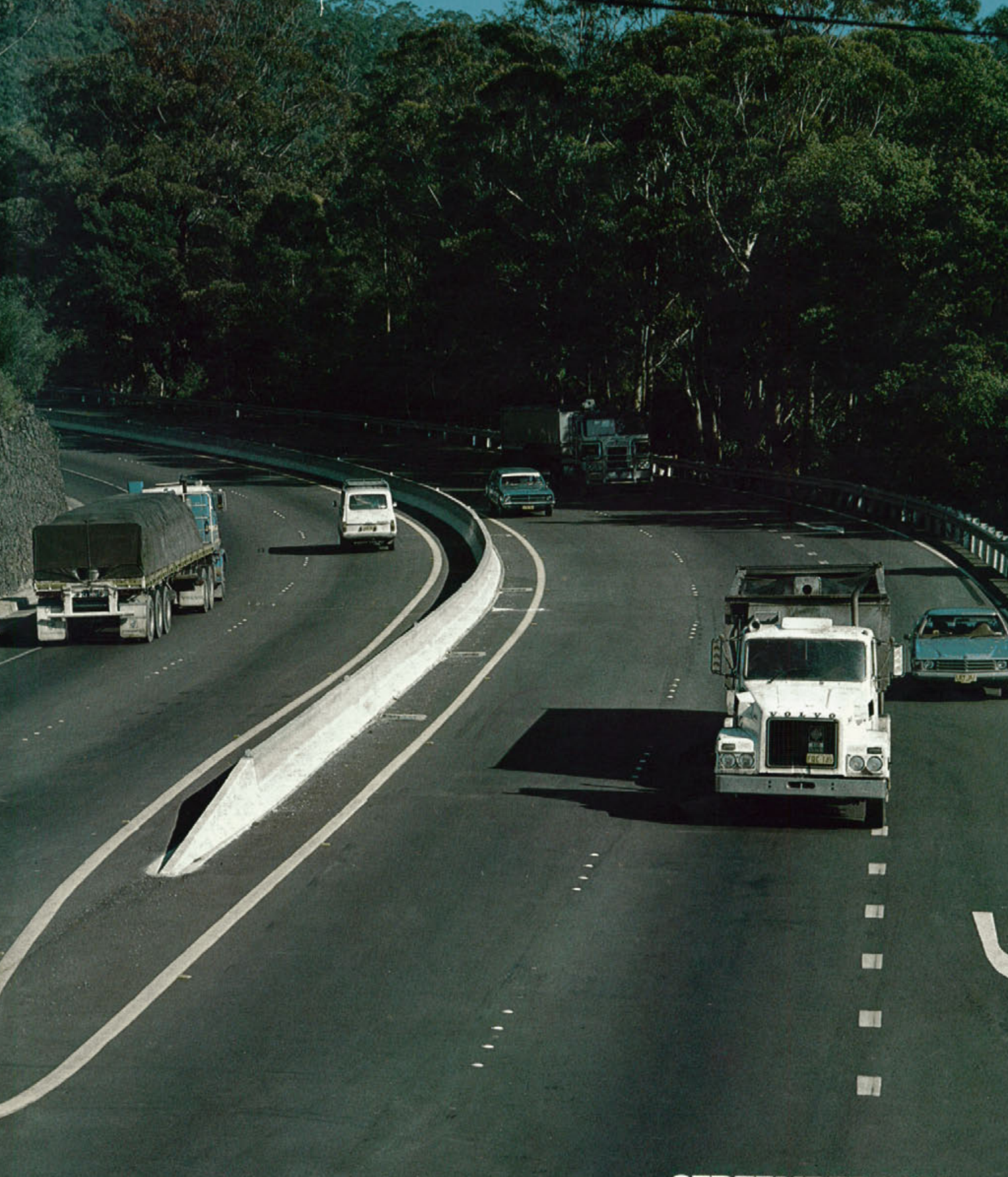


SEPTEMBER 1981

# MAIN ROADS

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JOURNAL OF THE DEPARTMENT OF MAIN ROADS,
NEW SOUTH WALES

SEPTEMBER 1981, VOLUME 46 No. 3
ISSN 0025–0597

**CONTENTS**



***COVER: (Front) The Mount Ousley section of Trunk Road No. 95 showing New Jersey median barrier. (Back) Watercolour of "Lapstone Hill" by S. T. Gill, undated (probably 1856). Reproduced by courtesy of Dixson Galleries, Sydney.***

Issued by the Commissioner for Main Roads, B. N. Loder.

Additional copies of this journal may be obtained from the Public Relations Section, Department of Main Roads, 309 Castlereagh Street, Sydney, New South Wales, Australia.

Typeset by Dalley Middleton Moore Pty. Ltd.

Printed by Blake and Hargreaves Pty. Ltd.

## Ferries come and go

Soon after the First Fleet's arrival at Sydney Cove, a search was made for suitable farming land and the district at the head of the Parramatta River was chosen. At this time the road linking the two centres was at best a bush track and consequently river transport won early favour.

In 1789, the 10 tonne *Rose Hill Packet* commenced plying its trade between Sydney and Parramatta, powered by oar and sail. On occasion, this vessel took more than a week to do the round trip, its sluggish nature earning it the nickname "The Lump".

By the early 1830s steamships operated the route, yet their usefulness was short lived. For by this stage, the road westward had been extended beyond the Blue Mountains (see article beginning on p. 70), and that portion between Sydney and Parramatta was a well-established transport route for both passengers and produce.

The crossing of the harbour at Sydney had also posed problems. In 1817, a West Indian named Billy Blue was granted 32 ha. of land to the north of the harbour, an area known now as Blues Point. He established Sydney's first ferry service by row boat, carrying goods and passengers between the northern shore and Millers Point.

A double-ended paddlewheel steam punt named *Princess* began a regular vehicle service in 1842 between Dawes Point and Blues Point. This service ran at a loss and was withdrawn after 15 months. However, other ferries soon replaced her.

In the 1880s a number of road links to the northern shore were established, via the original Gladesville and Fig Tree Bridges. This new route, although making road transport easier, was still not an attractive alternative to the many ferries which now crossed the harbour in a fraction of the time.

By 1890, Sydney harbour ferries were carrying five million passengers and almost 400,000 vehicles annually. Patronage increased and by 1928, the harbour ferries carried 46 million passengers annually.

The rest, of course, is history. Ferry patronage dwindled, for on 19 March 1932, the bridge Sydneysiders knew as the grandest in the world was opened, finally providing a direct road link to the north.

Sydney Harbour Bridge will be celebrating its jubilee anniversary in 1982 and a special commemorative issue of *Main Roads*, containing the bridge's amazing story, will be published in March.

Today the bridge carries, on average, about 160,000 vehicles daily. This usage understandably takes its toll in wear and tear on the bridge's pavement. The difficult task of resurfacing the bridge and its approaches is examined on p. 73 of this issue.

At the Richmond River on New South Wales' north coast, the recent completion of the 216m long bridge at Woodburn has meant that yet another costly ferry service is no longer needed. A brief history of the district and the ferry, together with details of the new bridge is included in an article beginning on p. 67.

Ferries, like the earliest bush tracks, have played an important part in the development of our road system. Yet it is inevitable that the weaker links must be replaced. It is sadly their lot, it seems, that ferries come and go. ●

# A NEW BRIDGE FOR THE RICHMOND RIVER

## Big Bridge for the Big Scrub

The Richmond River was discovered in 1828 by Henry Rouse, Commander of *H.M.S. Rainbow*. Pastoral occupation began around 1840, yet there was little attempt at cultivation for the next twenty years. In contrast, the cedar industry, which started there in 1842, soon employed more than 1,500 people.

The men and women worked hard in the "Big Scrub", trying to eke out their living in an unknown land. The eucalypt forests around Woodburn and Lawrence were felled to provide timber for railways, wharves and bridges. Woodburn itself (originally known as *Rocky Mouth*), was used as a depot for shipbuilding. The 150 tonne brigs *Dart* and *Prince of Wales*, which were built here, were among the first vessels launched on the Richmond River.

Even before the turn of the century, Woodburn was a busy travel centre. It was a depot for both coaches and river steamers. In 1878 the first government punt on the Richmond River was put into operation and in 1899 the first regular Woodburn ferry service started. The original timber vessel, with its twin cylinder steam engine, was still in service when the Main Roads Board took it over in 1925.

The old ferry had a hard time of it when the Richmond River flooded, which was fairly often. On such occasions, not only did people have to move themselves and their belongings to safety, but livestock—particularly from the north of Woodburn—had to be ferried across to the higher country in the south. This operation continued until rising flood-waters made the journey too dangerous. The ferry was eventually replaced by a steel decked, diesel-powered model with a twelve-car capacity.

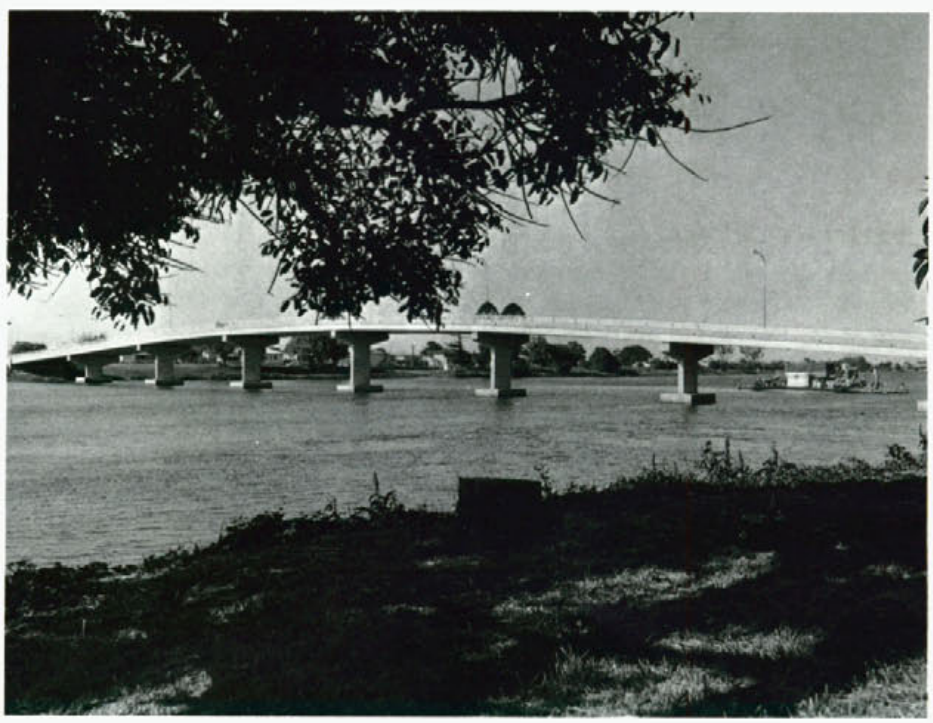
In 1979, the ferry averaged 175 trips per day and cost $70,000 to operate. The ferry is to be replaced by a bridge, a sound decision both economically and practically. The bridge, which is nearing completion, will be opened to traffic in October 1981. It is of considerable economic importance to the local community, particularly to cane growers who seek to transport produce to the Broadwater Mill by road. The new bridge will also establish a direct link for Lismore traffic joining with the Pacific Highway or going to Evans Head.

### The early roads

In the 1880s, many of the roads in the area were just narrow tracks through the scrub-like vegetation. A coach route ran from Hexham to Grafton, at which point a steamer could take travellers down the Clarence River to Harwood, then another coach to Woodburn, where the coach route terminated.

In 1925, when the Main Roads Board was established, the main roads system was of a very poor standard. About 430km, or less than half of the Pacific Highway between Sydney and the Queensland border, had a sealed surface. The rest was dirt or gravel.

At this time, there were eleven crossings of waterways by ferries on the Pacific



***The new streamlined structure dwarfs the old Woodburn Ferry.***

*Three picturesque views of the new bridge over the Richmond River at Woodburn.*

# ONE HUNDRED YEARS AGO

*The New Italy community near Woodburn had its genesis in most unusual circumstances, about one hundred years ago. It was started by the survivors of an expedition organised by the Frenchman Marquis de Rays to establish a colony in New Ireland, east of New Guinea.*

*In 1879, agents of the Marquis visited the province of Venetia in Italy and promised thirty hectares of land in New Ireland to anyone who would pay 1800 francs. In July 1880, a vessel carrying 200 men, women and children left Barcelona, Spain, reaching Port Breton, New Ireland, in October. A number of passengers died on the voyage, having become ill after eating the rotting food.*

*But their new land was no better. Port Breton consisted of two hastily erected sheds. Their new land was merely a jungle-covered island offering the new horrors of indignant natives, tropical diseases and little familiar food.*

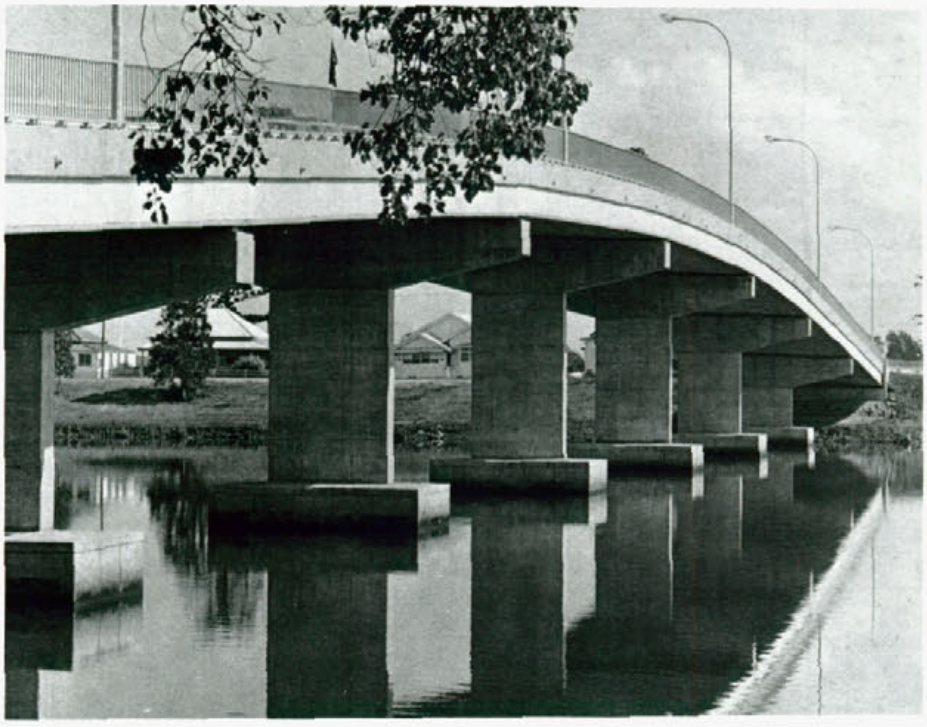
*They soon sent a deputation to the New South Wales Government, and, after negotiations, were retrieved by the vessel James Patterson by order of the Premier, Henry Parkes. They reached Sydney in April, 1881 and were accommodated in the Agricultural Hall in the Domain. About one year later, R. Caminitti, a farmer from the New Ireland expedition, went north to the Richmond River and selected a 16 ha block near Woodburn.*

*In 1882, eight more Italians selected small blocks in the same area, and others took up land in 1884 and 1885.*

*The name New Italy came into use in 1885. John Lang, a member of the Woodburn School Board, applied for the establishment of a school in the area and suggested the name New Italy.*

*By 1899, forty-three families were living in the district. Gradually the next generation sought employment elsewhere, so that by the 1930s only a few families remained.*

*The Department has recently constructed a rest area adjacent to the monument to New Italy, on the western side of the Pacific Highway south of Woodburn.*



***Top: Wal Greber, one of the ferry masters on the old Woodburn Ferry. The new bridge can be seen in the background. Above: The bridge forms a crest vertical curve and provides a clearance of 8.5 m above Mean High Water spring tides.***

Highway north of Newcastle, and several more on smaller roads. The trip is far less demanding today. All the rivers and streams on the highway, as well as the rivers at Ashby and now at Woodburn, have been bridged.

The bridge at Woodburn is a fine example of co-operation between Governments, Councils and private enterprise. It spans the boundary between the City of Lismore and the Richmond River Shire, and provides an attractive focal point for this historic area, now one of the most densely populated rural areas in Australia.

### Some dimensions

The 216m long bridge consists of eight 27m spans. Overall width of the structure is 11.1m, including an 8m wide carriageway and a footway 1.8m wide, on the downstream side.

New Jersey type traffic barriers are provided along the edges of the carriageway. A steel grille railing has been provided along the outside edge of the footway. Space for public utilities has been provided beneath the footway slabs. Light standards are provided at 40.5m intervals

*(continued on page 92)*

# THE MOUNTAIN ROADS OF COX AND MITCHELL

Following the first successful crossing of the Blue Mountains in May, 1813 by Blaxland, Lawson and Wentworth, Governor Macquarie sent Assistant Surveyor George Evans to investigate the planned route for a new and vital road westward.

Evans estimated that twelve men could clear a road in three months. Macquarie, in his despatch to London of April 1814, realistically increased the estimate to 50 labourers.

Agriculturalist William Cox volunteered his services to supervise construction of the road and gathered together a group of men with a wide variety of skills. The convict workers, selected for length of service and good behaviour, were offered emancipation on the completion of the road as a reward for their "Fatigues and Privations".

The road was commenced on 18 July, 1814, by cutting an approach to Emu Ford down the eastern bank of the Nepean River. Despite sickness, bad weather and a severe mountain winter, the road was completed on 14 January, 1815, as far as the site of Bathurst. Even though the 162 km road was barely a 4 m wide bush track, it was a triumph for Cox and his men. The chopping and grubbing of trees and the removal of rocks and boulders, was a formidable task. The work included construction of bridges to span the Lett and Coxs Rivers.

When constructed, the road had sections with a grade of 1 in 4 which provoked feelings of awe in the hearts of many early travellers. At Mount York, Macquarie himself remarked "we halted for a little while to view this frightful tremendous pass". The descent was rather terrifying. Logs were tied behind carts to steady them down the steep grade. At the bottom the logs were unhitched and left strewn over the road. These accumulations became so bad at times that parties of convicts had to be sent to clear them.

Bringing a loaded cart up the Mount York pass often involved the use of ropes and pulleys hitched to bullocks driven down the pass. Heavy staples with iron rings attached, fastened into rock at the steepest points, acted as anchors.

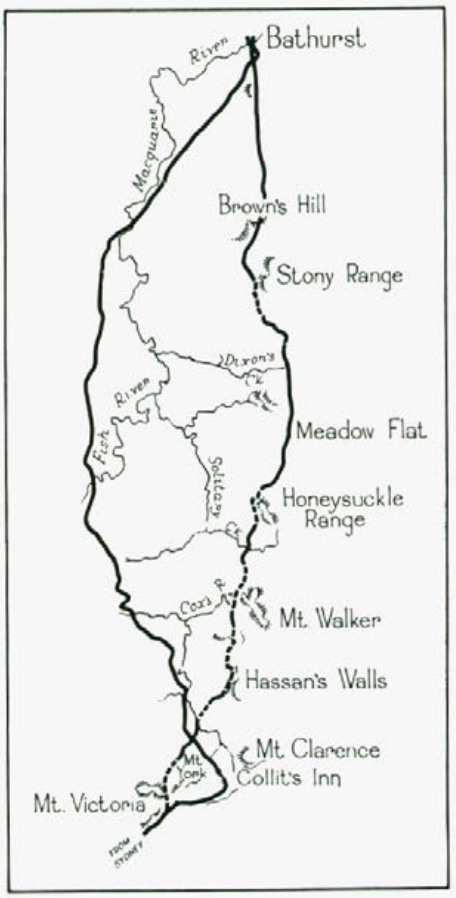
Cox's road soon fell into a state of disrepair and was abandoned west of Mount York in favour of a route credited to Lawson. This route was in use in 1827, and carried traffic westward until 1832.

Mitchell by this stage was proceeding with a road via Mount Victoria along a better route discovered by him.

Victoria Pass was declared open by Governor Bourke in October 1832. This descent is still in use, although widened and reconstructed in a number of sections.

The eastern ascent of the Blue Mountains from Emu Plains, as constructed by Cox, was used for seventeen years. A new road was then built between Emu Plains and the Pilgrim Inn (the site of present day Blaxland), in order to avoid the flood-prone Knapsack Gully.

***Mitchells Pass, built in 1832, looking towards Emu Plains. This section of the route, named after Surveyor-General, Major Mitchell, runs along the gully through which Lapstone Creek flows.***




***New location of the road between Mount Victoria and Bathurst suggested by Major Mitchell in 1827 and adopted in 1830. Cox's road is shown on the left, crossing Mitchell's line and passing Collit's Inn. (From Major Mitchell's Report on Roads, 1827-1855, in the Mitchell Library.)***

Mitchell again suggested a better route along the gully through which Lapstone Creek flows. A deviation was put in hand and was also finished in October 1832, Governor Bourke naming it Mitchells Pass.

During the construction of this pass, Mitchell employed David Lennox to design and build a bridge across Lapstone Creek. This has been claimed to be the first "scientifically constructed" stone arch bridge on the Australian mainland.

In 1926 a further deviation, on an improved grade and alignment, was built from Emu Plains. This deviation included a section of road built by the Main Roads Board along an abandoned railway track, using the Knapsack Gully bridge which was subsequently widened for traffic. Mitchells Pass then ceased to be the main route. ●

See *Main Roads*, September 1949, Vol. 15, No. 1, pp. 6-15, for an article entitled "The Great Western Highway, A Romance of Early Road-Building" and *Main Roads*, September 1974, Vol. 40, No. 1. pp. 16-17 and 24-28, and December 1974, Vol. 40 No. 2. pp. 56-60 for an article entitled "Building a Mountain Road".


# GREAT WESTERN HIGHWAY —SOME CURRENT WORKS

***Road widening being carried out at Glenbrook to provide a continuous length of climbing lane (Feb. 1981).***

The Department of Main Roads has a major road improvement program in hand along the Great Western Highway through the Blue Mountains.

The work is proceeding over a number of separate lengths. Between Knapsack Bridge at Lapstone and Hare Street, Glenbrook, the existing short lengths of climbing lane are being linked to provide a continuous and consequently more effective length. The work involves two large embankments which will be treated to encourage regeneration of natural growth.

Once the earthworks and widening between Governors Drive and Glenbrook have been completed, the intersection with Governors Drive will be channelised to provide for more efficient traffic movement.

Except for some final surfacing, widening to four lanes has been completed from Mount Street to Hare Street, Glenbrook. The installation of traffic signal facilities have been completed at Hare Street. These signals were provided primarily for the safer crossing of the highway at this location by the large number of pedestrians (particularly school children), and to facilitate the controlled movement of traffic entering the highway at Glenbrook.

The large pin oak trees planted at Glenbrook in 1932 were not affected by the present work. However, as they were in the path of future widening, it was decided to transplant them clear of the future carriageway. Five of the six trees were transplanted, the sixth being in too poor a condition due to a growth of mistletoe.

Adjacent to Glenbrook Oval, a stone memorial to explorers Blaxland, Wentworth and Lawson was also relocated beyond the future carriageway.

A pedestrian underpass near the RAAF base at Lapstone, financed by the Commonwealth Government, is nearing completion and will be in use by the end of 1981, after the installation of lighting and the construction of approach paths. A pedestrian bridge has also been constructed over the highway at Leura.

To co-ordinate with the construction, by the Blue Mountains City Council, of the new bridge over the highway at Fletcher Street, Glenbrook, the Department has constructed a cutting which will provide for the future widening of this section. In order to enable the contractor to proceed with the bridge abutments, the Department constructed the pavement for a temporary by-pass.

Four lane construction from Bridge Street, Blaxland has been completed for almost 1 km west of the town. Construction of an eastbound passing lane from Warrimoo to the end of this work has recently been completed.

Improvements for pedestrians crossing the highway and for turning traffic at Faulconbridge have been commenced and will be completed as soon as adjustments to public utilities—including the relocation of several water mains—are completed.

In addition to the provision of various lengths of eastbound and westbound passing lanes between Lawson and the foot of Bodington Hill, a four lane 1 km length has been constructed from the top of Bodington Hill towards Wentworth Falls.

Work on the approaches to the widened bridge at Medlow Bath is awaiting final surfacing, pending investigations into the possibility of improved vehicular access to the northern side of Medlow Bath.

Further west, the Department has accepted tenders for the construction of dual bridges over Farmers Creek, immediately west of Lithgow and for a bridge over Meadow Flat Creek, 30 km west of Lithgow.

In addition, a wide variety of maintenance jobs and resurfacing works are being carried out on the Great Western Highway in this region. These works will further improve travelling conditions and will make the crossing of the mountains a far cry from the standard of Cox's first mountain road ●

***Top: Pin oak trees at Glenbrook about to be transplanted clear of impending road widening (July 1980). Centre: Four lane construction in progress outside Blaxland (Feb. 1981). Right: A new section of highway near the RAAF base at Lapstone.***

# A NEW PAVEMENT

## FOR SYDNEY HARBOUR BRIDGE

During October 1980, the Sydney Harbour Bridge deck and direct approaches underwent major resurfacing work, the second occasion in the bridge's life when such work was undertaken.

Major resurfacing work was also undertaken in 1964 (*Main Roads*, September 1964, Vol. 30, No. 1, pp. 2-5). At that stage the deck pavement consisted of a lightweight concrete base, a layer of natural rock asphalt (which formed part of the original pavement) and a wearing surface of bituminous asphalt.

The choice was then either that an additional thin surface layer be provided, or that the old surface be removed and replaced with plant mix bituminous asphalt. After test coring and material analysis and the observation that water seepage had occurred through the upper layers of the pavement, it was decided to remove the pavement and to reconstruct the surface to the original level.

The method of heating and stripping was adopted in 1964 in preference to the use of pneumatic tools due to the traffic problems involved in the latter. The work took about four weeks to complete. About 3170 tonnes of material were removed from the pavement and 1970 tonnes of asphaltic concrete surface course were applied.

### Resurfacing a priority

Sideways force coefficient of friction Routine Investigation Machine (SCRIM) tests carried out in early 1980 on the bridge and its approaches showed that the then existing asphaltic concrete pavement was nearing the end of its effective life. At that stage there had also been proposals for the installation of "landing lights" and movable medians in the deck of the bridge and its approaches for control of "tidal" traffic flow. In order that no


***The Department's Rotomill pavement profiling machine cold-milling the old deck surface prior to resurfacing.***

*Minor maintenance work being carried out on the Rotomill pavement profiling machine during resurfacing of the Sydney Harbour Bridge. In the foreground is an automatic levelling device.*

*Final touches—hot thermoplastic linemarking material is applied to the new surface.*

damage be done to either lights or medians, it was decided that the deck should be resurfaced prior to their installation.

Discussions amongst officers of the Department were held to determine the timing of the work, the extent of preparation and programmes for traffic management. In order to allow time for extensive maintenance work to be carried out on expansion joints, the starting date for the resurfacing work was set at 12 October 1980.

Because of restrictions on the bridge's dead load limit, it was obvious that the existing surface would have to be removed. Heating, burning and ripping away the old surface is unpleasant, slow and noisy work. Expensive re-grading and compaction of the disturbed base is also needed before resurfacing.

## Cold-milling a preference

A faster, cleaner and more efficient way to remove the existing material is to cold-mill the old surface to a textured but level surface fit for refinishing.

Traffic volumes using the bridge are high at more than 150,000 vehicles per day. This meant that work was set for night-time when volumes were lowest. The nights of Sunday to Thursday were set as the working week, as Friday and Saturday night's traffic volumes would be too high.

Operations were planned so that the Department's pavement profiler and the paver worked in different areas, in order to minimise conflict. Programming was done on the basis that the Rotomill gang and paving gang would follow each other, the latter paving the area milled the previous night. However, due to the relatively lower production of the Rotomill, the paving gang was assigned also to other jobs in nearby suburbs.

## The men for the job

The Rotomill work was carried out by a 4 man crew from Central Asphalt Depot comprised of 2 Rotomill operators, a float driver and water truck driver, along with a maintenance gang and road sweeper from North Metropolitan Works Office. This gang provided the third operator for the machine, general assistance including cleaning up after the Rotomill, traffic control where required and the digging out of any metal objects from the pavement which might have damaged the Rotomill.

Paving work was carried out by the Metropolitan Division's paving gang based at Rockdale, and assisted by a gang from Gore Hill. They again helped by providing general assistance. They also cut out any of the existing pavement that the Rotomill could not remove, such as those areas adjacent to expansion joints, where ramps had to be left for use by traffic during the day.

During the night traffic was restricted to two lanes in each direction. The appropriate traffic arrangements were implemented by the tow truck operators from Sydney Harbour Bridge Traffic Office. Traffic management proved to be satisfactory, although some delays to traffic occurred at around 11 p.m.

The Rotomill removed an average 247.7 t per night, with a maximum quantity of 410 t in one night and a total of 4 211 t for the entire work. An average of 279.6 t of asphaltic concrete was laid per night, with a maximum of 336 t in one night. A total of 3 574 t of asphaltic concrete was laid, together with 61 t of tar mix. The work was completed in just over four weeks.●

Footnote: An article on the Department's SCRIM appeared in *Main Roads*, June 1978 (Vol. 43, No. 4, pp. 98-101). An article on the Department's Rotomill pavement profiler appeared in *Main Roads*, September 1978 (Vol. 44, No. 1, pp. 7-9, 16-17).

# MINISTERIAL CHANGES:
## FAREWELLS AND INTRODUCTIONS

**The retirement from Parliament of the Hon. H. F. Jensen and the re-allocation of Ministerial Portfolios following the recent State Elections have resulted in a change in the Department's Ministerial Head.**

In an article in June 1981 *Main Roads* Journal entitled "Welcome Addition at Walgett—New Crossing of Namoi" (pp. 50-53), the Hon. H. F. Jensen, then Minister for Roads and Minister for Local Government was quoted as speaking warmly of the country people because of *"the immediate friendship and goodwill"* which emanated from them.

His comments about the country people also apply directly to himself. Mr. Jensen is a person with great concern for others. He has never forgotten the less fortunate nor has he avoided any opportunity to help them. In addition, his impetus to seek higher office appears to have been orientated more to the benefit of others than to have been based on expectation of personal gain. The abovementioned bridge opening was therefore a sad occasion for the Department as it was the last ceremony at which Mr. Jensen officiated.

Perhaps there is no more succinct way of recording our appreciation than by quoting the then Acting Commissioner's statement from the 1980-81 Annual Report. Mr. Loder there stated *"I wish to record our gratitude to the Hon. H. F. Jensen, M.P. who was our Minister from October 1978 until his retirement when the new Government was elected in September this year.*

*"He was always deeply involved in advancing the work of the Department and the conditions of its work force . . .*

*"We wish Mr. Jensen and his wife a very long, healthy and happy retirement together."*

*An article recording Mr. Jensen's appointment appeared in* Main Roads, *December 1978, Vol. 44, No. 2, pp. 55.*

### Our new Minister

The Hon. Paul Whelan, LL.B., M.P., was appointed Minister for Consumer Affairs and Minister for Roads in conjunction with the forty-seventh Parliament of New South Wales.

Born in December 1943, Mr. Whelan was raised in the Sydney suburb of Ashbury, between Canterbury and Ashfield. He attended De La Salle College at Ashfield and subsequently Sydney University where he graduated in law. After a short period with a Sydney legal firm he practised as a solicitor in Ashfield for nine years.

In 1970 Mr. Whelan was elected as an alderman on Ashfield Municipal Council. He became Mayor in 1972, at which time he was the youngest Mayor in Australia. He held this office until 1976, when he contested and won the State seat of Ashfield, which he retained at the recent election, and in which he, his wife Colleen and their family now live.

The Department looks forward to working with Mr. Whelan in a close and productive relationship.●

***Below: (left) Mr. H. F. Jensen, and (right) the Hon. Paul Whelan, LL.B., M.P.***

# MOVING IN THE RIGHT DIRECTION

**"Disabled persons are entitled to the measures designed to enable them to become as self-reliant as possible."**

**"Disabled persons are entitled to have their special needs taken into consideration at all stages of economic and social planning."**

The 1975 Declaration of the Rights of the Disabled, proclaimed in the United Nations, contains the above two statements which seem to have particular relevance for an organisation such as the Department.

In common with other Government departments and authorities, the Department of Main Roads is concerned, in this International Year of Disabled Persons, to show its awareness of the needs of the handicapped and to make relevant and positive contributions to their welfare.

### Promoting awareness

As part of a programme of encouraging awareness of IYDP among Departmental personnel, staff publications have carried articles describing the role of NADOW (National Association for Training the Disabled in Office Work) and promoting the work of TAD (Technical Aid to the Disabled). Films dealing with various forms and aspects of disability have been shown during lunch breaks and guest speakers have attended to give further insights and answer questions.

The Department is also trying to improve accessibility to all its premises for disabled people and thus open the way to wider employment opportunities for the handicapped—since lack of access is often the greatest barrier.

However, probably the most widely significant contributions made by the Department relate to signalised pedestrian crossings.

### One small step . . .

Pedestrian crossings can pose severe problems for disabled people, particularly for those in wheelchairs. It is hard for the able-bodied to appreciate what a huge obstacle a kerb is to someone in a self-propelled chair. It is quite impossible to negotiate without help. And even with assistance, a kerb can be hard to handle.

City and Municipal Councils are now making considerable efforts to provide kerb ramps at major intersections, encouraged by financial assistance from the N.S.W. State Government (under a scheme to assist Councils with projects having lasting benefit for disabled persons).

For its part, the Department is now making sure that, wherever relevant, new traffic signal construction projects incorporate kerb ramps as a matter of course. Ramps are also being introduced when existing signal sites undergo reconstruction. The work (usually carried out by local Council labour) is paid for from the Department's Traffic Facilities Fund.

### Sense and safety

Kerbs, however, are not the only problems at pedestrian crossings. For other disabled persons—the visually handicapped—the difficulty is not one of access but of identification . . . is it, or is it not, safe to cross?

Responding to the needs of pedestrians with severely impaired sight, the Department (in association with L. Challis and Associates Pty Ltd) has, over the last few years, developed and tested an audio-tactile aid that has been hailed as a milestone in the path towards improved facilities for the visually handicapped. (See previous article in *Main Roads* Vol. 43, No. 2, pp. 42-43.)

The device consists of a modified pedestrian push-button box fitted to the normal traffic signal column (and always placed at right angles to the roadway as a directional clue). The box emits a slow steady 'beep' as a locating signal. When the WALK signal appears (after the button is pressed) the sound changes to a much faster and louder note. In order to aid users with both visual and hearing handicaps, the two sounds are accompanied by appropriate rates of vibration in the box, easily felt and distinguishable through the sense of touch.

An unusual feature of the device is its automatic volume control. An in-built

# *IN A WORLD OF BUSY PEOPLE . . .*

***the disabled cannot rely on assistance from others. Measures such as kerb ramps and audio-tactile push-buttons at pedestrian crossings help some in their fight for independence.***

*Joan Hume, Project Officer at the International Year of the Disabled Secretariat, waits to cross a busy intersection near her Sydney office. Ramps like these, sloping right down to road surface level, are preferred by wheelchair users—even a slight lip between road and ramp can cause difficulties.*

*A student at the Deaf and Blind Children's Centre at North Rocks uses an audio-tactile pedestrian signal near the Centre. The push-button box (1) emits a slow, pulsing, locating signal which changes to a faster and louder note in conjunction with the WALK signal. By keeping a hand on the box (2), a pedestrian who is both blind and deaf can identify the signal by sensing the accompanying vibrations, and cross the road when safe.*

1


2


3

***Negotiating an intersection unaided—thanks to kerb ramps—gives wheelchair-users an increased sense of independence.***

microphone responds to the level of background noise and adjusts the strength of the signal accordingly. In normal traffic conditions, a blind pedestrian can locate the sound signal from a distance of about eight metres.

Trials have been successfully completed at seven sites in the Sydney Metropolitan Area and it is now planned to go ahead with the installation of audio-tactile devices at approximately 100 traffic signal locations throughout the State over the next few years.

Each unit costs around $300 per post to buy. Installation costs vary considerably, depending on whether the existing signals already have a push-button control, and on whether the necessary cabling is available at the site. However, it is hoped to carry out the installation programme as rapidly as funds will permit.

Priority will first of all be given to sites known to be regularly used by visually handicapped pedestrians. The second group of signals for modification are those at busy pedestrian crossings in the Sydney Central Business District and at selected urban shopping centres, particularly outside railway stations.

It has also been decided that all future signal construction and reconstruction projects will incorporate the necessary cabling for audio-tactile devices.

## Within reach

Ramps and audio-tactile devices should benefit hundreds of disabled people. Occasionally, however, it is possible to make a very simple modification to equipment that can be of enormous benefit to an individual. Such was the case recently in the Sydney suburb of Pennant Hills. A pedestrian-activated signalised crossing there is used each day by an 8 year old boy who has a maximum reach of only one metre—too low to operate the usual push-button. Although quite able to negotiate the crossing unaided, the boy was dependent on other pedestrians to activate the WALK signal for him. In their absence, he could be stranded on the kerb for long periods.

Through the efforts of Departmental road design draftsman, Mr Rod Simpson, who is also a member of TAD (Technical Aid for the Disabled), traffic signal technicians were authorised to install a second push-button on the signal column, below the one metre level. This easy and inexpensive procedure has made a world of difference to one young boy and his family.

## Recycling signals

Traffic signal equipment does, from time to time, become obsolete. In several instances, such equipment has been put to good use in the grounds of special schools or homes for the disabled, where it can serve both to control visiting vehicles and to educate the handicapped, especially children, in road safety procedures.

A recent example of this worthwhile "recycling" was the installation (by Departmental technicians working in their own time) at the Deaf and Blind Children's Centre at North Rocks. The signals form part of a new mobility track (financed by Carlingford—Dundas Lions Club) which also incorporates different types of paths, fencing, gates and steps, as well as many other features of a normal outdoor environment. Blind multi-handicapped children use the track to learn about the variety of surfaces, obstacles and hazards they will encounter in everyday life.

## Results

The naming of 1981 as International Year of Disabled Persons has served to focus attention on the special needs of the handicapped. One fact seems to stand out above all others: disabled people want, not sympathy, but self-reliance—the chance to lead their own lives.

The Department hopes that the measures described above will go some of the way towards helping many disabled men, women and children achieve that sought-after independence. ●

# TRANSPORT NEEDS in the WOLLONGONG REGION

*This by-pass of Shellharbour Shopping Centre on Main Road No. 522 has greatly facilitated traffic movement through the area.*

## Summary of transport improvement programme

A major study of transport problems and requirements in the Wollongong region completed last year, was commissioned and managed by the Transport Strategy Advisory Committee (TRANSAC). It was conducted by the State Transport Study Group, in co-operation with the TRANSAC Illawarra Advisory Committee and local representatives. The study sought to identify what might be done about current and future problems with respect to roads, traffic and public transport in the Wollongong area. The area studied included the City of Wollongong, the Municipality of Shellharbour and the urban areas of Kiama Municipality, excluding Gerringong and Gerroa.

Based largely on the study findings, TRANSAC prepared a strategy from which a Transport Improvement Programme has been developed.

With respect to roads, the study confirmed that Wollongong is a car-oriented city. This is because its growth has occurred mainly since World War II in the form of low-density suburbs, with the population relying principally on private cars to meet its transport needs. Car ownership is 12% higher in Wollongong than in Sydney and fewer households are without a car. Over two-thirds of weekday trips in Wollongong are made by private car compared with less than 10% by public transport.

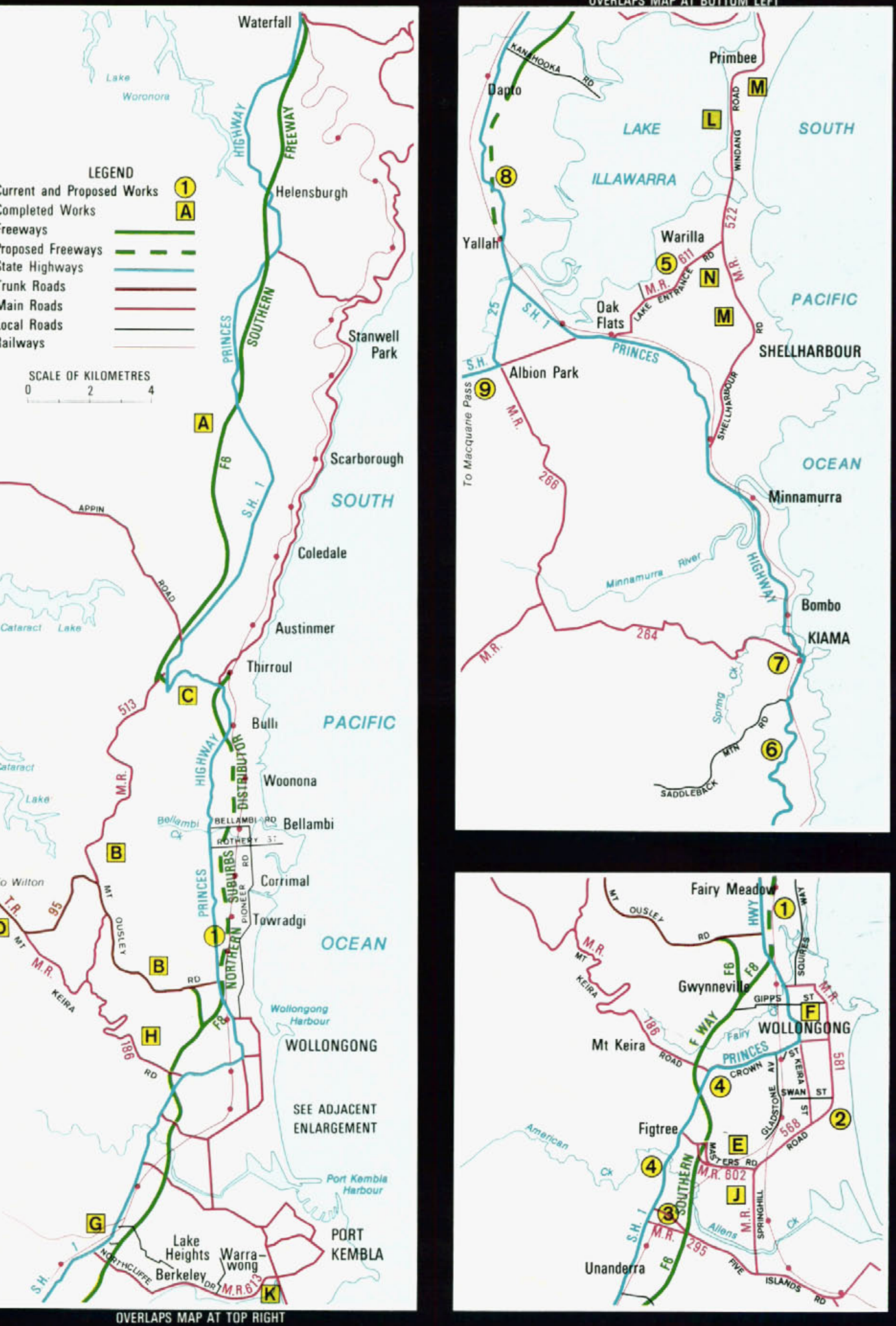
Development of the road system has, by and large, kept pace with the growth of the region and serious traffic problems have been rectified relatively quickly. Major works still required are the completion of the F6 freeway to Yallah, completion of the F8 northern distributor to Rothery Road or Bellambi Lane, completion of works on Lake Entrance Road, the provision of a bypass around Kiama town centre and the removal of a number of level crossings.

Special attention was paid to the movement of large motor vehicles (particularly those carrying coal) in environmentally sensitive areas such as the CBD.

In relation to traffic management, considerable progress has been achieved with improvement programmes developed to assist the smooth flow of traffic through the Wollongong area. These programmes include co-ordination of traffic signals and the introduction of a priority road system on major routes. With the exception of the Masters Road connection between the Southern Freeway and Springhill Road, which together with Port Kembla Road provides access to the Coal Loader, little use has been made of designated truck routes in the solution of problems arising from heavy trucks and congestion.

Over 90 per cent of all public transport travel in the area is provided by private bus operators. With the exception of services to the industrial area, virtually all bus services are oriented to the CBD or fringe of the CBD. At present, there are no cross-regional services.

The findings indicate that with few exceptions, roads are generally adequate in the Wollongong region. The few exceptions relate to the need to complete the north-south system, to by-pass the Kiama township and to eliminate certain level crossings. Additional improvements to traffic flow and safety can probably be achieved through traffic management measures. The issue of coal transport will continue to need close attention and is undergoing detailed examination by the Government. The major transport-related problems that emerged from the study concern public transport within the




OVERLAPS MAP AT TOP RIGHT


*pecial safety measures have been nplemented on the steep Mount usley descent on Trunk Road No. 5, including warning lights, speed mit signposting and truck lane lentification.*

*he F6—Southern Tollway between Vaterfall and Bulli Pass.*

region. From separate considerations interurban rail transport has also been identified as an issue of importance.

For the road system, the strategy of the study is to:

- Develop as soon as practicable a high quality (but not necessarily freeway standard) north-south road system through the north Wollongong area to take traffic off the Princes Highway and relieve overloaded and environmentally sensitive north-south roads near the coast;
- Give high priority to the development of traffic management approaches designed to minimise the intrusion of heavy trucks into the environmentally sensitive areas.

To give effect to the strategy, a Transport Improvement Programme has been formulated comprising a wide range of initiatives. In summary, the Transport Improvement Programme involves the following with respect to road improvements, traffic management and truck safety.

## ROAD IMPROVEMENTS

For the past decade, an intensive road improvement programme has been carried out in the Wollongong area. With the completion of the Southern Freeway to Yallah and the Northern Suburbs Distributor to Rothery Road or Bellambi Lane, during the next decade, the major elements of the Department of Main Roads works programme will have been completed.

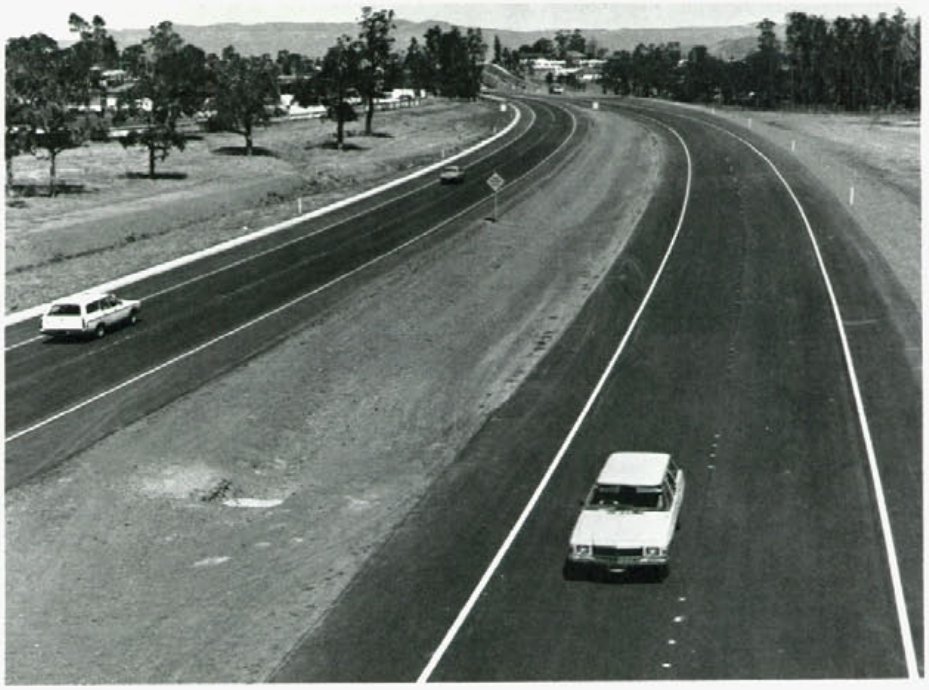
In the last four years, the Government has spent $57 million on improvements to the Wollongong main roads system. All areas of the Wollongong Region have benefited, or will benefit from the road improvement programme as detailed below. The map on page 80 shows the precise location of works. The roadworks shown complement those undertaken by the Wollongong City Council and the Municipalities of Shellharbour and Kiama.

### Current and proposed works (costs are in 1981/82 values)

### Northern Suburbs

1. Northern Suburbs Distributor

Problems with congestion and the movement of coal trucks through shopping centres in the northern suburbs could be alleviated by the construction of the Northern Suburbs Distributor. This road will eventually extend as far as York Street, Russell Vale and allow through traffic to by-pass some of the shopping centres along the Princes Highway. It will help alleviate problems associated with traffic delays at level crossings.



*The recently opened Kanahooka Road-Fowlers Road section of the F6—Southern Freeway.*

Preparatory work for the first stage of construction towards Towradgi Road has already commenced with the replacement of the Flinders Street railway overbridge at North Wollongong (estimated cost $2.9 million). An overbridge is being investigated at Elliots Road to extend across the railway line and the F8, thus eliminating the level crossing at that location.

The second stage is planned to extend to Rothery Road. The Department of Main Roads, however, is examining the possibility of extending this work to Bellambi Lane, Bellambi. This would greatly reduce problems with the Bellambi Lane level crossing and congestion on the Pioneer Road link to Squires Way. Completion of the distributor to Rothery Road will cost an estimated $24 million.

### Central Area

2. Main Road No. 581—Springhill Road

Work has commenced on a second carriageway between Swan Street and Keira Street, including a bridge over the main southern drain. Estimated cost of this work is $630,000.

3. Main Road No. 295—Five Islands Road

Work has commenced on providing a divided carriageway on the deviation between the Princes Highway and the Southern Freeway including a new railway overbridge and a bridge over Allens Creek. Estimated cost of this work is $2.4 million.

4. State Highway No. 1—Princes Highway

Construction has commenced to provide four lanes between The Avenue and Five Islands Road, including a new bridge at American Creek. Estimated cost of this work is $2.8 million.

### Southern Suburbs

5. Main Road No. 611—Lake Entrance Road

Construction has commenced to provide six lanes from Shellharbour Road, Warilla to Government Road, Oak Flats. Estimated cost of this work is $860,000.

### Minnamurra—Kiama

6. State Highway No. 1—Princes Highway

Improvements are being made to the alignment on a 4 km length of road south of Kiama at an estimated cost of $6.26 million.

7. State Highway No. 1—Princes Highway

A deviation is being investigated at Kiama of approximately 4.2 km in length (including bridges over Main Road No. 264, Bland Street and Saddleback Mountain Road). If constructed this will provide a by-pass for the Kiama township at an estimated cost of $6.75 million.

### South-Western Suburbs

8. F6—Southern Freeway

Construction has been completed between Mount Ousley Road and Fowlers Road at an approximate cost of $69 million. Work is continuing southwards and is expected to be completed to Yallah by the end of 1984 with a further expenditure of $6 million.

9. State Highway No. 25—Illawarra Highway

Plans to improve the existing road are being examined concurrently with investigations of alternative routes. However,

no new construction is likely to occur within the next few years.

Recent completion of the F5—South-Western Freeway between Campbelltown and Yanderra, coupled with the upgrading of Mt. Ousley Road, have provided an alternative route for heavy trucks to the Southern Tablelands.

### Completed works

### Northern Suburbs

A. F6—Southern Tollway

The F6 Tollway from Waterfall to Bulli Pass has been completed at an approximate cost of $68.5 million.

B. Trunk Road No. 95 and Main Road No. 513—Mount Ousley Road

Mount Ousley Road has been widened to provide four lanes between the F6 at Gwynneville and the top of Bulli Pass. Special safety facilities including slow speed lanes for trucks have been provided on steep grades. This work cost approximately $18 million.

C. State Highway No. 1—Princes Highway

Reconstruction and widening on Bulli Pass has been provided and the formation width restored at an approximate cost of $1.2 million.

D. Trunk Road No. 95—Wilton Road

This road has been widened along various sections between Mount Ousley Road and Wilton at a cost of approximately $2.45 million.

### Central Area

E. Main Road No. 602—Masters Road

A new connection has been constructed between the Southern Freeway and Springhill Road. This entailed provision of a new rail overbridge and approaches at a cost of approximately $1.54 million. This connection will enable coal trucks bound for the Port Kembla Coal Loader to avoid the streets of Wollongong.

F. State Highway No. 1—Princes Highway

This road has been reconstructed and widened from Fairy Creek to Station Street at a cost of $1.12 million.

G. State Highway No. 1—Princes Highway

Side strips have been provided from Flagstaff Road to Orange Grove Road, Unanderra at a cost of $295,000.

H. Main Road No. 186—Mt. Keira Road

This road has been reconstructed from Kembla Street to Mt. Keira Primary School at a cost of $365,000.

J. Main Road No. 568—Springhill Road

The southbound carriageway has been widened from two to three lanes from Masters Road to Allens Creek at a cost of $305,000.

K. Main Road No. 613—Northcliffe Drive

This road has been reconstructed from King Street (Main Road No. 522), Warrawong, to Lake Heights Road, Lake Heights, at a cost of $687,000.

L. Main Road No. 522—Windang Road

The northbound carriageway has been reconstucted from Wattle Avenue to Primbee Deviation at a cost of $391,000.

### Southern Suburbs

M. Main Road No. 522—Windang Road—Shellharbour Road

This road has been widened generally to six lanes with sheltered right-turn bays in the median. Local amenity in the Shellharbour area has been substantially improved by completion of a by-pass route around the Shellharbour shopping centre.

N. Main Road No. 611—Lake Entrance Road

Upgrading has been carried out between the Princes Highway at Oak Flats and Shellharbour Road at Warilla, leading to substantial improvement in traffic conditions.

## TRAFFIC MANAGEMENT

An extensive traffic management programme has been initiated in Wollongong to facilitate the smooth flow of traffic through the road system in both peak and off-peak times and to improve the level of safety for road users. Three specific traffic management projects being undertaken follow.

- Firstly, a traffic signals co-ordination programme to facilitate smooth traffic flows. Thus far, 28 signal sites have been co-ordinated in the Wollongong region and more will be incorporated in the co-ordination system over the next three years.
- Secondly, by the appropriate use of "Give Way" signposting, a priority road system has been introduced on major roads. This programme will be extended progressively to the more important non-classified roads. In this way, a road hierarchy will be developed that will permit safer and easier driving.
- Thirdly, traffic signals will be installed at key locations. This will be in order to improve safety at intersections, provide improved accessibility to major routes, and cater for the needs of pedestrians, especially school-children, in crossing busy roads in areas of high pedestrian activity.

## TRUCK SAFETY

Following a number of fatal accidents on Mt. Ousley Road and Bulli Pass, the Government implemented a number of special safety measures. These included the establishment of a Mobile Inspection Division within the Department of Motor Transport.

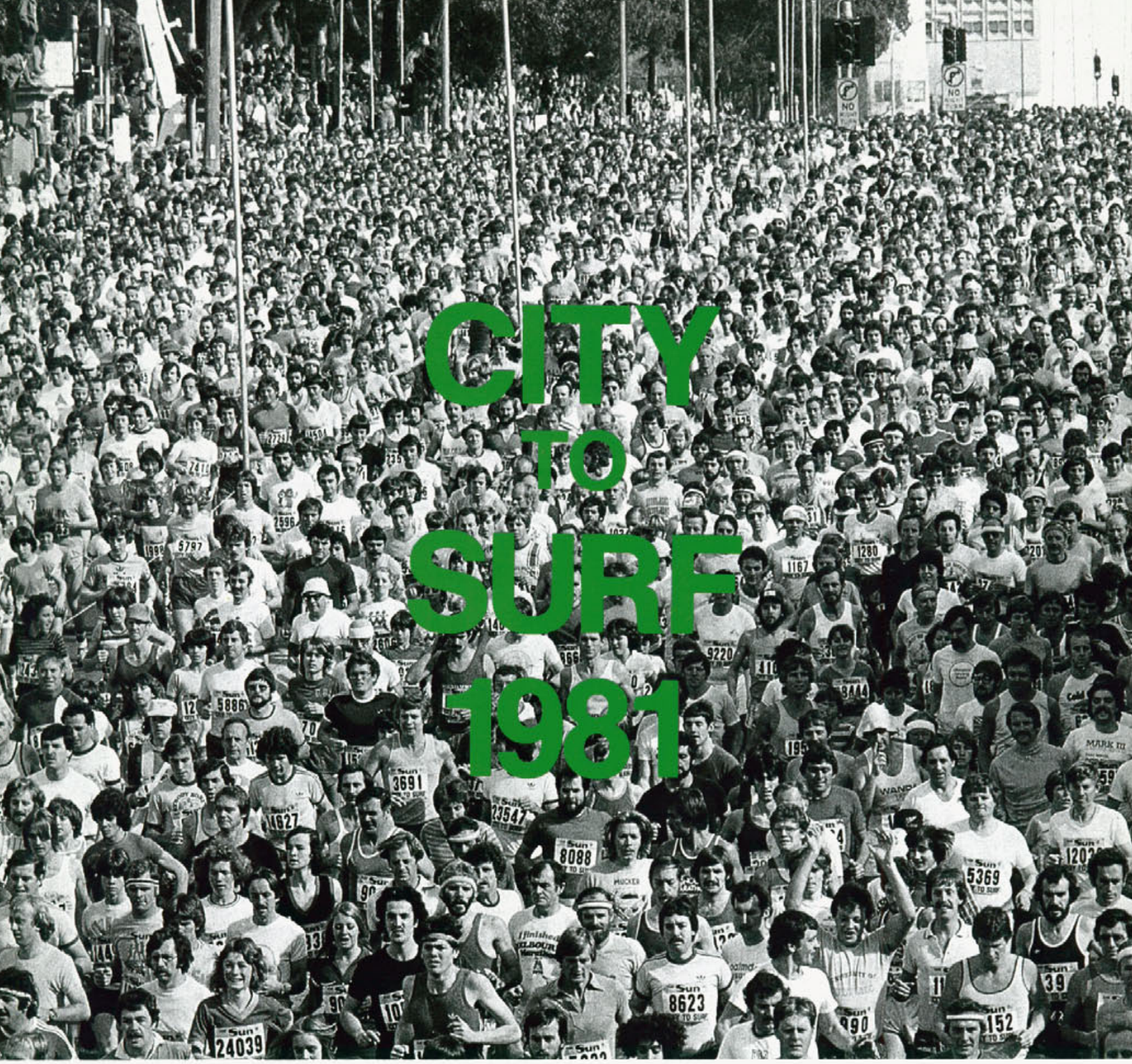
Initiatives designed to improve road safety in the Wollongong Region follow.

- The Motor Traffic Regulations have been amended to provide for special truck lanes and reduced speed limits for trucks over specified sections of road. Trucks are also required to engage and stay in low gear where indicated by signs.
- A truck speed limit of 40 km/h, signs declaring 'Trucks Must Use Low Gear' and a truck lane have been introduced on Mt. Ousley. A truck speed limit of 20 km/h and similar signs have been introduced on Bulli Pass.
- Concrete median barriers have been provided at Mt. Pleasant on Mt. Ousley Road to separate opposing traffic flows.
- Special attention has been given to signposting on both Mt. Ousley Road and Bulli Pass.
- Roadworks to provide a widened carriageway from the top of the escarpment to the foot of Mt. Ousley have been completed. Where possible on the steepest grades, each carriageway has been marked for three lanes to provide a special slow speed lane for trucks.
- Investigations are proceeding into the provision of gravel arrestor beds for out-of-control trucks. Controlled testing of various types of vehicles under simulated out-of-control conditions will be undertaken to assist in making the best possible decision on this matter.
- Up to January 1981, 1,200 trucks had been inspected by the Department of Motor Transport in the Wollongong area. The inspections have led to a substantial improvement in the maintenance of heavy trucks in Wollongong. A number of fleets have been inspected twice and marked improvements noted in the condition of the trucks. Efforts to bring about further improvements will continue through roadside checks, follow-up inspections of truck fleets and random inspections of trucks operated by owner/drivers●


*Ready to start in William Street.*

*The Army steps out.*

*Heading toward Kings Cross Tunnel.*




*Reproduced by permission of John Fairfax & Sons Ltd.*

Sunday, 9 August 1981 was a day with a difference in certain Sydney and eastern suburbs streets. More than 25,000 people of all ages, shapes and sizes set out enthusiastically in the world's largest foot race—the annual "City to Surf" community fun run from Park Street (near College Street) to Bondi Beach.

The journey of 14 km took the fastest runner exactly 40.08 minutes while the less hurried competitors crossed the finishing line after about 2½ hours. The route begins in William Street and proceeds through the Kings Cross road tunnel. For the runners as well as for those who prefer to drive, the tunnel has much reduced travelling time to the Eastern Suburbs. The route continues along New South Head Road (Main Road No. 173) past Rushcutters Bay, Double Bay, Rose Bay and Vaucluse to join Old South Head Road (Main Road No. 339), and proceeds south via Military Road through Dover Heights to finish in Campbell Parade (Main Road No. 172).

The event is organised by the Sydney newspaper *The Sun* and, since the first run in 1971, has attracted more and more entrants, including competitors from all over Australia and from overseas. But most are just afternoon and weekend joggers out to keep fit and enjoy the fun of the run. Two lucky entrants whose names are drawn from the first 10,000 to finish are flown to San Francisco to take part in the "Bay to Breakers" run, a similar event in Sydney's sister city.

The race is held with the co-operation of the Police Department, the Traffic Authority, the Council of the City of Sydney, Woollahra and Waverley Municipal Councils and this Department. For a few brief hours, cars, buses and trucks give way to people as the runners surge along the city's streets, creating an amazing spectacle for the thousands of on-lookers who turn out for this once-a-year happening.

And runners aren't all you see: some walk while others ride skate-boards, roller-skate, or even roll themselves along in wheelchairs. A few bring their pet dogs on a leash or push their toddlers in prams to catch the sun and the excitement. Many organisations and Government departments enter a group of jogging enthusiasts to get into the spirit of the day, such as the Army, pictured opposite. ●

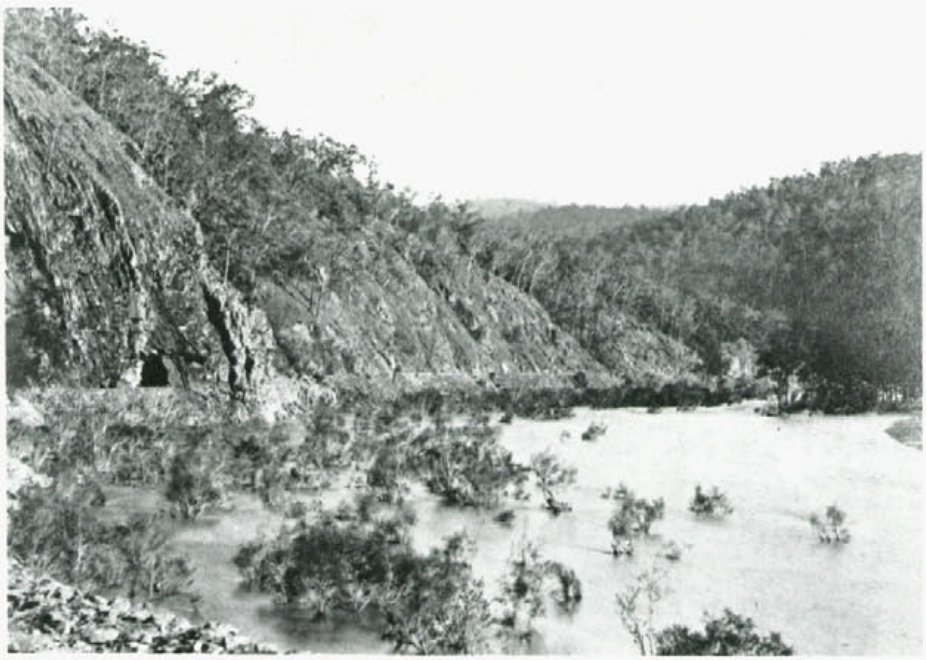
# GETTING THROUGH . . .

## Road Tunnels on New South Wales Main Roads

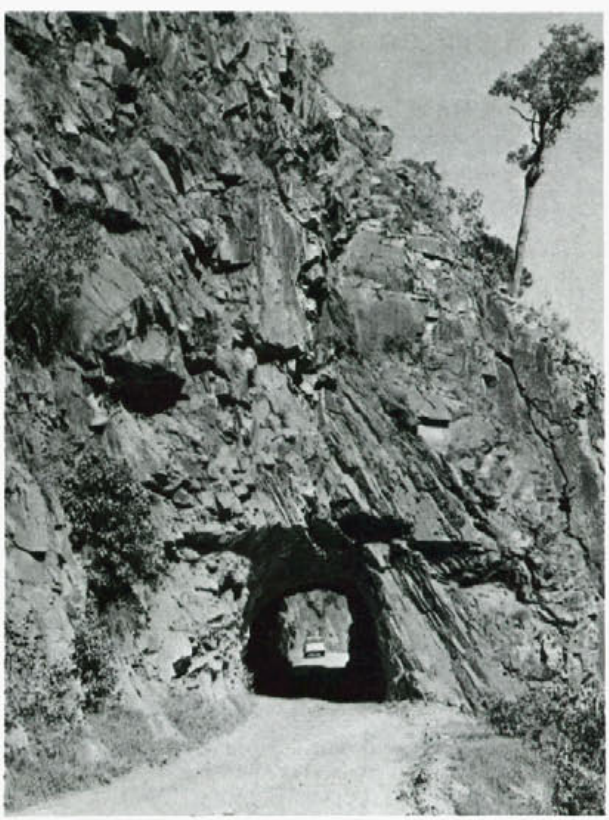
Tunnels may conjure in the mind images of daring prison escapes, smuggling, or perhaps scenes from Jules Verne's "Journey to the Centre of the Earth". Yet tunnels regularly perform far wider uses and functions, from carrying pipelines of oil, gas or water, to providing rail and road access.

The world's longest road tunnel, beneath the Swiss Alps at Goschen, is over 16 km long. Even at autobahn speeds, it takes more than nine minutes to traverse. Compared to this sample, none of our tunnels would give the subterranean traveller even a slight twinge of claustrophobia.

Motorists in New South Wales need little reminder that there are, fortunately, far fewer high mountainous areas in our State than in Europe. Consequently, there has been much less need for tunnels to be constructed. For a summary of the variety of road tunnels which are to be found in New South Wales, some brief notes follow.



***The "Sweeneys" tunnel, cut through this rugged hillside, is on the old route of the Gwydir Highway which, at this point, runs alongside the Boyd River.***



### Wombeyan Caves Road

The Wombeyan Caves in the New South Wales southern highlands are thought to have been discovered by Rev. J. Hassall in 1842 or 1843, when he visited the district with his schoolmaster, Rev. Troughton (New Nation Magazine, June 1930, p. 51). On Main Road No. 258, which leads to the caves, lies a tunnel which an early report mentions "*. . . the road passes through a tunnel cut through the sandstone ridge, and runs under the shadow of weather-worn and precipitous rocks which tower overhead and form the southern escarpment of the range . . .*" (*Guide to Wombeyan Caves, 1906*, O. Trickett, p. 9.)

According to the Department of Public Works' Annual Reports, construction of the road began in 1890 and took more than ten years to complete. The one-lane 20m-long tunnel along the route was hewn by hand into a surprisingly smooth arch.

## "Sweeneys" on the old Gwydir Highway

Between Dalmorton and Newton Boyd on the old route of the Gwydir Highway, a 60m-long tunnel was built near an area known locally as "Sweeneys". Excavated through hard igneous rock, this work was conducted by the Department of Public Works under the supervision of David Howison as engineer-in-charge.

Work commenced in 1866 with the primary aim of eliminating a circuitous path around a spur. This route was the major link betwen farms in the district and the markets at Grafton.

The *Clarence and Richmond Examiner* of 27 November 1866, reported: "*The tender of Mr. H. P. Wiseman for contract No. 1 at the Big Hill on the Newton Boyd line road has been accepted by the Government and the work will be proceeded with forthwith.*" The same paper reported on 20 October 1868: "*The tunnel at Sweeneys through blue trap, is well advanced towards completion . . .*"

This section of the highway was in service until 9 December 1960, when a new route over Gibraltar Range was opened from Grafton to join with the old route near Mitchell.

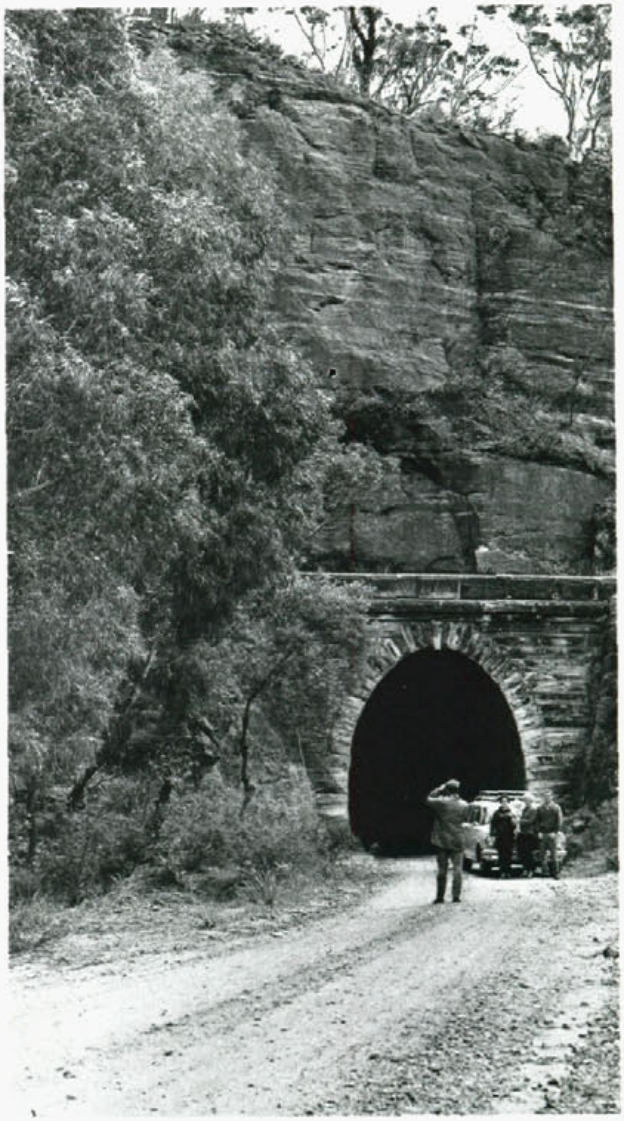
## Lithgow Zig-Zag

The western railway line was constructed across the Blue Mountains under the charge of John Whitton, engineer-in-chief of the New South Wales Government Railways. It was decided to incorporate a zig-zag to descend the steep western escarpment of the Blue Mountains, into the Lithgow Valley. In its day, it was considered one of the world's engineering marvels, involving some extremely heavy rock cutting and having fine, tall stone viaducts with semi-circular arches. The zig-zag involved 6 km of track, eight viaducts, four tunnels and 268 culverts. The vertical drop that the zig-zag negotiates is 210m.

The railway opened in 1869 and remained in use until 1910, when a new line was opened on an easier grade. The old route remained, and a road was adapted to the railway right-of-way, connecting it to the Lithgow-Bell road. This roadway was proclaimed as Tourist Road No. 4011 in 1962. The road terminated at a 70m tunnel which formed part of the original zig-zag.

The old railway route has again become a major tourist attraction with the introduction of steam locomotives which provide joyrides along part of the zig-zag. (See also *Main Roads*, September 1967, Vol. 33, No. 1, pp. 17-18.)

***One of the stone, elliptical viaducts incorporated in the Lithgow Zig-Zag which negotiates a steep vertical drop on the western side of the Blue Mountains.***



***A hand-hewn tunnel cut through a ridge on Main Road No. 258. The route leads to the Wombeyan Caves, situated to the west of Mittagong.***

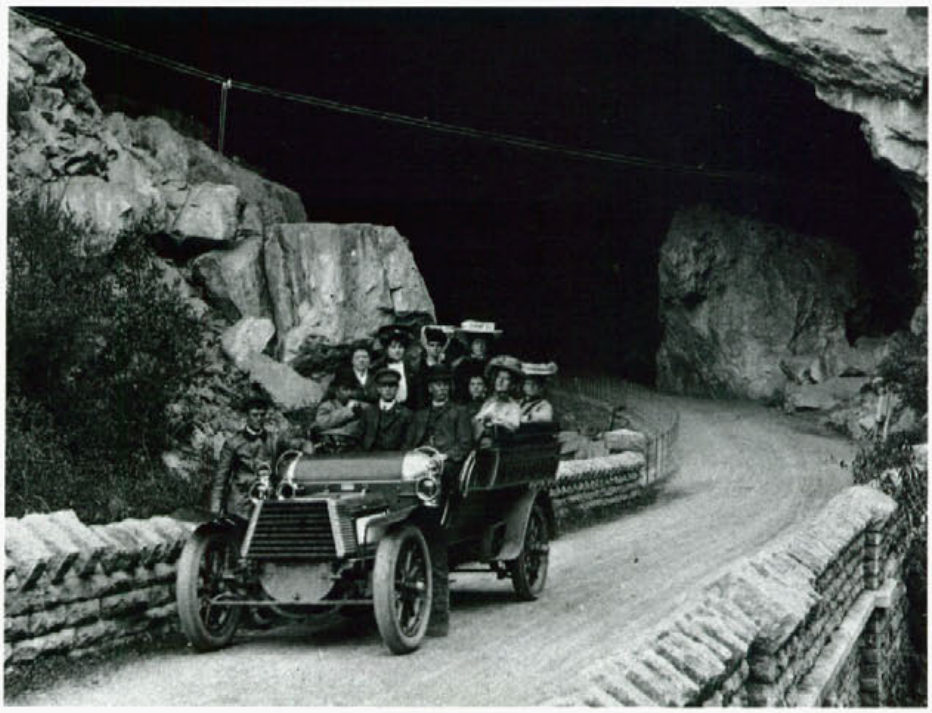
## Jenolan Caves Road

Details of the discovery of Jenolan Caves are particularly sketchy, but it is generally thought that they were discovered in 1841 by James Whalen. Accompanied by two mounted police, Whalen encountered the caves while his party was searching for the notorious bushranger McKewin (the spelling of his name varies in early accounts).

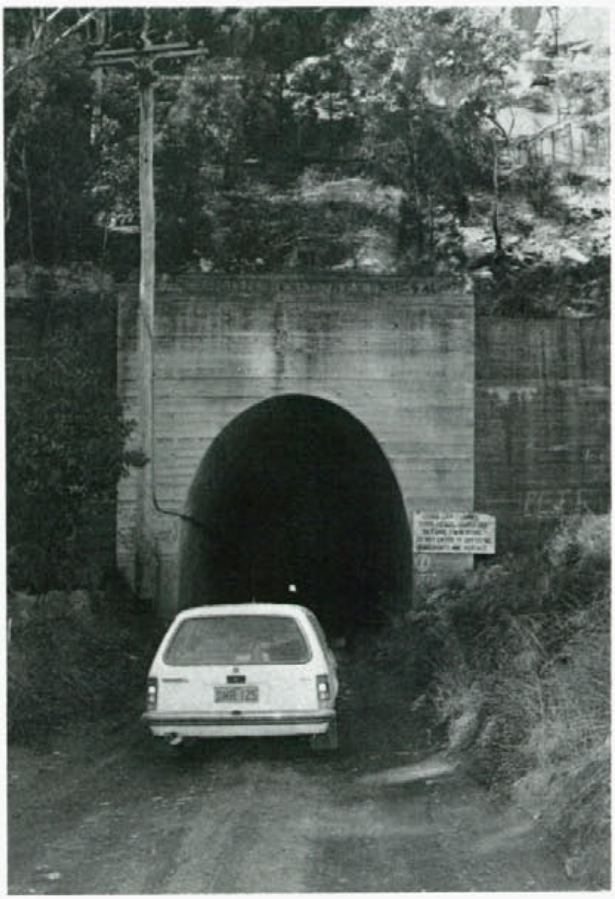
The tunnel through the Grand Arch was constructed in 1895-96, by which time the caves were already an established tourist resort. Constructed by the Department of Public Works, the tunnel has an arch span of 7m, a carriageway 4.5m wide, a length of 33m and is almost 30m high.

From the Royal Australian Historical Society's *Journal and Proceedings*, 1934 (Vol. 20, Pt. 1, p. 51) we read: "*In December 1895, operations were begun for extending the Mount Victoria Road through the Grand Arch. The project for which £1,500 was granted, was entrusted to Mr. Brownrigg, Resident Engineer, Lithgow.*" The *Journal of Legislative Council of New South Wales* 1896 (Vol. LV, Pt. 2, Appendix 1), mentions the tunnel in detail. "*... commencing at the 'Turntable', the present terminus ... of the Mount Victoria Road, the new road will follow the course of the existing bridle-track for a distance of 9 chains, which section will be 16 feet wide and fenced on the creek side. From this point, McEwan's and Cave Creeks which form a junction here, will be spanned by a bridge, which, including approaches, will be over 80 feet in length, thus bringing the road to the mouth of the Grand Arch, eastern end. Thence the present track will be followed for a distance of about 250 feet under the archway, beyond which, on account of the confined space, it will be necessary to follow the course of the creek for about 200 feet, the road being carried 3 feet above the bed of same by iron girders and buckled plates in the form of a long culvert. In order to obtain the necessary width on the latter section a considerable amount of overhanging rock will have to be dislodged.*

"*From this point ... the road will rejoin the present track, and, emerging from the archway at the western end, connect with the Oberon Road opposite the plantation, 150 feet beyond the culvert. The natural features of the archway and surroundings will be interfered with as little as possible, and it has been arranged to carry out that portion of the work under the arch without the use of powder. When this work is completed visitors from the mountains will be landed at the accommodation house, and thus not put to the inconvenience of having to walk a quarter of a mile to and from the coach as at present. It will also prove a great boon to the district people.*"



***Some early tourists enjoying the view from beneath the Grand Arch at Jenolan Caves. A large portion of overhanging rock had to be dislodged from within the arch to allow for the construction of the road.***



***The Coxs Gap tunnel, west of Muswellbrook was originally constructed in 1939 as part of the Sandy Hollow Railway Line.***

## Coxs Gap

An 800m-long tunnel was constructed as part of the original Sandy Hollow Railway line west of Muswellbrook. Built between 1936 and 1939, this line was beset by many difficulties and remained incomplete and abandoned until the late 1970s.

The tunnel was soon to prove popular to motorists as an alternative to an arduous mountain crossing on Main Road No. 208, which was actually above the tunnel. Hand-painted signs encouraged motorists to turn their headlights on before entering the single-lane tunnel.

In 1981 it was decided to close the tunnel to road traffic and to extend the railway line through to the Ulan colliery, to serve as a coal haulage route to Newcastle. The route above the tunnel was therefore reconstructed by the Department of Main Roads at a cost of approximately $2.5 million, involving 2.3 km of roadworks.


***The Kings Cross road tunnel was completed in 1975. It makes quite a contrast to the earlier road tunnels.***

## Cahill Expressway

The length of roadway referred to as the Cahill Expressway comprises two linked sections. The first 1.1 km section is from the southern end of the Sydney Harbour Bridge via the Circular Quay overhead roadway to Conservatorium Place. This section was opened to traffic on 24 March 1958, at a cost of $9 million. It was designed and constructed by Sydney City Council and the then Department of Railways. At the western end of this section there is a short 160 m long tunnel leading into a spiral ramp for northbound traffic proceeding over the Bridge. (See *Main Roads*, March 1958, Vol. 23, No. 3, pp. 76-83.)

The second section extends from Conservatorium Place to Sir John Young Crescent, Woolloomooloo. This 950 m section opened to traffic on 1 March 1962, at a cost of $7.8 million. The four-lane tunnel, 395 m long, extends underneath the Royal Botanical Gardens, and incorporates fan-boosted ventilation in case of traffic delays. This section was designed by Sydney City Council with the aid of consultants. The Department examined plans and estimates and carried out regular inspections during construction. (See *Main Roads*, June 1962, Vol. 27, No. 4, pp. 98-107.)

## General Holmes Drive, Mascot

This 375 m long twin tunnel carries General Holmes Drive under the north-south runway of Sydney (Kingsford-Smith) Airport. The southbound carriageway was in use by July 1967, and the whole tunnel was opened to traffic in early 1968.

Special design consideration was given to enable the tunnel to withstand the loading of the massive 747 jet aircraft during take-off and landing. The tunnel was built by Concrete Constructions Pty. Ltd. under contract to the then Commonwealth Department of Works. (See cover photograph on *Main Roads*, September 1972, Vol. 38, No. 1.)

## Kings Cross Road Tunnel

This 275 m long tunnel was opened to traffic on 15 December 1975. It provides dual carriageways in separate tunnel cells, each 11.54 m wide and 4.9 m high. Bridges at each end of the tunnel form portals and also carry cross-traffic over the through traffic in the tunnel.

The tunnel was constructed by contract but the Department's own forces constructed the approaches and surface street adjustments. The cost of the tunnel with approaches was approximately $8.2 million. (For more details of the tunnel see *Main Roads*, December 1975, Vol. 41, No. 2, pp. 34-38, 56-67.) ●

*Tenders for the leasing of the airspace above the tunnel have been invited by the Department. It is proposed that the accepted tender be for a prestige international standard hotel, residential development, convention, retail or entertainment centre.*

## STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 30 JUNE 1981

| | County of Cumberland Fund | |
|---|---|---|
| **Receipts** | $ | |
| State Sources | | |
| Motor vehicle registration weight tax and tax levy | 47,205,405 | |
| Charges on heavy commercial vehicles for maintenance of roads | 4,691 | |
| Motor vehicle registration fee — allocation from the Road Transport and Traffic Fund | | |
| Loans — from State General Loan Account | 10,000,000 | |
| — raised by the Commissioner under Semi-Government Loan Allocation | 25,300,000 | |
| — from Department's Reserve for Loan Repayment | 5,500,000 | |
| Road Tolls (Less Collection Costs) | 6,559,467 | |
| Interest — On Sinking Fund Investments | 2,511,926 | |
| — On Treasury Fund Balances | 608,466 | |
| Contributions for Specified Works — from Other Departments | 492,935 | |
| — from Other Sources | | |
| Contributions by Councils for works carried out in conjunction with works on Main Roads | 248,078 | |
| Rents from Properties Acquired for Works (Less Collection and Maintenance Costs) | 2,116,352 | |
| Natural Disasters — State/Commonwealth Grant for Restoration Works | | |
| Miscellaneous | 726,765 | |
| Commonwealth Grants | | |
| — National Roads | | |
| — Arterial Roads — Urban | 36,138,000 | |
| — Rural | | |
| — Local Roads | | |
| — Minor Traffic Engineering and Road Safety Improvements | | |
| — Planning and Research | | |
| **Total Receipts** | 137,412,085 | |
| Cash at Treasury as at 1 July 1980 | 6,855,413 | |
| **Total Funds Available** | 144,267,498 | |
| **Payments** | | |
| State Road System | | |
| — Construction and Reconstruction | 69,818,460 | |
| — Property Acquisitions (Less Proceeds of Sales) | 16,775,296 | |
| — Maintenance and Minor Improvements | 21,520,229 | |
| — Natural Disasters — Restoration Works | 9,265 | |
| Local Roads | | |
| — Construction and Maintenance | 5,307 | |
| — Natural Disasters — Restoration Works | | |
| Intersection Improvements, Traffic Signals, Signs and Road Marking | | |
| — Construction and Reconstruction | | |
| — Maintenance and Operations | | |
| Land and Buildings — For Works Operations | 1,200,066 | |
| — For Administration | 17,064 | |
| Net Transactions of Operating and Suspense Accounts | 3,010,718 | |
| General Administration | 5,523,585 | |
| Research | 1,797,579 | |
| Loan Charges | | |
| — Repayable Treasury Advances — Interest | 627,479 | |
| — General Loan Account — Interest and Management Expenses | 6,733,200 | |
| — Loans raised by the Commissioner — Interest and Management Expenses | 8,495,373 | |
| **Sub-Total** | 135,533,621 | |
| Loan Repayments — Repayable Treasury Advances — Principal | 249,782 | |
| — General Loan Account — Sinking Fund | 873,300 | |
| — Loans raised by the Commissioner — Principal | 2,290,405 | |
| Investments for Loan Repayments for Loans raised by Commissioner | 5,164,300 | |
| **Total Payments** | 144,111,408 | |
| Net Transactions of Trust Accounts | 3,574,230 | Cr. |
| Cash at Treasury as at 30 June 1981 | 3,730,320 | |
| | 144,267,498 | |

**B.N. Loder**
ACTING COMMISSIONER FOR MAIN ROADS

**E.C. Cooper**
CHIEF ACCOUNTANT

| Country Fund | Commonwealth Fund | Traffic Facilities (Note 1) | Sydney Harbour Bridge Accounts | Total 1980-81 | 1979-80 |
|---|---|---|---|---|---|
| $ | $ | $ | $ | **$** | $ |
| 123,444,281 | | 11,755,135 | | **182,404,821** | 143,478,320 |
| 18,763 | | | | **23,454** | 1,222,885 |
| | | 18,503,622 | | **18,503,622** | 19,127,717 |
| | | | | **10,000,000** | 36,850,000 |
| 59,825,040 | | | | **85,125,040** | 70,174,960 |
| 9,500,000 | | | | **15,000,000** | — |
| 5,500 | | 2,737,967 | 1,613,956 | **10,916,890** | 10,206,801 |
| 836,613 | | | 595,247 | **3,943,786** | 2,943,042 |
| 971,037 | | | 279,000 | **1,858,503** | 1,737,357 |
| 1,009,819 | | 1,188,157 | 263,732 | **2,954,643** | 4,092,359 |
| 293,258 | | 260,197 | | **553,455** | 872,212 |
| 486,523 | | 193,509 | | **928,110** | 843,793 |
| 190,824 | | | 268,433 | **2,575,609** | 2,245,970 |
| 569,188 | | | | **569,188** | 1,499,214 |
| 1,556,653 | | | | **2,283,418** | 1,408,099 |
| | 92,509,303 | 2,438,697 | | **94,948,000** | 81,153,000 |
| | | | | **36,138,000** | 32,990,000 |
| 22,998,000 | | | | **22,998,000** | 20,691,000 |
| | 42,417,000 | | | **42,417,000** | 38,162,000 |
| | | | | | 3,793,000 |
| | 801,601 | | | **801,601** | 1,229,986 |
| 221,705,499 | 135,727,904 | 37,077,284 | 3,020,368 | **534,943,140** | 474,721,715 |
| 12,585,332 | 1,357,593 | | 4,361,210 | **25,159,548** | 31,712,710 |
| 234,290,831 | 137,085,497 | 37,077,284 | 7,381,578 | **560,102,688** | 506,434,425 |
| 109,857,826 | 73,602,252 | | | **253,278,538** | 223,930,787 |
| 3,419,085 | 4,943,129 | | | **25,137,510** | 19,122,721 |
| 75,980,896 | 10,405,872 | | 2,044,097 | **109,951,094** | 98,045,231 |
| 74,197 | | | | **83,462** | 218,377 |
| 804,211 | 41,529,652 | | | **42,339,170** | 37,980,740 |
| 1,070,228 | | | | **1,070,228** | 738,446 |
| | | 8,517,540 | | **8,517,540** | 9,779,070 |
| | | 25,027,492 | | **25,027,492** | 21,345,662 |
| 1,245,463 | | 337,759 | | **2,783,288** | 2,790,496 |
| 88,090 | | | | **105,154** | 270,706 |
| 4,062,075 | | 1,495,211 | | **8,568,004** | 9,167,154 |
| 9,340,103 | 4,019,308 | 1,699,282 | 160,000 | **20,742,278** | 17,509,400 |
| 2,697,483 | 797,009 | | | **5,292,071** | 4,291,324 |
| 537,840 | | | | **1,165,319** | 1,205,830 |
| 3,706,800 | | | 820,000 | **11,260,000** | 8,851,500 |
| 16,311,769 | | | 524,578 | **25,331,720** | 15,524,134 |
| 229,196,066 | 135,297,222 | 37,077,284 | 3,548,675 | **540,652,868** | 470,771,578 |
| 214,098 | | | | **463,880** | 423,370 |
| 615,700 | | | 112,000 | **1,601,000** | 1,041,500 |
| 895,743 | | | 105,643 | **3,291,791** | 2,723,636 |
| 1,632,400 | | | 545,000 | **7,341,700** | 6,113,500 |
| 232,554,007 | 135,297,222 | 37,077,284 | 4,311,318 | **553,351,239** | 481,073,584 |
| 217,051Cr. | | | | **3,791,281Cr.** | 201,292 |
| 1,953,875 | 1,788,275 | | 3,070,260 | **10,542,730** | 25,159,549 |
| 234,290,831 | 137,085,497 | 37,077,284 | 7,381,578 | **560,102,688** | 506,434,425 |

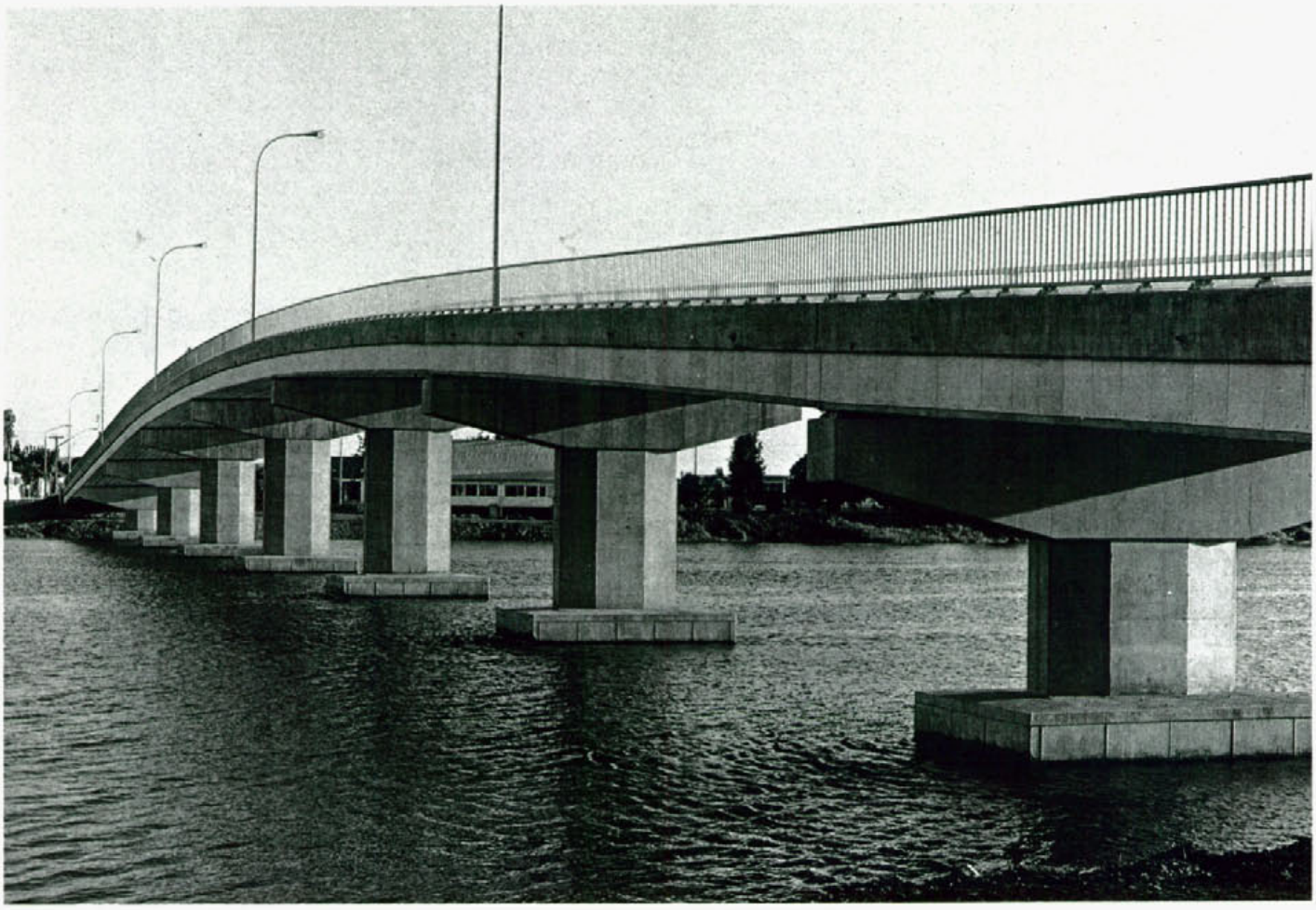
The accounts of the Department of Main Roads have been audited in accordance with the provisions of the Audit Act, 1902. In my opinion, the above statement and the accompanying summary of loan liabilities, read in conjunction with notes 1 to 6, is a true and fair statement of transactions on the several Funds and Accounts of the balances remaining at the close of the year.

The Traffic Facilities Fund reflects only Department of Main Roads' transactions through the Fund on behalf of the Traffic Authority of New South Wales.

**J. O'Donnell**

SYDNEY, 11 September 1981

AUDITOR-GENERAL OF NEW SOUTH WALES



*The reinforced concrete piers have single columns, 3.4 m in width, with cantilevered headstocks.*

along the footway. In order to enhance the overall appearance of the structure, polished asbestos fascia panels have been placed on both sides of the bridge.

The bridge forms a crest vertical curve and provides a clearance of 8.5m above Mean High Water spring tides. Horizontal clearance between piers is about 36m.

## Substructure

Foundations at the piers and abutments consist of steel encased 1m diameter reinforced concrete cast-in-place piles founded on sandstone. The piles vary in length from 16.2m to 18.6m and are socketted at least 1m into weathered rock.

There are six piles at each pier, raking at 1:8 and supporting a reinforced concrete pilecap, 1.05m deep. The lower edges of the pilecaps are just above low tide level. Precast skirting units, which form the sides of the pilecaps and project 0.4m below them, were used to facilitate casting of the pilecaps between tides. They also conceal the tops of the piles at low tide.

The piers are of reinforced concrete and have single columns with cantilevered headstocks. The columns are 3.4m wide and vary in thickness between 0.7m and 1.0m. There are five piles at each abutment, two of which are raked at 1:8 longitudinally. Reinforced concrete headstocks with wingwalls and curtain walls are cast on top of the piles.

## Superstructure

The superstructure consists of simply supported spans of prestressed reinforced concrete girders with an asphaltic concrete wearing course. Girders are 1m deep broad flange type, with a top flange width of 850mm and a bottom flange width of 970mm.

Each girder is 27.76m long and weighs approximately 29 tonnes. The girders were prestressed using twenty-four 15.2mm diameter super-grade normal relaxation strands. Each strand was stressed to 192kN.

Bearing plates were cast in at each end of the girders. In order to allow for the high grades and the 3% two-way crossfall on the bridge, the orientation of these bearing plates varied for each span.

Each span consists of 11 girders, with reinforced concrete infill between the top flanges. The girders were transversely stressed together after being placed in position. Tendons for transverse stressing, which consist of twelve 12.5mm strands, were stressed to 1400kN.

The minimum thickness of the asphaltic concrete wearing course is 50mm. This varies up to 140mm at some locations to allow for the hog of the girders and the vertical curve of the bridge.

## Bearings

The girders are supported at the piers and the abutments on elastomeric type bearings. These will accommodate maximum vertical loads, rotational effects and longitudinal movements due to thermal expansion and contraction and creep and shrinkage on concrete.

Transflex type deck joints will allow for all anticipated longitudinal movements at the piers and abutments.

## Materials

The approximate quantities of materials used in the construction of the bridge were:

| | |
|---|---|
| Steel casing for 1m diameter piles | 836m |
| Concrete for piles, piers, abutments and deck (20 MPa) | 1275m$^3$ |
| Concrete for cross girders (40 MPa) | 100m$^3$ |
| Reinforcing steel | 155 tonnes |
| Prestressed concrete girders | 2570 tonnes |

The contract for the construction of the bridge was let to Transbridge Pty. Ltd. at a tender price of $1,527,981.00. ●

# DEPARTMENT'S NEW MINI-PAVER

*recent addition to the Depart-ent's paving equipment is this llatt-SP50 mini-paver. The 46,000 unit, made in Britain, is owered by a 27 kW Hatz diesel.*

*nly 3m long and 1.6m wide, the ini-paver is suitable for laying sphaltic concrete on narrow oulders, footpaths and confined eas too small for conventional wing equipment.*

*he mini-paver has automatic grade d slope control and is capable of wing widths between 0.3m and 4m. It can be used in conjunction th normal tipping trucks or deliv-y trucks equipped with conveyors d side-discharge chutes.*


# Tenders Accepted by the Department of Main Roads

**The following tenders (in excess of $20,000) for road and bridge works were accepted for the three months ended 30 June 1981.**

| Road No. | Work or Service | Name of Successful Tenderer | Amount |
|---|---|---|---|
| F3—Sydney-Newcastle Freeway | Shire of Wyong. Construction of twin bridge over McPherson Road, 88.8 km north of Sydney. | Geoffrey Stewart Constructions Pty Ltd | $406,071.00 |
| F3—Sydney-Newcastle Freeway | Shire of Wyong. Construction of substructures for twin bridges over Deep Creek, 89.4 km north of Sydney. | Wrightson Contracting Pty Ltd | $196,130.00 |
| F3—Sydney-Newcastle Freeway | Shire of Wyong. Manufacture, delivery, unloading and stacking of precast pretensioned concrete trough girders for twin bridges over Wyong Road, 90.3 km north of Sydney. | EPM Concrete Pty Ltd | $230,652.00 |
| F3—Sydney-Newcastle Freeway | Shire of Wyong. Construction of piles and substructures for twin bridges over Wyong River, 90.3 km north of Sydney. | Transbridge—Division of Transfield (N.S.W.) Pty Ltd | $611,822.00 |
| F3—Sydney-Newcastle Freeway | City of Gosford. Painting exterior of girders. | Ignazio Mondello | $134,600.00 |
| F4—Western Freeway | Municipalities of Concord and Strathfield. Loading, transporting and erecting of girders for Span 11 of the bridge over the northern railway line at North Strathfield. | Marr Contracting Pty Ltd | $112,150.00 |
| F4—Western Freeway | Municipalities of Concord and Strathfield. Supply, installation, stressing and grouting of transverse tendons in Spans 10, 11 and 12 plus the fourth tendon in 40 precast girders erected in place in the superstructure for the bridge over the northern railway at North Strathfield. | Prestressed Concrete (Aust.) Pty Ltd | $55,426.00 |
| F4—Western Freeway | Municipalities of Concord and Strathfield. Construction of the superstructure for Span 1 to 9 (inclusive) of the bridge over northern railway line at North Strathfield. | Transbridge—Division of Transfield (N.S.W.) Pty Ltd | $1,385,849.00 |
| F4—Western Freeway | Municipalities of Concord and Strathfield. Construction of abutment 'A'. Extension for bridge over northern railway line at North Strathfield. | A.A.M.M. Constructions Pty Ltd | $211,447.00 |
| F4—Western Freeway | Municipalities of Concord and Strathfield. Loading, transporting and erecting of girders for Spans 10 and 12 for bridge over northern railway line at North Strathfield. | Marr Contracting Pty Ltd | $180,978.00 |
| F4—Western Freeway | Municipality of Holroyd. Construction of bridge on the on-loading ramp over A'Becketts Creek at Harris Park. | A.A.M.M. Constructions Pty Ltd | $350,254.50 |
| F5—South Western Freeway | City of Liverpool. Construction (excluding piles) of bridge over Georges River and adjoining underpass at main southern railway at Casula. | Enpro Constructions Pty Ltd | $2,689,306.00 |
| State Highway No. 2 | Hume Highway. Shire of Holbrook. Supply, deliver and laying up to 1,700 t of 10 mm asphaltic concrete at locations within 2 km of Holbrook. | Allen Bros. Asphalts Ltd | $84,490.00 |
| State Highway No. 7 | Mitchell Highway. City of Dubbo. Supply and laying of up to 450 t of asphaltic concrete at intersection with Macquarie Street, Dubbo. | Bitupave Ltd | $28,666.00 |
| State Highway No. 9 | New England Highway. City of Maitland. Supply and delivery of 3,500 $m^3$ of 20 mm fine crushed rock to construction site between Mitchell Drive and George Street, East Maitland. | Quarry Products Pty Ltd | $32,900.00 |
| State Highway No. 9 | New England Highway. City of Maitland. Supply and laying 3,700 t of 10 mm asphaltic concrete, 23.5 to 25.6 km west of Newcastle at East Maitland. | Bitupave Ltd | $171,125.00 |
| State Highway No. 9 | New England Highway. City of Maitland. Supply and laying up to 430 t of 10mm dense graded asphaltic concrete to reconstruction work between Lochinvar and Kaludah Creek, 13.4 to 14.0 km west of Maitland. | Boral Road Surfaces Pty Ltd | $23,048.00 |
| State Highway No. 9 | New England Highway. Shire of Singleton. Remove 5000 m of fencing and erect 7,100 m of fencing at approaches to Bowmans Creek Bridge. | C. G. Kellehear | $22,940.00 |
| State Highway No. 9 | New England Highway. Supply and laying 900 t of 10 mm asphaltic concrete at Three Sisters climbing lane, 34.4 to 35.3 km west of Maitland. | Hawkins Asphalt Pty Ltd | $49,500.00 |
| State Highway No. 9 | New England Highway. Shire of Singleton. Supply and lay up to 840 t of 10 mm dense graded asphaltic concrete to construction of climbing lane at Grasstree Hill, 84.2 to 85.8 km west of Maitland. | Bitupave Ltd | $47,863.00 |
| State Highway No. 9 | New England Highway. Shire of Singleton. Supply and lay up to 570 t of 10mm dense graded asphaltic concrete to reconstruction work at intersection with Mitchell Line Road. | Bitupave Ltd | $31,572.00 |
| State Highway No. 9 | New England Highway. Shire of Singleton. Supply and delivery of up to 6,000 $m^3$ of sub-base gravel to climbing lane at Grasstree Hill, 37.0 to 39.0 km north of Singleton. | Les Tinkler Earthmoving | $22,800.00 |
| State Highway No. 9 | New England Highway. City of Maitland. Supply and lay up to 930 t of 10 mm dense graded asphaltic concrete to reconstruction work from Lochinvar to Kaludah Creek 12.2 to 13.4 km west of Maitland. | Boral Road Surfaces Pty Ltd | $49,755.00 |
| State Highway No. 9 | New England Highway. Shire of Muswellbrook. Supply and spray up to 80,000 l of C160 bitumen to construction work between Hebden Road and Sylvesters Road, Grasstree Hill, 37 to 39 km north of Singleton. | Polson & McKinley Pty Ltd | $27,040.00 |
| State Highway No. 9 | New England Highway. Shires of Quirindi & Murrurundi. Supply and laying of asphaltic concrete at Quirindi Creek Bridge, Wallabadah and Kankool Weighbridge. | Bitupave Ltd | $20,606.60 |
| State Highway No. 9 | New England Highway. Shire of Parry. Construction of various types of concrete dished drains and dykes between 24.8 and 27.6 km north of Tamworth—Moonbi Range construction. | Mr. J. Zuvela | $50,380.50 |
| State Highway No. 10 | Pacific Highway. Shire of Wyong. Supply & delivery of up to 6,000 $m^3$ of upper base material for sealing and strengthening of shoulders, 106.3 to 109.4 km and 110.8 to 113.8 km north of Sydney. | D. & J. Constructions Pty Ltd | $44,340.00 |
| State Highway No. 10 | Pacific Highway. Shire of Wyong. Supply & laying 1800 t of 10 mm asphaltic concrete to construction of northbound carriageway between Saliena Avenue and Elizabeth Bay Road, 121.2 to 123.9 km north of Sydney. | Bitupave Ltd | $94,500.00 |
| State Highway No. 10 | Pacific Highway. Municipality of Lake Macquarie. Supply and laying 900 t of 20 mm asphaltic concrete between Swansea Bridge and Soldiers Road, Pelican. | Hawkins Asphalt Pty Ltd | $45,450.00 |
| State Highway No. 10 | Pacific Highway. Municipality of Lake Macquarie. Supply and laying 900 t of 20 mm asphaltic concrete between Swansea Bridge and Soldiers Road, Pelican. | Boral Road Surfaces Pty Ltd | $46,980.00 |
| State Highway No. 10 | Pacific Highway. Shire of Great Lakes. Supply and delivery of 300 $m^3$ 15 mpa ready mixed concrete to section between Bacon's Quarry and Bangalow Creek. | Bulahdelah Ready Mix | $20,500.00 |
| State Highway No. 10 | Pacific Highway. Municipality of Lake Macquarie. Extrusion of 4,500 m of S.H. & S.G. kerb and gutter from Nords Wharf Road to north of Mine Camp Road. | Seovic Holdings Pty Ltd | $65,300.00 |
| State Highway No. 10 | Pacific Highway. Shire of Wyong and Municipality of Lake Macquarie. Supply and delivery of 5,000 $m^3$ of shoulder gravel for maintenance in Wyong Shire and Lake Macquarie Municipality areas. | R. L. Scadden | $25,000.00 |
| State Highway No. 10 | Pacific Highway. Shire of Wyong. Supply and delivery of 5,000 $m^3$ of natural gravel to Highway between Doyalson and Chain Valley Bay Road, 117.5 to 124.3 km north of Sydney. | D. & J. Constructions Pty Ltd | $46, 150.00 |

# Tenders Accepted by the Department of Main Roads

**The following tenders (in excess of $20,000) for road and bridge works were accepted for the three months ended 30 June 1981.**

| Road No. | Work or Service | Name of Successful Tenderer | Amount |
|---|---|---|---|
| State Highway No. 10 | Pacific Highway. Various areas. Supply and spraying 90,000 l of C160 bitumen at various locations. | Boral Road Surfaces | $33,008.00 |
| State Highway No. 10 | Pacific Highway. Shire of Manning. Manufacture and delivery of bridge bearings and associated steel plates for bridge over Stewarts River at Johns River. | VSL Prestressing (Aust.) Ltd | $36,764.00 |
| State Highway No. 12 | Gwydir Highway. Shire of Boomi. Construction of Bullarah bridge over Goonal Creek, 69.1 km west of Tamworth. | Mr. N. Del-Gotto | $262,794.00 |
| State Highway No. 14 | Sturt Highway. Shire of Kyeamba. Widening of bridge over Tarcutta Creek at Lower Tarcutta, 39.5 km east of Wagga Wagga. | Evalco Constructions Pty Ltd | $212,129.00 |
| State Highway No. 17 | Newell Highway. Shire of Timbrebongie. Widening of bridge over Bundara Creek at 36.7 km north of Peak Hill. | G. & E. M. Tincknell | $54,698.50 |
| State Highway No. 18 | Castlereagh Highway. Shire of Gilgandra. Construction of bridge over Castlereagh River at Armatree. | Bridge & Civil Pty Ltd | $933,703.00 |
| Trunk Road No. 79 | Shire of Mulwaree. Construction of Macroom Bridge over Mulwaree River at Tarago, 38.4 km south of Goulburn | John Holland (Constructions) Pty Ltd | $555,880.00 |
| Main Road No. 208 | Shire of Muswellbrook. Supply and spray 165,000 l of C160 bitumen at Coxs Gap. | Polson and McKinley Pty Ltd | $56,595.00 |
| Main Road No. 208 | Shire of Muswellbrook. Supply and delivery of up to 450 $m^3$ of 7mm sealing aggregate and up to 1,100 $m^3$ of 20 mm sealing aggregate for reconstruction work at Coxs Gap. | G. Hawkins and Sons | $26,018.00 |
| Main Road No. 217 | Municipality of Lake Macquarie. Supply and delivery of up to 500 $m^3$ of 20 mpa ready mixed concrete to site of new bridge over main northern railway line at Morisset. | Pioneer Concrete (N.S.W.) Pty Ltd | $32,500.00 |
| Main Road No. 309 | City of Parramatta. Construction of bridge over A'Becketts Creek in Unwin Street, Rosehill. | McGregor Construction (Australia) Pty Ltd | $247,819.93 |

# Tenders Accepted by Councils

**The following tenders (in excess of $20,000) for road and bridge works were accepted for the three months ended 30 June 1981.**

| Council | Road No. | Work or Service | Name of Successful Tenderer | Amount |
|---|---|---|---|---|
| Bogan | Trunk Road No. 57 | Construction of bridge over Bogan River | Armstrong Constructions | $485,626.61 |
| Cabonne | Main Road No. 310 | Extension and widening of bridge over Belubula River flood channel, 0.8 km south of Canowindra. | Murray Constructions Ltd | $119,244.00 |
| Culcairn | Various | Bitumen resealing of various trunk and main roads. | Emoleum (Aust.) Ltd | $62,414.94 |
| Forbes | Trunk Road No. 56 | Construction of bridge over Goonigal Creek 48.9 km north-west of Cowra. | Murray Constructions Ltd | $158,963.00 |
| Gosford | State Highway No. 10 and Main Road No. 336 | Resheeting of Mann Street (Pacific Highway); reconstruction and widening of Masons Parade (Main Road No. 336) and reconstruction and widening of Victoria Street (Main Road No. 336). | Bitupave Ltd | $217,000.00 |
| Holbrook | Main Road No. 284 | Bitumen sealing of reconstruction works on section between 10 to 14.3 km east of Little Billabong. | Emoleum (Aust.) Ltd | $33,344.38 |
| Inverell | Various | Supply, heat, haul and spray C160 bitumen on various roads within the Shire area. | Emoleum (Aust.) Ltd | $75,186.16 |
| Murray | Trunk Road No. 94 | Construction of reinforced concrete box culvert at 11.3 km west of Deniliquin. | Herbert Bros. Unit Trust | $47,909.43 |
| Narrandera | Main Road No. 387 | Bitumen sealing 8.2 to 10.9 km west of Ardlethan. | Emoleum (Aust.) Ltd | $22,965.55 |
| Queanbeyan | Trunk Road No. 51 | Pavement construction—3000$m^3$ D.C.B. 20. | Readymix Group (N.S.W.) | $36,960.00 |
| Queanbeyan | Trunk Road No. 51 | Pavement construction—1850 t of asphaltic concrete. | Allen Bros. Asphalt Ltd | $78,907.00 |
| Singleton | State Highway No. 9 | Supply and lay up to 830 t of 20mm asphaltic concrete and up to 520 t of 10mm asphaltic concrete for pavement reconstruction and resheeting between 44.4 and 46.5 km north of Maitland on the New England Highway. | Bitupave Ltd | $72,631.00 |
| Wagga Wagga | Main Road No. 211 | Asphaltic concrete surfacing and reconstruction of Bourke Street, Wagga Wagga from Fernleigh Road to Red Hill Road. | Pioneer Asphalts Ltd | $213,476.80 |
| Wagga Wagga | Trunk Road No. 78 | Asphaltic concrete resheeting of the section of Fitzmaurice Street from Gurwood Street to Crampton Street. | Pioneer Asphalts Ltd | $26,619.20 |
| Wakool | Trunk Road No. 94 | Construction of bridge over Merran Creek, 133.5 km west of Deniliquin. | Nelmac Pty Ltd | $151,759.90 |

LAPSTONE HILL.

*By S. T. Gill.*