1958

VICTORIA

COUNTRY ROADS BOARD

FORTY-FOURTH ANNUAL REPORT

FOR YEAR ENDED 30TH JUNE, 1957

PRESENTED TO BOTH HOUSES OF PARLIAMENT PURSUANT TO ACT No. 3662.

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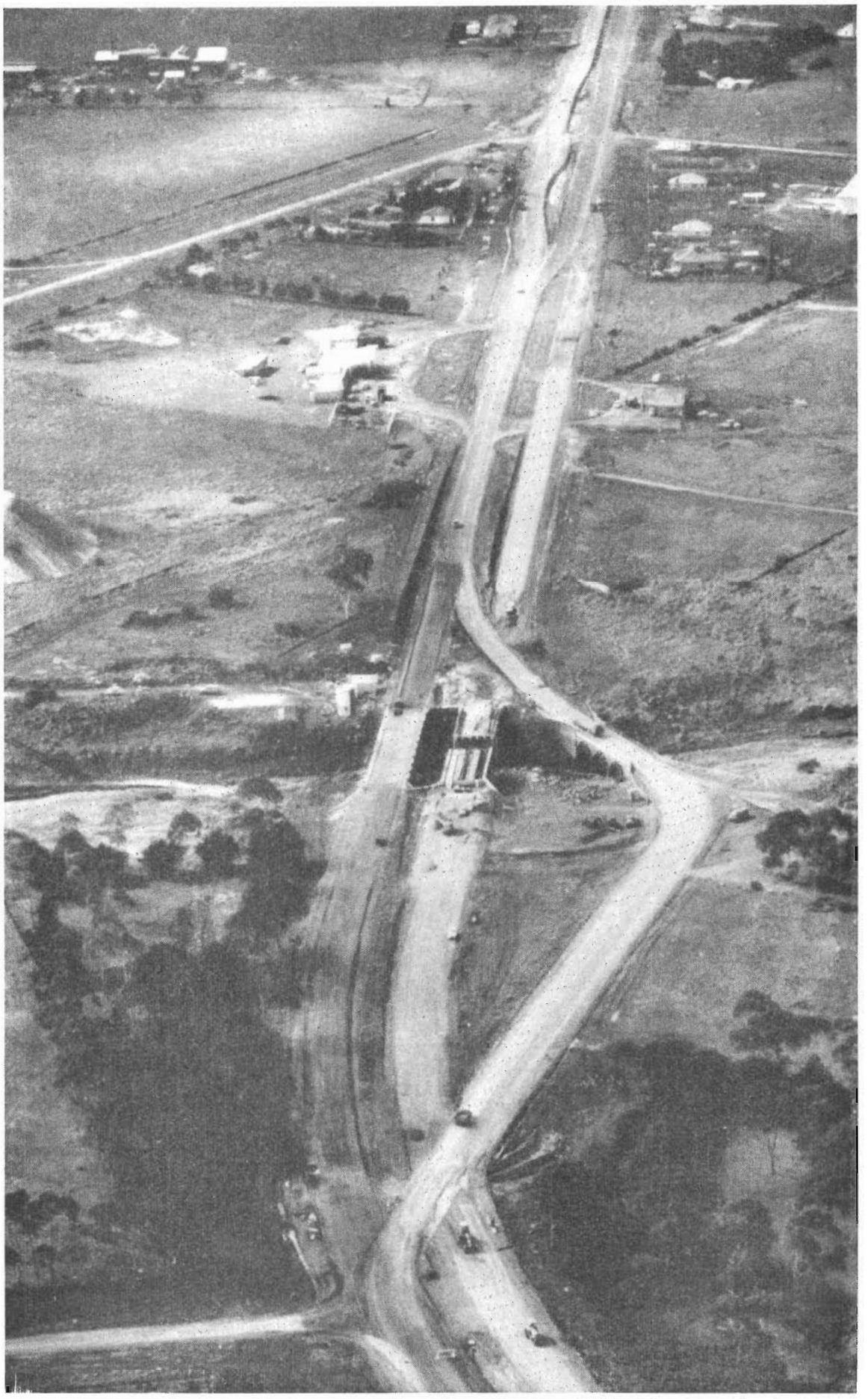
DUAL HIGHWAY CONSTRUCTION



Frontispiece :—Princes Highway West, at Kororoit Creek—Duplication of pavement and construction of new bridge on new alignment.

COUNTRY ROADS BOARD

FORTY-FOURTH ANNUAL REPORT, 1956-57

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COUNTRY ROADS BOARD

FORTY-FOURTH ANNUAL REPORT

Exhibition Building,
Carlton, N.3,
21st November, 1957.

The Honorable Sir Thomas Maltby, M.L.A.,
Minister of Public Works,
Department of Public Works,
Melbourne, C.2.

SIR,

In accordance with the requirements of Section 96 of the *Country Roads Act* 1928, No. 3662, the Board has the honour to submit to you, for presentation to Parliament, a report of its proceedings for the year ended 30th June, 1957.

FINANCE.

From a financial viewpoint the year was somewhat difficult. Owing to the favourable construction season in many parts of the State early in 1956 and to the generally increasing desire and ability of municipal councils to carry out an enlarged programme of road works, the rate of expenditure in the previous financial year was higher than estimated when the allocations for the year 1955–56 were made, with the result that the available finances were severely taxed. Hitherto the Board has been obliged to close its accounts year by year without incurring a debit balance, a very inflexible requirement. Legislative authority was, however, secured early in 1956 to incur an overdraft of £500,000 at the closing date of any financial year, subject to the repayment of the amount by the 30th September of the ensuing financial year. Advantage was taken of this timely new provision at 30th June, 1956. In addition, it was necessary to carry over to the year 1956–57 claims totalling £593,000 which the Board was unable to meet at the 30th June, 1956. Thus liabilities of £1,093,000 had to be met early in the year now under review.

The Board has for some years been pressing for greater revenue to carry out its ever-expanding responsibilities and to assist local government authorities in road and bridge works. It is gratifying to record that on the 1st January, 1957, the *Motor Car (Fees) Act* 1956 (No. 6038) came into operation, increasing by 50 per cent. generally the fees for the registration of motor cars, motor cycles and trailers under the Motor Car Act, and correspondingly increasing the Country Roads Board Fund during six months of the year. The net amount received by the Board during the financial year from motor registration fees (including the 50 per cent. increase) and from fines, two-thirds of additional registration fees, and half the drivers' licence fees, less costs of collection, was £6,419,468—an increase of £1,234,758 over the amount received from the same sources during the financial year 1955–56. The receipts from petrol tax were £5,247,438—an increase of £816,863 over the previous year's receipts. Collection of the ton-mile tax under the *Commercial Goods Vehicles Act* 1955, which had come into operation on 1st April, 1956, continued for the full period of the financial year and amounted to £1,314,784—an increase of £1,098,998 over receipts from the same source in the previous year, when only two months' collections were received.

Loan moneys available to the Board for its normal works programme amounted to only £370,000 compared with £1,035,000 in the previous financial year. The available loan being required for works on main roads and bridges in the metropolitan area, it was necessary to finance reconstruction works on State highways wholly from revenue instead of partly from loan as had been the practice since 1949.

As in previous years, maintenance works, which must perforce receive priority, absorbed a high proportion of the Board's funds and only a limited portion of necessary reconstruction and improvement works could be undertaken.

Though the increases in motor registration fees and other revenues afford greatly needed additional finance it is obvious that with the continuing increase in traffic, particularly heavy commercial traffic, maintenance costs will increase and continue to absorb a considerable portion of the Board's resources. Until further substantial funds are made available the progress which can be made with the road improvement programme will remain considerably below what is necessary for overtaking arrears of essential reconstruction and new construction.

Commonwealth Aid Roads Funds.

The *Commonwealth Aid Roads Act* 1954–56 provides for the payment into the Commonwealth Aid Roads Trust Account of the proceeds of 8d. per gallon customs duty on motor spirit imported into Australia and a similar amount per gallon excise duty on motor spirit refined in Australia.

After retention by the Commonwealth of £950,000, representing £800,000 for the construction, maintenance, &c., of strategic roads, roads of access to Commonwealth property and other roads serving or likely to serve Commonwealth properties, and £150,000 to be expended on the promotion of road safety practices throughout the Commonwealth, the balance is distributed to the States on the basis of three-fifths as to population and two-fifths as to area. The Act includes a proviso that not less than two-fifths of the amount paid into the Trust Account shall be expended on "rural" roads, which do not include "highways" and "main" roads. Out of this quota an amount equivalent to £1,000,000 apportioned each year among the States on the area-population basis may be expended on other works connected with transport by road or water, and in respect of the State of Victoria the amount which may be so expended is approximately £175,700 each year.

The total sum received by the Board under the provisions of the *Commonwealth Aid Roads Act* 1954–56 was £5,247,438 and this was expended as under:—

	£
Construction and maintenance of classified roads	2,935,665
Construction of unclassified roads including the restoration and rebuilding of bridges	1,728,296
Assistance in construction of soldier settlement roads	96,225
Contribution towards level crossings projects	186,723
Repair of flood damage on unclassified roads	20,267
Provision towards maintenance of unclassified roads	280,262
	5,247,438

The stipulation that 40 per cent. of Federal Aid money must not be spent on main roads or "highways" tends to deter the declaration of further roads as main roads even though they may be of considerable importance. In some areas the progressive bituminous surfacing on subsidiary roads which benefit from the stipulation appears to be somewhat unbalanced by comparison with the needs for similar work on main roads. With the changes in traffic since this type of stipulation was introduced the needs of the existing primary road system appear to merit greater emphasis for a period.

Loan Moneys.

The amount of £370,000 made available to the Board during 1956–57 from loan moneys for expenditure under the provisions of the Country Roads Acts was applied chiefly to the carrying out of works to which it was already committed from the previous year on main roads and bridges in the metropolitan area where half the expenditure is repaid by councils over a period of 35 years.

The Board's interest and sinking fund bill on loan moneys for the year 1956–57 is £806,849 and is becoming an increasingly heavy charge on the Board's funds. From the inception of the Board to the 30th June, 1957, a total amount of approximately £13,360,000 will have been paid in meeting such charges. In the light of the pressing road needs of to-day, payments of such magnitude make a severe impact on the Board's finances year after year and can be ill afforded at present or in the future. As detailed later a ten-year " target " survey of road needs for a moderate progressive programme in Victoria shows that in the new financial year alone a further amount of nine (9) million pounds will be required to provide for such a programme. If receipts from the various sources continue in each case merely on the current basis a larger deficiency will exist in future financial years particularly after allowing for steadily rising costs.

The chief sources of road finance are from road vehicle owners and operators (" service " and " pay-as-you-go " charges) and from local rate revenues (" access and betterment " contributions), little being contributed from general revenue notwithstanding the dependence of the community as a whole on the service given by road communications. Some overseas investigators in discussing the sharing of road benefits suggest a contribution by the general taxpayer of from 25 per cent. to 33⅓ per cent. as appropriate. In some fields of public enterprise a contribution is made by way of relief from loan charges on capital works. Thus it is interesting to note that the capital liability in respect of irrigation and rural water works districts in Victoria remains entirely borne by the State together with the relevant interest and sinking fund charges. Interest, exchange, and loan conversion expenses on head works and capital borne by the State in 1955–56 amounted to £2,961,509. If a similar relief of interest and sinking fund charges could be extended to the Board many municipalities would receive increased benefits and the State's road network would benefit as a whole. It is, therefore, most desirable that in future, interest and sinking fund charges should not be charged against the revenue of the Board but should be borne by Consolidated Revenue.

Allocations for Works.

The total allocation for road and bridge works from all funds in the financial year 1956–57 including revotes and amounts already committed in respect of works authorized was £13,115,891 as compared with £17,690,000 in 1955–56. The allocation of £13,115,891 comprised £7,930,854 from the Country Roads Board Fund, £4,815,037 from the Commonwealth Aid Road moneys and £370,000 from loan moneys.

The amounts available for road works in the year 1956–57 exceeded the total amount of expenditure reimbursed in the previous financial year. A greater proportion of revotes and commitments was involved as well as reimbursement of large expenditure as previously mentioned. Consequently a marked reduction had to be made in the grants for fresh works. Notwithstanding this reduction there was still in general a considerable volume of works in hand at 30th June, 1957, represented by commitments of the order of £3,115,207.

In spite of the smaller allocation expenditure reimbursed proved to be somewhat less than was allowed for when the allocation was made.

MAIN ROADS.

Allocation of Funds.

The total amounts applied for both by 196 municipal councils for works under municipal supervision and by the Board's Engineers for works under the direct supervision of the Board for the maintenance and improvement of the 9,789 miles of main roads in the State was £11,543,040. Allocations were made totalling £5,194,748 representing 45 per cent. of the total applications.

As in previous years, the Board in making its allocation provided firstly the amount essential for patrol and general maintenance, bridge maintenance, resheeting, and resealing, this provision leaving a balance far short of actual requirements for items in the nature of improvements such as extension of bituminous surfacing and reconstruction of failing sections of pavement and weak and narrow bridges.

The expenditure for the year on main roads was £3,897,718, equivalent to 79 per cent. of the allocation, compared with 57·7 per cent. in 1955–56, 66 per cent. in 1954–55, and 67 per cent. in 1953–54. Commitments outstanding at the 30th June, 1957, amounted to £975,116.

Apportionment of Costs.

It is provided in the Country Roads Act that not more than one-third of the amount expended from the Country Roads Board Fund on the maintenance of main roads during the preceding year shall be apportioned to the municipalities, whose contributions are due and payable on the 1st January in the financial year next following that in which the expenditure was incurred. The Act also provides that the municipal contribution may be reduced below one-third where the cost of maintenance of a road is deemed to be excessive, and where such cost is due to motor traffic not of local origin, or to timber traffic. In dealing with the apportionment of the cost of works, the Board must take into account the revenue, valuation, and rating of the municipality concerned.

With the great development in motor traffic generally and with increased timber traffic in certain parts of the State, municipal contributions have in many cases been reduced below one-third. This has operated for a number of years and has been of considerable assistance to the councils concerned. The Board has further assisted in reducing the contributions by providing portion of the grants from Commonwealth Aid Road moneys, free from additional contribution by the councils, these supplementary grants being made mainly in relation to larger items such as reconstruction and bridge projects.

The percentage of contributions by councils to the total expenditure for 1955–56 was 14·80 per cent. as compared with 15·61 per cent. in 1954–55. Details are as follows :—

	£
Expenditure from the Country Roads Board Fund	2,522,660
Expenditure from the Commonwealth Aid Roads moneys ..	971,580
	3,494,240
Amount apportioned to councils (based on expenditure from Country Roads Board Fund only)	£517,203
Percentage of amount apportioned to the total expenditure from the Country Roads Board Fund	20·50%
Percentage of apportionment to total expenditure (including Commonwealth Aid Roads grants)	14·80%

Had the whole of the expenditure been financed from the Country Roads Board Fund and apportioned strictly on a one-third basis, the councils would have been required to contribute one-third of £3,494,240, that is £1,164,747. By reason of the reduced contributions and the "free" grants from Commonwealth Funds, however, their contributions amounted to £517,203 only, a reduction of £647,544.

Major Works.

Particulars of typical major works carried out on main roads during the year are set out hereunder :—

Omeo Shire—Ramrod Flat Road.—Completion of Connor's Hill deviation of approximately 3·5 miles between Doctor's Flat and Ensay, providing satisfactory grade and alignment on this important connexion and effecting further improvement in the access to Omeo (Plate No. 1).

MAIN ROAD RECONSTRUCTION

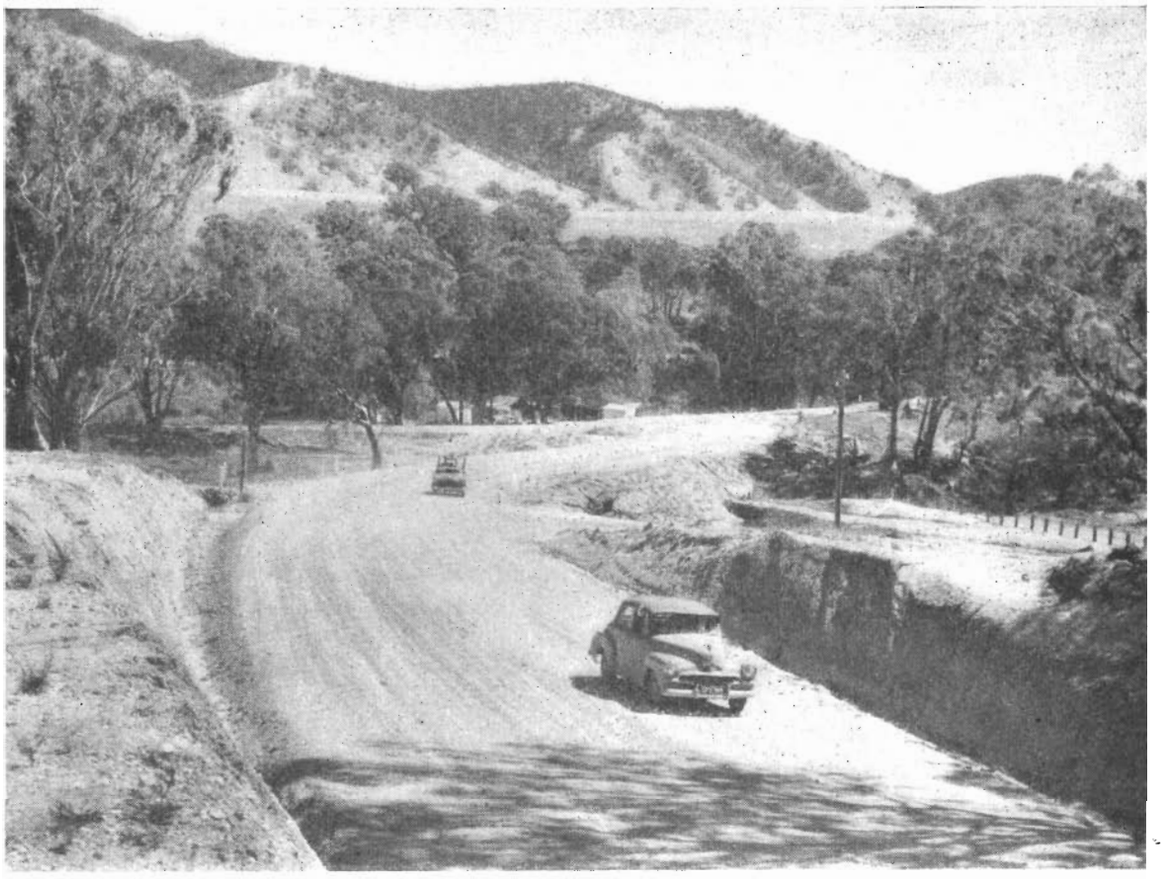

Plate No. 1 :—Omeo Shire—Ramrod Flat Main Road realignment and reconstruction near Doctor's Flat.

PRINCES HIGHWAY EAST

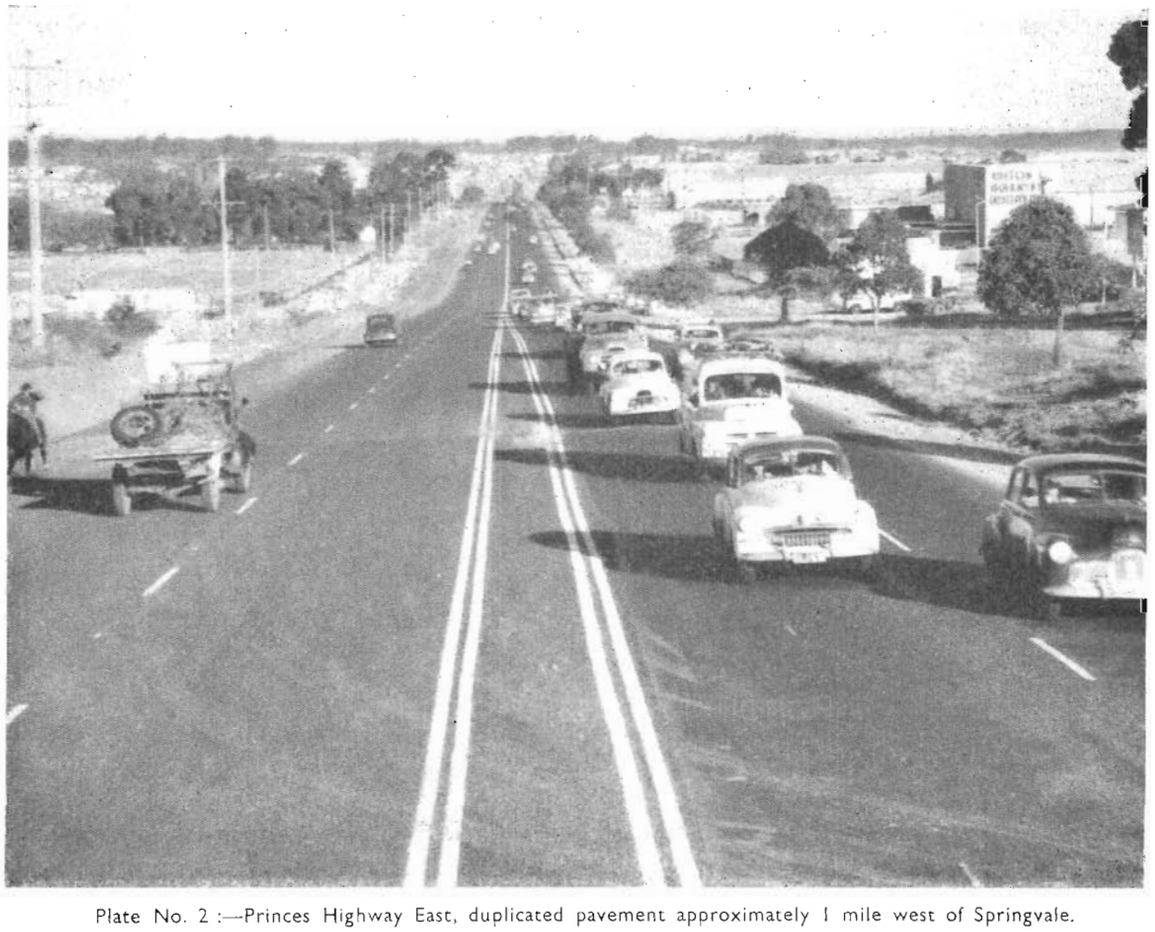

Plate No. 2 :—Princes Highway East, duplicated pavement approximately 1 mile west of Springvale.

Oxley Shire—Buffalo River Road.—Osborne's Bridge spanning the Buffalo River was reconstructed by contract following the collapse of timber trusses which had deteriorated after 30 years' service.

Lillydale Shire—Dorset Road.—The Victorian Railway Department commenced construction of a new overpass bridge on Dorset Road consequent on duplication of the railway. The new bridge will be on a straight alignment eliminating sharp curves at the approaches to the old bridge. Half width of the bridge has been completed together with a large part of the earth works and pavement of approaches, the latter work being carried out by the shire council.

Box Hill City—Burwood Road.—Duplication of roadway from Elgar Road to Greenwood Street, including continuation of earthworks, construction of culvert at Gardiner's Creek, and commencement of pavement and median islands.

Maffra Shire—Licola Road.—Three miles of resheeting and sealing near Licola and the construction of a 7 feet x 7 feet reinforced concrete culvert at Motherbud Creek.

Mortlake Shire—Geelong–Hamilton Road.—A new ten-span reinforced concrete bridge 240 feet long was constructed over the Hopkins River at Hexham replacing an old, weak-timber structure built some 80 years ago.

STATE HIGHWAYS.

Through limitations of finance the Board was again able to allocate only on a very restricted basis for the 3,849 miles of State Highways throughout the State and the available funds were used primarily for works in the nature of maintenance rather than improvements. On a limited number of sections throughout the State, road and bridge reconstruction and some duplications are being carried out.

The Board has long foreseen that the time would come when the provision of additional traffic lanes would be required on many of our principal highways, especially those leading into the metropolis and provincial cities and carrying increasing concentration of traffic. Unfortunately it has not been possible to proceed with the work as quickly as required to give adequate service. On some routes where sections with narrow reserve will certainly be too cramped for future requirements the Board commenced action more than twenty years ago to acquire additional width of reserve. The necessary land purchases and adjustments to fences have proceeded gradually year by year with a minimum of interference with the interests of property owners. The benefit of this forward planning is now becoming more and more apparent as the time obviously approaches when with increasing traffic, active construction of the additional pavements will have to be put in hand.

Practically the whole of the maintenance and improvement work on State highways is carried out under the direct supervision of the Board whose Divisional Engineers were asked to submit programmes of works of greatest urgency. They applied for a total sum of £7,741,564 and were allotted a sum of £3,805,454 equivalent to 49·2 per cent. of the total applications.

The more important works carried out during the year included the following :—

Princes Highway East.—Duplication between Oakleigh and Springvale Road was completed by contract (Plate No. 2), and the construction by direct labour of a channelized intersection at the intersection of Springvale-road and the Princes Highway East was commenced. The work includes creek realignment and new culverts, and provides for separated pavements for highway traffic, with a number of islands to facilitate turning movements and cross traffic.

Work continued on construction of a three-span reinforced-concrete bridge 69 feet long and 2,600 lineal feet of new approaches on the deviation at Young's Creek near Orbost.

Pyrenees Highway.—A new seven-span reinforced concrete bridge 231 feet long, replacing a weak, old-timber bridge over the Avoca River in Avoca, was completed by contract. 2·3 miles of worn gravel pavement were reconstructed and sealed near Amphitheatre.

GOULBURN VALLEY HIGHWAY

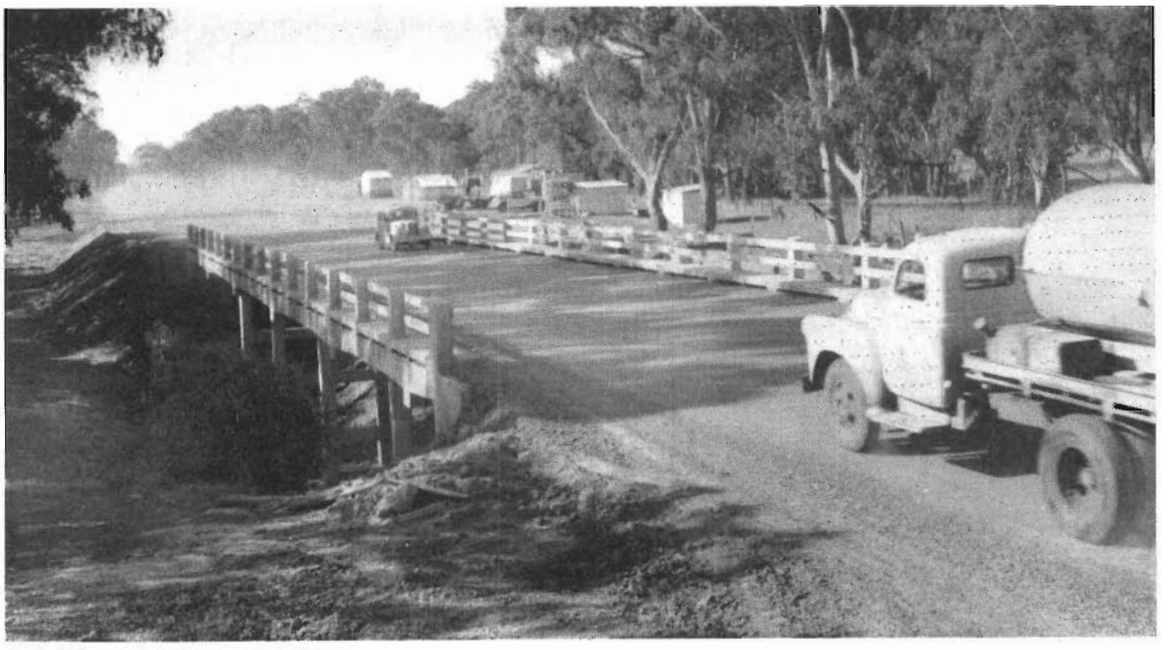

Plate No. 3 :—Goulburn Valley Highway—New bridge over Muddy Creek—between Wahring and Arcadia.

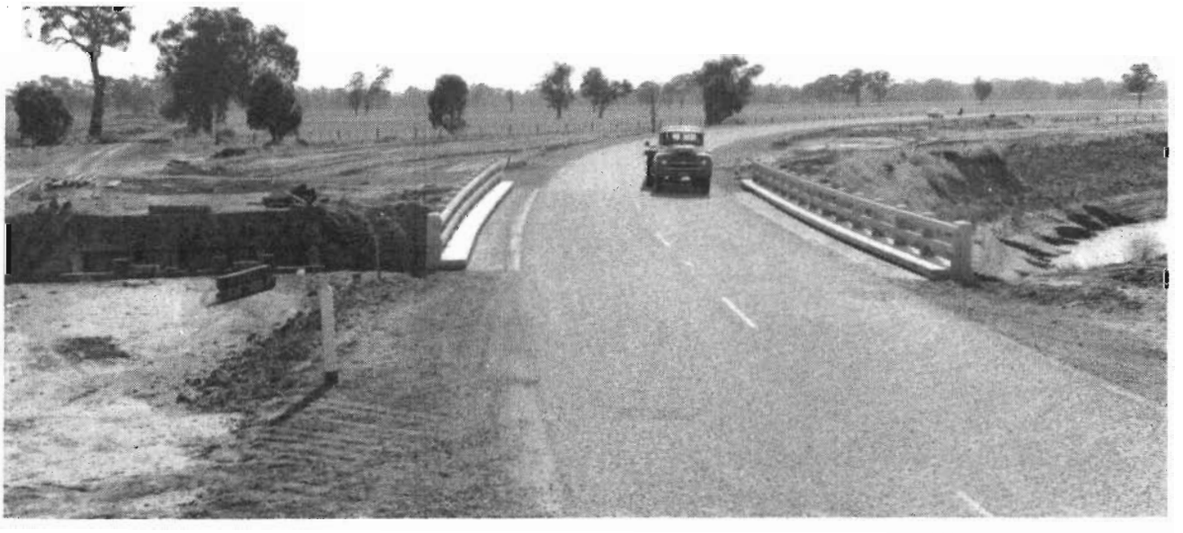

Plate No. 4 :—Goulburn Valley Highway—New bridge over irrigation channel at Wahring.

Plate No. 5 :—Goulburn Valley Highway—Reconstructed section north of Tallygaroopna.

PRINCES HIGHWAY WEST

Plate No. 6 :—Princes Highway West at Kororoit Creek—Duplication of pavement and new bridges on new alignment.

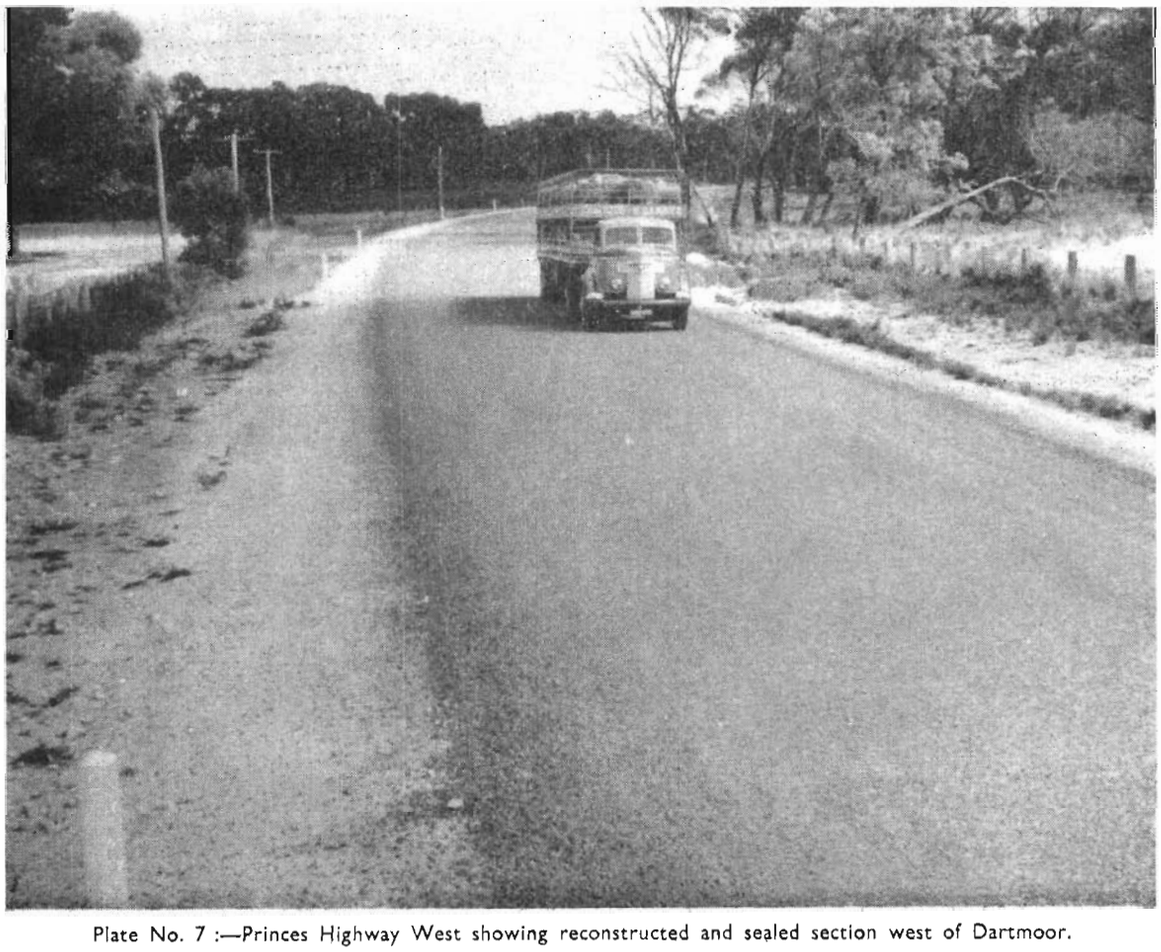

Plate No. 7 :—Princes Highway West showing reconstructed and sealed section west of Dartmoor.

Hume Highway.—Approximately 6 miles south of Wallan were widened from 20 feet to 24 feet. Old timber bridges at Violet Town and Barnawartha were replaced with concrete bridges. A section of 3·18 miles north of Locksley which had failed was reconstructed with a sealed pavement width of 24 feet and a formation width of 40 feet. On a similar section of 2 miles near Creighton's Creek the pavement top course was granitic sand, stabilized with cement. Another failing section for 4·79 miles north of Barnawartha was reconstructed to the same widths, whilst a section of 5·3 miles south of Wodonga was similarly widened.

Goulburn Valley Highway.—Reconstruction of 2·5 miles of highway including approaches to new concrete bridges at Wahring and Muddy Creek was carried out between Wahring and Arcadia (Plates Nos. 3 and 4). Four miles in sections near Tallygaroopna previously subjected to flooding were reconstructed (Plate No. 5).

Ovens Highway.—A reinforced-concrete bridge 166 feet long and 24 feet between kerbs over the Yellow Creek near Wangaratta was virtually completed, replacing a very old weak timber structure.

Calder Highway.—A deviation was constructed and sealed south-east of Mittyack together with reconstruction and sealing of adjoining sections of highway, the whole work totalling 6·4 miles. The sealing of this section completed a sealed highway from Melbourne to Mildura.

Murray Valley Highway.—Reconstruction, widening, and sealing included raising a length of 1·84 miles above flood level between Lake Tutchewop and the Fish Point Road near Lake Boga, a section which had been greatly damaged by prolonged flooding from the Avoca River. Similar reconstruction between Lake Boga and Swan Hill included widening and sealing of seven sections totalling $3\frac{3}{4}$ miles. Between Swan Hill and Nyah sections totalling $6\frac{1}{2}$ miles were widened and sealed.

Loddon Valley Highway.—Two sections near Hawkinston totalling 6 miles which had been much damaged by flood waters from the Loddon River were raised, widened and prepared for restoration of seal coat.

Ouyen Highway.—A new deviation $5\frac{1}{2}$ miles in length was built east of Walpeup, thereby eliminating two railway crossings.

Maroondah Highway.—At Blakeney's Cutting southerly from Yarck 1·3 miles of narrow and steep side cutting were realigned, regraded, widened, and sealed 20 feet wide.

Princes Highway West.—The important section from Melbourne to Geelong now carries more than 4,000 vehicles a day so that, to avoid serious congestion and to provide added safety, duplication, which has been commenced over lengths totalling only 3 miles, must be accelerated and brought to completion within a few years (Plate No. 6). During 1956–57 the duplication work at Brooklyn was completed except that the pavement depth may be increased by 4 inches at a later stage, the mountable kerbs against the central median being 4 inches higher on the exposed face than the final design. This "stage construction" pavement was given a very light seal with $\frac{3}{8}$-inch aggregate and kept under traffic for some months to make sure any surface defects were dealt with and made sound and then a thin hot mix wearing course was applied. This procedure was to some extent experimental in nature, the surfacing being laid as thin as it was possible to achieve without sacrificing appearance. The average rate equalled 1 ton to 45 square yards. Included in this project were the two new bridges over Kororoit Creek which were also finally completed during the year. (See Frontispiece.)

Plate No. 8 :—Calder Highway—Shamrock Bridge over Campaspe River west of Carlsruhe, using precast beams.

Plate No. 9 :—Midland Highway—Flood conditions—Near Corop.

A new reinforced-concrete bridge 69 feet long incorporating precast beams was constructed over the Pirron Yallock Creek at Pirron Yallock to replace a masonry and timber bridge at which undermining of the masonry abutments had occurred. Three sections of weak, narrow pavement totalling 2·50 miles were reconstructed on improved alignment west of Port Fairy (Plate No. 7). A section of 1·80 miles of rough, narrow pavement west of Dartmoor was reconstructed using soft limestone and sealed, and work was commenced on realigning two other sections totalling 2·40 miles in the same locality to eliminate several abrupt curves and raise the formation to avoid frequent minor flooding.

Western Highway.—Along the section of old pavement between Albion Railway Gates and Station Road, Deer Park, which had been widened and portions strengthened in 1955–56, the remaining widened section was strengthened by using a premixed bituminous macadam course, averaging 2 inches in consolidated thickness, followed by a minimum thickness layer of stone-filled sheet asphalt, to ensure water-proofing of the rather open textured macadam.

West of Myrniong 0·9 miles were reconstructed with a third lane provided for slow traffic on the steep grade. The highway was also regraded and reconstructed full width between kerbs for 1·34 miles in Beaufort Township.

Major reconstruction of weak and failed sections proceeded on a length of 7 miles west from Horsham and for 4 miles near Dadswells Bridge. Six (6) miles of widening and 1 mile of reconstruction were completed between Dimboola and Nhill.

Midland Highway.—Towards the close of the year a start was made on the regrading and realignment of Batesford Hill leading into Batesford Township from Geelong. This steep hill with sharp curves has been an unsatisfactory feature of this highway for years.

Considerable damage by floods had occurred along the route between Shepparton and Corop (Plate 9). A section of $\frac{3}{4}$ mile at Langdon's Swamp near Ardmona and two sections totalling $3\frac{3}{4}$ miles between Corop and Stanhope across the Wallanjoe Swamp were raised above flood level, widened and restored (Plate 10).

Replacing weak and narrow old timber bridges, two reinforced-concrete bridges (Nos. 2 and 3) between Shepparton and Mooroopna were completed. Bridge No. 2 (Plate No. 11) is 491 feet long with a 28-feet roadway, two 6-feet wide cycle tracks and one 6-feet wide footpath. No. 3 bridge, constructed to the same standard, is 381 feet long.

Bellarine Highway.—On this highway where a programme of widening the old 16-feet pavement has been in progress for several years widening of narrow sections between Newcombe and Marcus was completed. This work was carried out using a sandy limestone as paving material with an armour coat of fine crushed rock to improve the shear resistance of the surface. A start was also made on the section between Marcus and Point Lonsdale turnoff. When this length is completed a 24-feet sealed pavement will be provided from Geelong City boundary to the Queenscliff Railway Crossing at Newcombe and a 22-feet sealed pavement from Newcombe to the outskirts of Queenscliff.

Glenelg Highway.—Between Denhill's Creek and Wennicott Creek west of Coleraine over a length of 3·8 miles the old 12 feet wide rough pavement, which was on a tortuous alignment, has now been replaced with a 20-feet sealed carriageway designed to modern standards of grade and alignment.

MIDLAND HIGHWAY—SECTION 3.

Plate No. 10 :—Midland Highway section 3—Sealing near Mooroopna township.

Plate No. 11 :—Midland Highway—Completed No. 2 bridge west of Shepparton.

TOURISTS' ROADS.

Tourists' roads are those which are proclaimed to be tourists' roads under the *Country Roads (Tourists' Roads) Act* 1936, No. 4405. Municipal councils are not required to contribute towards the cost of work on this class of road.

For the 416 miles of proclaimed tourists' roads in this State a total sum of £786,212 was applied for and £334,263 was allocated.

Further widening was carried out on the Mt. Victory Road between the Silverband turn-off and Reid's Lookout. Half of the length of the Silverband Road and the Mt. Victory Road between Hall's Gap and the Silverband turn-off have been sealed. On the Grampians Road concrete bridges were constructed over Dairy Creek and Stony Creek near Hall's Gap. At the latter site the road has been deviated to avoid traversing the large camping ground. (Plate No. 12).

FOREST ROADS.

Forest Roads are those which are proclaimed to be forest roads under the *Country Roads (Forest Roads and Stock Route) Act* 1943 (No. 4953) and shall not be proclaimed " except in such areas in the State as are within or adjacent to any State Forest or as the Board considers to be timbered mountainous or undeveloped areas ".

No contribution is required from municipal councils towards the cost of work on forest roads.

Applications totalling £280,732 were received this financial year for the 377 miles of proclaimed forest roads and the sum of £144,310 was allocated.

UNCLASSIFIED ROADS.

The Board again made provision for works on unclassified roads under two general headings :—

1. The construction and reconstruction of roads serving settlements including roads to properties of isolated settlers.
2. The maintenance of unclassified roads generally.

For the first group applications amounting to £9,504,145 were received by the Board and £2,656,658 was allotted. For general maintenance £1,386,754 was applied for and £431,688 allotted. In making grants for maintenance of these roads the Board does not accept responsibility for the entire maintenance of the road as on main roads but rather makes a contribution towards the cost of maintenance with a stipulation that the council contribute generally at least £1 towards each £2 provided by the Board. These grants have proved to be of great assistance to the councils over the years and although in some cases the amounts allotted are comparatively small they encourage the adoption by councils of better standards of maintenance than they could otherwise provide.

Numerous requests were made during the year by councils for the declaration of certain unclassified roads as main roads but the Board was unable to carry the additional financial burden which such action would have involved. The Board has endeavoured, however, to assist the councils with the maintenance of the roads as far as funds would permit. The total expenditure on unclassified roads during the financial year amounted to £1,942,160 for construction and reconstruction work and £412,227 for maintenance.

BRIDGES.

The total volume of work carried out on the construction and maintenance of bridges has shown an improvement over previous years. The supply of basic materials has increased, although at higher prices, and several new contractors have entered the field of bridge construction. In some instances, contractors have been lacking in experience and equipment and these shortages have been overcome by drawing on the Board's resources. There has been keen competition for bridge works advertised by tender, and contract prices have been relatively stable. In those cases when satisfactory tenders could not be obtained, and on work involving difficult widening or foundation problems, construction has been carried out by direct labour.

BRIDGE CONSTRUCTION

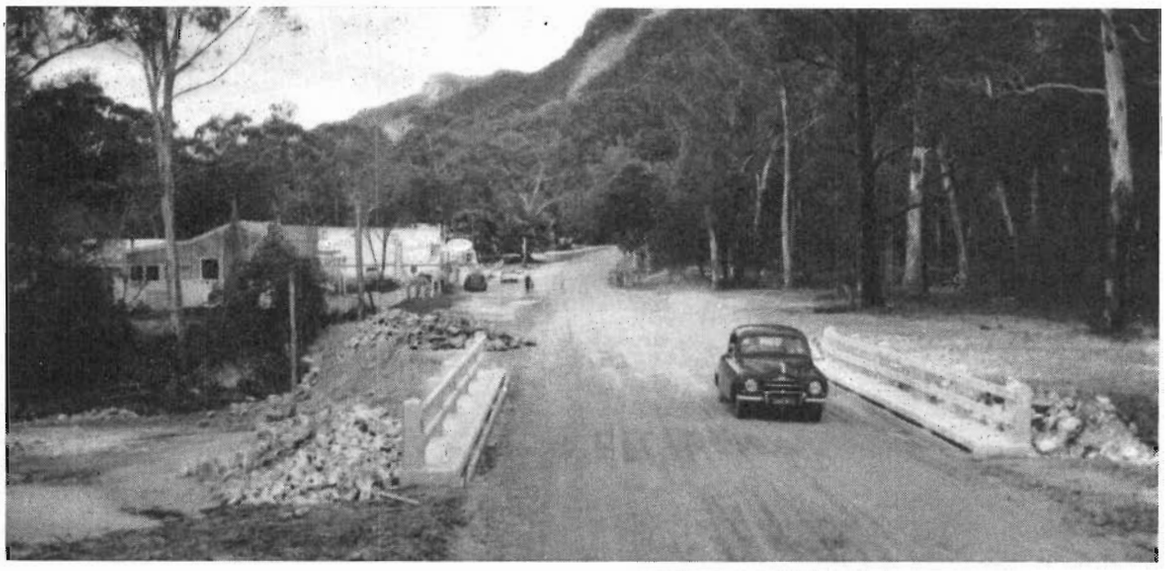

Plate No. 12 :—New bridge over Stony Creek and realignment and reconstruction of Grampians Road at Hall's Gap.

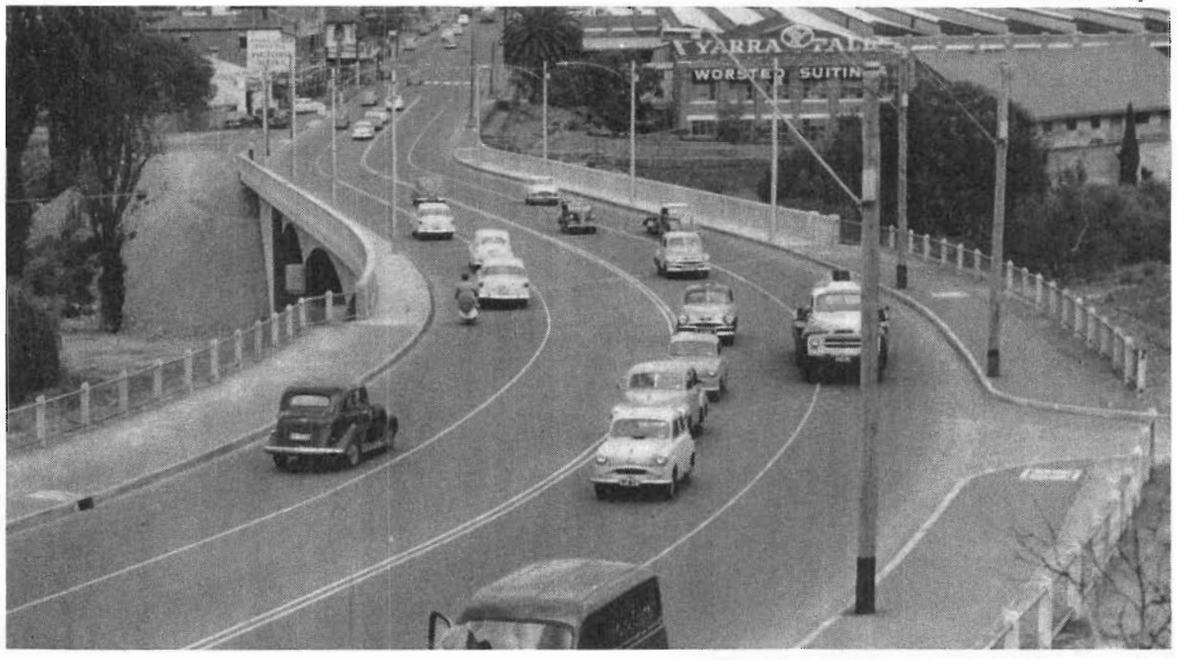

Plate No. 13 :—Cities of Collingwood and Kew bridge over Yarra River at Johnston Street.

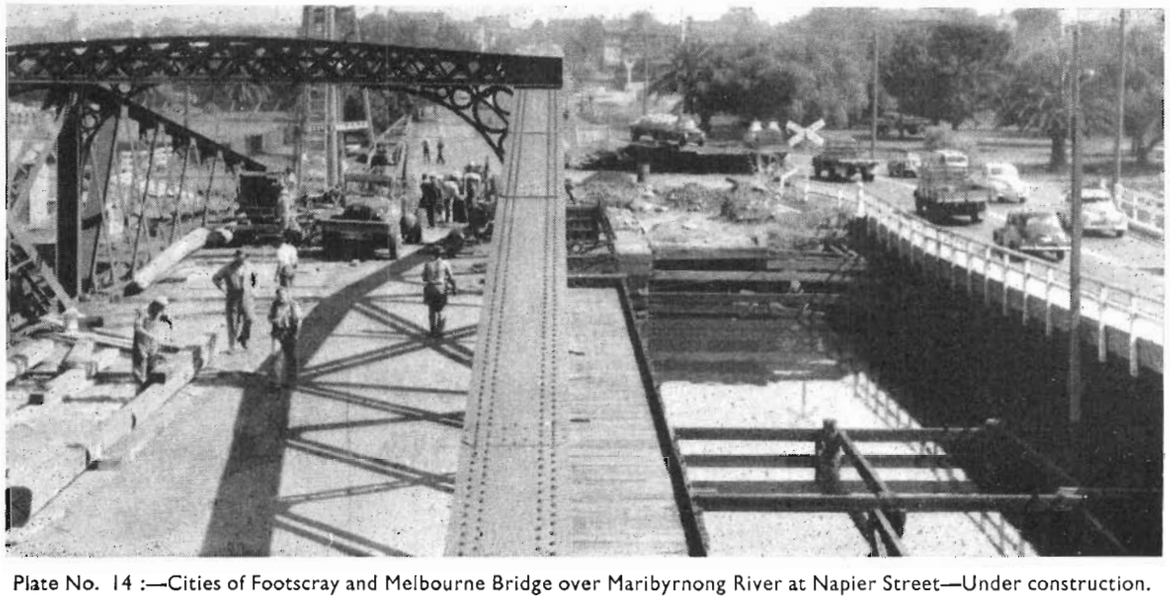

Plate No. 14 :—Cities of Footscray and Melbourne Bridge over Maribyrnong River at Napier Street—Under construction.

The improvement in resources for construction of bridges has accentuated the serious shortage of qualified engineering staff engaged on bridge design. In the past three years, during which period the programme of bridge work has been expanding, a total of 30 qualified engineers have resigned from the Board's bridge division necessitating new appointments. Among the resignations have been those of experienced engineers whose loss has been keenly felt. The salaries which the Board is permitted to offer to young engineers at the outset and throughout their careers do not attract capable young men to such vital work for the community in anything like due proportions.

Considerable flood damage occurred to bridges throughout the years, particularly in the north-eastern part of the State, and this has resulted in increased expense to the Board. The Board was again compelled to fix load limits on a number of structures in order to permit of their use by the general public on a restricted loading basis.

During the year, construction was commenced on 193 bridges, of a total value of £1,721,130. This brings the total number of bridges either erected or in the course of erection with funds provided by the Board since its inception to 4,710. Of the new bridges, 152 of a total value of £610,430 were under municipal supervision and the remaining 41 of a total value of £1,110,700 were under the direct supervision of the Board.

Metropolitan Bridges.

Cities of Melbourne and South Melbourne.—Bridge over Yarra River at King Street.

Under instructions from the Government, the Board invited tenders on a world-wide basis for the design and construction of a bridge over the Yarra River at King Street. The portion over the Yarra River is 420 feet long and 147 feet wide, including two 12-feet footways. The central roadway continues into Hanna Street, South Melbourne, by an elevated structure, a total length of 2,290 feet and approximately 57 feet wide. There is also an overpass in Flinders Street 600 feet long and 62 feet wide. Seven tenderers submitted a total of fourteen tenders for the work, and after examination by the Board's officers, the Government accepted the tender of Utah Australia Limited.

Construction is scheduled to commence early in 1958, and to be completed in September, 1960.

Cities of Brunswick and Essendon.—Bridge over Moonee Ponds Creek in Dean Street.

Good progress was made on this structure during the year and the bridge was opened to traffic during 1957.

Cities of Collingwood and Kew.—Bridge over Yarra River at Johnston Street.

This bridge was completed and was fully opened to traffic during 1957. Only minor cleaning up and restoration of surroundings remained at the end of the period of this report. (Plate No. 13).

Cities of Footscray and Melbourne.—Bridge over Maribyrnong River at Napier Street.

No satisfactory tenders having been received for this bridge, construction of the substructure was commenced by direct labour, under the supervision of the Board. (Plate No. 14).

Cities of Camberwell and Malvern, Shire of Mulgrave.—Bridge over Gardiner's Creek in Warrigal Road.

During the year, work was commenced on the widening of this structure by direct labour under the direct supervision of the Board. Satisfactory progress has been made to date.

Country Bridges.

Important bridges in country areas which were either commenced or in progress during the financial year were as follows :—

Bridge over Mitchell River on Princes Highway East at Bairnsdale, 564 feet in length, was continued by direct labour under Board's supervision. Bridge over Merri River on the Bushfield–Mailer's Flat Road at Woodford washed away by floods of 1946 (since when a temporary bridge has been in use) is now being replaced under contract by a four span reinforced concrete and steel superstructure 160 feet long. A weak, old, timber bridge over Campaspe River on the Calder Highway near Kyneton (Shamrock Bridge) is being replaced by a reinforced concrete structure 217 feet long. (Plate No. 8.) The widening of the first of five very narrow bridges over River Murray billabongs on the Hume Highway between Wodonga and Albury have been commenced by contract.

FLOOD DAMAGE.

In the Board's Forty-Third Annual Report reference was made to extensive damage to roads and bridges in various parts of the State during the period covered by that report.

Following immediately upon these conditions, further heavy rains throughout Eastern and South-eastern Australia culminated in one of the most disastrous floods ever known in the River Murray. Flood waters of similarly unusual volume in the tributaries of the principal stream were unable to get away and consequently banked back for many miles, inundating the surrounding country and making many roads impassable for considerable periods, severely damaging the road surfaces and foundations and scouring around bridge abutments. (Plates Nos. 15, 16, 17.)

In July, a rapid survey by the Board's Divisional Engineers produced a preliminary estimate of damage of the order of £1 million, but as large areas were still submerged at this stage, it was anticipated that the cost of repairs would be well in excess of this figure. This estimate increased to £1,575,000 when a more accurate physical survey could be made of the damage to roads and bridges both under municipal jurisdiction and also under the direct control of the Board.

Following an analysis of applications for assistance, it was realized that the major portion of damage was suffered in those areas bordering the River Murray and its tributaries and to a lesser extent in the areas bordering the Wimmera River, but in the remainder of the State, damage was not so extensive or severe. Representations were made to the State Government for the provision of funds to restore the whole of the damage. In turn the State Government presented a case to the Commonwealth Government, which, recognizing the national importance of the position in the River Murray areas, agreed to assist financially. From the conference with the Commonwealth Treasurer, there was formulated the Commonwealth–State Flood Relief Agreement under which an amount of £726,000 was provided on a £1 for £1 basis between the Commonwealth and State Governments for the restoration of roads and bridges in the Murray Basin, but this was not to be applied to the Wimmera or areas south of the Great Dividing Range.

A total sum of £550,450 was allocated for restoration work on declared and unclassified roads and bridges under the jurisdiction of the respective councils eligible for assistance under the agreement. In order to implement this amount a further contribution of £109,890 was to be contributed by these councils on a basis of £1 for every £5 of Government money provided. From the balance thus remaining, further allocations were made to restore arterial highways throughout the areas benefiting by the agreement, after deduction of an amount of £8,000, which was to be applied where necessary, by the Soil Conservation Authority, to erosion control works in the vicinity of various roads.

The work of restoration having been put in hand as soon as conditions permitted is progressing satisfactorily and at the end of the financial year under review, a total amount of £236,640 had been reimbursed by the Board.

The Murray Valley Highway was seriously affected by flooding from the Avoca and Murray Rivers. The Avoca River normally ends in a series of lakes and marshes north-west of Kerang, but early in June floods caused the lakes towards the River Murray to overflow. The two high floods of May and July increased this flow to the north, raising the level of the water and eventually the Murray Valley Highway was flooded early in August and closed to all traffic just south of Lake Boga on the 17th August, 1956. A detour through Tresco was in use until early in January, 1957. The section of highway flooded south of Lake Boga was completely destroyed, but rebuilding commenced as soon as the flood waters receded. The Wandella Creek which flows out of the Loddon River flooded the highway north-west of Kerang near Reedy Lake, but traffic was able to proceed with assistance of patrolmen over the several months' duration of the flood. (Plate No. 16).

Between Piangil and Hayesdale the flood reached record height, but the highway was kept open to traffic by the construction of approximately 6 miles of levee bank along its northern side. Much damage was sustained on this section from traffic proceeding under very wet conditions. Between Hayesdale and Boundary Bend several sections of this highway were flooded and this length was closed from the end of July until late in December, traffic being forced to use a long detour through Kooloonong.

Flooding of this highway south of Nathalia caused extensive damage over a length of 3·5 miles. (Plate No. 17.)

Considerable damage was also caused to unclassified roads and to main roads, the roads affected being too numerous to list separately. (Plates Nos. 18 and 19.)

FLOOD DAMAGE

Plate No. 15 :—Murray Valley Highway—Flooded section approximately 2 miles east of Lake Boga showing failed pavement.

Plate No. 16 :—Murray Valley Highway—Flooding at Wandella Creek.

FLOOD DAMAGE

Plate No. 17 :—Murray Valley Highway—Badly damaged, sealed section, after flooding by Goulburn River—Approximately 3 miles south of Nathalia.

Plate No. 18 :—Gordon Shire—Mincha Road half mile north from Pyramid Hill—showing flooding.

Plate No. 19 :—Kerang Shire—Koroop Road, showing school bus on boggy section.

ELIMINATION OF RAILWAY LEVEL CROSSINGS.

Work was continued on the construction of the deviation of the Hume Highway approximately 4 miles long through Glenrowan Township to eliminate two level crossings on this important route, but because of a very wet winter, work was suspended for several months.

A start has been made on the construction of 4 miles of unformed roadway on the Stawell–Warracknabeal Road near Sheep Hills, which will bypass two level crossings on the Murtoa–Hopetoun line. The whole length has been cleared, grubbed, formed and drained in preparation for stabilizing and sealing during 1957–58.

Satisfactory progress was made by the Contractor, Lewis Construction Company Proprietary Limited in the construction of the road overpass at Clifton Hill. The southern portion was open to traffic in April, 1957, and the south ramp leading to Hoddle Street was open several weeks later.

Work was continued by the Railway Department on the four-lane overpass where the Dandenong–Frankston Road crosses the Main Gippsland railway. For this structure the Board supplied the Department with precast units consisting of reinforced-concrete beams, median strip slabs, and footing slabs, and, in addition, arranged for the supply of pre-stressed concrete slabs under contract. Construction of approaches was commenced by Dandenong Shire Council by direct labour.

WORKS FOR OTHER AUTHORITIES.

As in previous years, the Board's organization and equipment were fully availed of during 1956–57 by other State and Commonwealth Authorities for carrying out certain special projects at their cost.

The total expenditure involved was £658,360 as shown on the statement hereunder, and includes :—

Ballarat Division.—Portion of the 53° runway at the R.A.A.F. School of Radio, Ballarat, was reconstructed and sealed and portion resealed.

Benalla Division.—Because of the construction of the new Eildon Weir, reconstruction of the Mansfield–Wood's Point Road has been necessary and work is well advanced on the section where it follows the old Howqua River Road for 2 miles. Approximately 4 miles of the new Eildon–Jamieson Road was constructed from the Jamieson end in the direction of Cummins Gap.

Plate No. 20 :—Rosedale–Stradbroke Road, which was constructed and sealed for the cartage of limestone.

Works rendered necessary because of the raising of the Hume Weir, and either completed or commenced, comprised on the Murray Valley Highway 0·79 miles of a deviation near Ebden, 2·25 miles of a deviation east of Tallangatta (old Town), 1·13 miles at Tatonga, the raising of the highway embankment over a length of 1·08 miles near Sandy Creek, and 0·50 miles at First Bay Creek, and a relocated road embankment and new reinforced-concrete and steel girder bridge at Koetong Creek, besides deviations near mileages 52·85, 53·5, 54·09—54·65 and 62. On the Murray Valley main road similar works were undertaken at mileages 2·81–3·84 and 5·95–6·45 and a new junction was constructed with the Murray Valley Highway near Granya.

Dandenong Division.—Construction of the Eildon–Jamieson Road continued and a total of 5 miles was formed and lightly paved, but final paving is still to be carried out on these portions. About 3¾ miles of the Eildon–Ring Road and associated roads were resheeted and sealed.

Geelong Division.—The necessary preliminary road work and paved areas were carried out for the Western Suburbs Crematorium between Kororoit Creek and Laverton and a service road between Salvia Street and North Shore Road was constructed for the Corio Shire Council.

Traralgon Division.—The construction of sealed roads, concrete kerbs, channels, and footpaths at the Morwell Housing Estate was extended, and 2 miles of reconstruction and deviation to provide an 18 feet sealed pavement for cartage of brown coal to the Australian Paper Manufacturers Limited at Maryvale was carried out on the Tanjil East Road. On the Rosedale–Stradbroke Road 10·5 miles of construction and sealing of 14 feet pavement for cartage of limestone to Gippsland Cement and Lime Company, Traralgon, was undertaken. (Plate No. 20).

WORKS EXECUTED ON BEHALF OF COMMONWEALTH AND STATE AUTHORITIES FOR YEAR ENDED 30TH JUNE, 1957.

Department or Authority.	Description of Works.	Expenditure Chargeable to Authority.
		£ s. d.
Department of Public Works	Roadworks and Bridgeworks; Stawell Shire, Sundial and Wunderlands Roads, Chandler Highway	3,520 17 10
Forests Commission	Roadworks; Maffra and Otway Shires ..	355 17 11
Gas and Fuel Corporation	Roadworks; Morwell	566 1 3
Geelong Waterworks and Sewerage Trust	Bridgeworks; Bostock Dam Project ..	5,621 17 11
Housing Commission	Roadworks and Bridgeworks; Ballarat, Moe, Morwell, and Norlane Housing Estates, Broadmeadows Barry's Road Overpass	36,004 15 0
Lands and Survey Department	Roadworks; Glenelg Shire	11,212 14 2
Latrobe Valley Development Advisory Committee	Roadworks; Morwell and Narracan ..	11,544 7 5
Melbourne and Metropolitan Board of Works	Roadworks; Healesville and Upper Yarra Shires	438 13 8
Mount Royal	Bridgeworks; Culvert at Mt. Royal Home	85 8 6
Premier's Department	Roadworks; Rosedale	8,646 18 0
Soldier Settlement Commission	Roadworks; Estates throughout Victoria..	98,609 1 1
State Electricity Commission	Roadworks and Bridgeworks; Kiewa Valley, Morwell, Princes Highway East and West	12,432 12 10
State Rivers and Water Supply Commission	Roadworks and Bridgeworks; Eildon Project, Hume Weir, Cairn Curran Reservoir, Princes Highway East and West, Glenmaggie Weir. Murray Valley Highway Section 3. Goulburn Valley and Midland Highway. (Culverts)	455,959 0 7
Victorian Inland Meat Authority ..	Roadworks; Ballarat	4 0 0
Victorian Railways	Roadworks; Moe, Mt. Buffalo	1,180 2 1
		646,182 8 3
Commonwealth Department of Works ..	Construction and Sealing Works; Essendon and Ballarat Aerodromes. Mt. Alexander Telerepeater Station, Wilson's Promontory	12,177 13 7
		658,360 1 10

SOLDIER SETTLEMENT ESTATE ROADS.

Work continued during year 1956–57 in connexion with the construction of roads to serve estates purchased by the Soldier Settlement Commission. Since the inception of the Commission in 1946–47, the Board has been responsible in conjunction with municipal councils, for the investigation of the roading proposals for the various estates and has exercised general supervision, through its Divisional Engineers, over the works undertaken by the councils.

Prior to 1953 the basis of contribution by the Commission, the councils and the Board was determined on the recommendation of the Board itself. With the approval of the Government of the day, however, a uniform basis of contribution was adopted during 1953, viz., four parts Commission, three parts Board, and one part councils, and the bulk of the expenditure is now apportioned on that basis. The total expenditure during the year 1956–57 on road and bridge works to service soldier settlement estates was £223,111, of which £98,609 was paid by the Commission, £96,225 by the Board, and £28,277 by the councils. The total expenditure on all roads and bridge works associated with soldier settlement estates since the inception of the scheme is £1,223,529, of which £724,673 was contributed by the Commission, £350,560 by the Board, and £148,296 by the councils.

Typical of the work carried out during the year was the roading of Yulong Estate in Kowree Shire, where 7 miles of roads and one bridge were constructed, the roads being located on new alignments through undulating country near the Glenelg River, together with 4 miles on Pine Hills Estate in the same Shire. Surfacing of roads in the Horsham Irrigation Settlement Estate at Drung Drung in Wimmera Shire has been completed. Twenty-eight dairy farms will be served by these roads.

To provide access to a large area of Crown land being opened up for settlement in virgin bush in the Heytesbury area east of Timboon, the Board undertook the design and construction of 11·36 miles of new roads, including a five-span precast " U " beam type bridge 100 feet long over Corriemungle Creek. Portion of the work was let by contract and the remaining 4½ miles by direct labour. (Plate Nos. 21 and 22.)

MUNICIPALITIES FOREST ROADS IMPROVEMENT FUND.

This fund was established by the Government in 1955 with a contribution of £50,000 and was to be used for the improvement and protection of roads adjacent to State forest areas to facilitate the extraction of forest produce.

The fund has been fully allocated and as there are numerous applications for assistance still outstanding, representations have been made for an additional contribution from the Government.

The expenditure to the end of 1956–57 was £21,259.

DECENTRALIZATION.

The workshop at the Ballarat Divisional Depot was lengthened by 50 lineal feet to provide a greater floor space for repair and overhaul of a variety of plant units. A small building was erected for vehicle maintenance, housing a compressor, a hydraulic hoist, and cleansing equipment.

A toilet block and lunch room building were erected for the use of the Benalla Divisional Depot personnel.

The new Divisional Office building in Firebrace Street, Horsham, was nearly completed as were the new patrol centres at Nhill and St. Arnaud and the precasting yard in Horsham Division.

ROADMAKING MATERIALS.

The Board's crushing and screening plant at Bald Hills, 7 miles north of Ballarat operated throughout the year in providing quartz aggregate for bituminous surfacing. Additional elevator, trommel screen and bins were installed to increase the output of the plant by screening out the material which is already suitable and does not need crushing.

Plate No. 21 :—Heytesbury Soldier Settlement—Scott's Creek, area formation of road.

Plate No. 22 :—Heytesbury Soldier Settlement—Scott's Creek area new bridge over Cooriemungle Creek, western section.

To overcome the shortage of aggregate in the Horsham Division a new crushing and screening plant was installed at Rutter's Quarry, situated on the Pomonal Road about 4 miles from Stawell. (Plate No. 23.) The new plant was supplied under the contract by Jaques Brothers, and erected by the Board. Thirty-six thousand cubic yards of 4 inch to 6 inch spalls had been previously prepared and stock piled at the quarry and although a contract was let for the secondary crushing the contractor abandoned his contract after producing 1,500 cubic yards of screenings. The output from the new plant over a period of five months was 200 cubic yards per day and a total quantity of 28,000 cubic yards of aggregate was obtained from the 36,000 cubic yards of spalls.

The method of handling sandstone in this Division by quarrying and transporting direct to the roadbed for use without crushing other than by rolling, which has been in operation for some time, was continued, a typical section reconstructed being a length of 3·6 miles of the Western Highway near Dahlen. Similar materials and procedures have been used successfully in the Shires of Wimmera, Dunmunkle, and Lowan.

In certain locations, notably in the Heidelberg, Greensborough, and Eltham areas, certain deposits of " basaltic gravel ", which is basalt occurring in a considerably weathered state, have been used for road-making purposes. In some cases plastic failures have occurred in the roads where this material has been used and considerable investigation by the Board's Materials Research Division has shown that these materials would require such careful selection in quarrying and such close control of the output as to render them uneconomical for use in roads and streets carrying commercial and bus traffic. They may, however, be of use for a foundation course in minor traffic facilities such as purely residential streets. The Chief Engineer's report contains reference to the tests employed on this material and the use to which it is put.

TEN-YEAR TARGET.

In order to estimate just how much should be applied throughout Victoria in a reasonable road effort the Board has instituted two State-wide research surveys of road deficiencies and needs.

The results of the first survey in 1949 showed that in terms of 1949 values £100,000,000 should be spent in ten years on the arterial and rural road network. At that time the actual expenditure on these roads was only £7 million per annum, of which the bulk was merely for maintenance. By 1955 three factors had combined to render the 1949 survey obsolete, namely the increase in traffic in many localities was much greater than allowed for in 1949, the community had become somewhat more " road conscious " and with the depreciation of many values the 1949 estimates had become misleading.

Plate No. 23 :—New plant and screens—Stawell Quarry—Vibrating feeder, elevators, and secondary crushers.

A second survey has therefore been carried out during the year under review. As on the previous occasion the Board's engineers have collaborated with local government engineers throughout the State in estimating reasonable requirements for the arterial and rural roads over the limited period. More than 200 engineers have thus contributed to the work. In order to assess the needs for Victoria as a whole, allowance has been made for road requirements in urban areas throughout the State and in Government housing estates, State forests, and other areas controlled by various public instrumentalities.

The total estimated requirements for the ten-year period are £380,000,000, so that the average yearly road expenditure should be of the order of £38,000,000. A forecast of finance available allowing for increases in revenue in accordance with established and announced scales indicates a shortage of the order of £9,000,000 per annum. Waste arising from road deficiencies probably costs the community far more than this amount every year.

PATROL ORGANIZATION.

The Board's earliest annual reports refer to the necessity for constant and regular attention to maintenance of roads and bridges and to the advantages of patrol systems. The ever increasing volume of traffic to-day calls for even more intense maintenance on both our main and unclassified road systems than was necessary 40 years ago. The responsibility for organizing such work on these roads usually rests with municipal councils. Except perhaps for very lightly trafficked sections of the road network, the most successful method of satisfactorily maintaining these roads is by constant attention from a regular patrol gang. With extension of bituminous surfacing, a development in itself productive of economies in every way, the necessity for regular maintenance does not disappear as is sometimes imagined, but rather the reverse. Intermittent attention from a central gang is usually less satisfactory. In a shire of medium area and resources, a three-man gang can satisfactorily maintain 50 or 60 miles of bituminous pavement with occasional assistance from a power grader. The plant required consists of:—

	Estimated Cost £
1 4–5 cubic yard tip truck	1,900
1 drawn grader 7-feet blade (with windrow attachment) ..	485
1 half bag concrete mixer (for premix)	250
1 135 gallon heater with lance type sprayer attachment ..	700

The drawn grader may be dispensed with if a power grader is available for regular shoulder maintenance in conjunction with other work.

The cost per year to finance such a regular patrol gang is approximately £4,000 excluding materials, which cost between £500 and £1,000 per annum. The method is especially advantageous where the patrol depots can be located at convenient local centres disposed throughout the municipal district.

Employment of men continually on this type of work on the same section enables them to observe any irregularities in the condition of the pavement or bridges on their sections. Trees can receive regular attention and care. The maintenance of direction boards and warning signs is also likely to be much better where a regular patrol operates.

CONSTRUCTION.

Since the 1939–45 war, there has been a scarcity of contractors who will tender for complete construction jobs. Even where quite light earthworks are involved, contractors have not been well equipped for forming, reforming or shouldering. To ensure that works are put in hand promptly, most municipalities have equipped themselves to carry out the earthworks by direct labour. Tenders are, however, invited for the supply and delivery of the surfacing material.

There is usually a sufficient number of contractors available to obtain competitive tendering. Methods of winning and loading surfacing material have improved during the past few years. Outputs of 200 cubic yards up to 1,000 cubic yards per day are quite common. This increase in the production of surfacing material means that improved methods of speeding up construction work on the road are essential. The bulk of the work on the road is carried out with a power grader which of necessity must be of the heavier type to cope with the quantities of surfacing material available. The use of heavy power graders is much more economical than the employment of light types.

BOARD'S INSPECTIONS.

During the year the Board inspected roads and bridges in 30 municipalities in all parts of the State. Those visited were Euroa, Berwick, Wycheproof, Warragul, Buln Buln, Strathfieldsaye, Werribee, Whittlesea, Rodney, Shepparton, Bet Bet, Marong, Narracan, Mirboo, Towong, Fern Tree Gully, Belfast, Kaniva, Lowan, Wangaratta, Huntly, Oxley, and Warrnambool Shires, the Boroughs of Kyabram, Port Fairy, Moe, and Wangaratta, and the Cities of Bendigo, Shepparton, and Warrnambool. Where possible, two or more neighbouring municipalities are visited consecutively, particularly where long distances are involved, in order to save travelling time. For the 30 inspections listed, nineteen journeys were made.

These inspections are of great assistance to the Board in assessing the potentialities and the road needs of the areas visited; they also provide municipal councils with an opportunity to discuss their problems and requirements on the ground. The Board values greatly the insight into local problems which its members gain from their visits and very much appreciates the hospitality which is extended to it by the members of the councils.

The divisional engineers invariably accompany the Board on these inspections and greatly assist in the elucidation of local problems. It is very gratifying to the Board to observe the extent to which members of councils, as well as their officers, value the practical assistance and special knowledge which divisional engineers are able to impart in the joint management of roads and bridges by the councils and the Board.

PHOTOGRAPHY.

During the year the Board's mobile film unit serviced Board's camps in locations remote from townships. A total of 121 screenings was given to audiences totalling 2,652, using films hired from commercial distributors supplemented by the Board's own productions. Screenings of Board's films were given to schools, clubs, and other organizations on 26 occasions, to audiences totalling 1,560.

Film productions during the year were "Gazette 11", "Johnston Street Bridge", and "Timber Bridge Inspection". For the period of the Olympic Games, the Board's still and cine photographers were seconded for official Olympic Games photographic duties.

ROYAL SHOW.

At the 1956 Show of the Royal Agricultural Society of Victoria the Board exhibited a model of a modern highway with restricted access. This combined with large scale photographs of development along the Princes Highway between Oakleigh and Dandenong and between Footscray and Geelong attracted much interest.

Officers of the Board in attendance during the period of the Show answered many questions which demonstrated public interest in problems of traffic engineering.

CONTROL OF HEAVY TRAFFIC.

The increase in the number of commercial goods vehicles particularly those on interstate cartage mentioned in the previous reports has been maintained and the incidence of offences has increased.

On the Hume Highway continuous checks were made during October, 1956, and March, 1957, each having a duration of 140 hours. (Plates Nos. 24 and 25.)

During the March check, overloading by an average of one in fourteen trucks led to prosecutions. Many of these offences were committed by drivers of interstate vehicles. As was the case in previous checks, the number of trucks operating on Saturday and Sunday was less than during week days at 17·7 per hour compared to 28·7 per hour but offences on Saturday and Sunday were at the rate of 1 to 5·6 trucks whereas the week-day figure was only 1 to every 9·6 trucks.

Plate No. 24 :—Hume Highway—Wallan weighbridge.

Plate No. 25 :—Heavy Transports—Ouyen-Piangil Road.

Due to successful appeals to the High Court on the basis of Section 92 of the Commonwealth Constitution, increasing numbers of trucks engaged in interstate transport are being registered out of Victoria, notwithstanding the fact that the owners are really domiciled in this State; an appreciable amount of revenue is thus being lost.

The total number of offences reported during the year was 5,518, a rise of 1,260 or 29·4 per cent. Of this number, 5,062 or 91·7 per cent. were successfully prosecuted. Fines imposed were £64,261 6s. 3d., an increase of 38·3 per cent. on last year. Of the successful convictions under the Motor Car Act, 666 or 14 per cent. were for speeding trucks, 3,999, or 70 per cent. for overloading in various manners, 784, or 16 per cent. for exceeding vehicle dimensions, and 14 for miscellaneous offences.

The practice of requiring the unloading of severely overloaded vehicles was intensified during the year with good results. Seldom does it occur that trucks which have been unloaded are again found offending to a similar extent. For "speeding" the drivers of thirteen trucks were convicted for the second time and the prior conviction being proved, their licences to drive were cancelled by the Court for periods ranging from one to six months.

The number of offences against the Country Roads Act detected during the year was 199, this being 54 per cent. of the previous year's figure, due mainly to a large reduction in reports of unattended stock on highways. Records of accidents show that for the twelve months period 1st April, 1956, to 31st March, 1957, ten accidents were attributed to the presence of cattle on the highways either as a prime cause or contributory factor. Two persons involved therein were injured, and none was killed.

The number of permits issued for the year was 5,481, an increase of 417, or 8 per cent. Of these 4,264 were for single trips, and 1,217 were of annual duration. Of the latter, approximately 50 per cent. were in respect of roads on which 6 tons gross load limits have been imposed. At the 30th June, 1957, 511 miles of State highways, 551 miles of main roads, 207 miles of tourists' roads, and 12 miles of forest roads were limited to 6 tons gross loads under the Motor Car Act, a total of 1,281 miles.

The co-operation of the Chief Commissioner of Police and the keeness and efficiency of the members of Mobile Traffic Section of the Victoria Police who have been seconded for duty with the Board are greatly appreciated.

LEGISLATION AFFECTING THE BOARD.

An important enactment designed to provide additional funds for road-making purposes was passed by Parliament in October, 1956, under the title of the *Motor Car (Fees) Act* 1956 (No. 6038). The Act authorized an increase of approximately 50 per cent. in the fees payable for the registration of motor cars, motor cycles, and trailers under the Motor Car Act as from 1st January, 1957.

Other Acts passed during 1956–57 which affected the Board include the *Public Works Loan Application Act* 1957 (No. 6066). This Act provides for the issue and application of loan money for Public Works and other purposes. Items included therein which affected the Board were Victoria's half-share of the Commonwealth–State Flood Restoration Funds for the restoration of damage caused by the 1956 floods and an amount of £40,000 for expenditure on unclassified roads in respect of flood damage incurred from June, 1955, to March, 1956.

The *Country Roads (Amendment) Act* 1957 (No. 6079) makes the following provisions:—

(*a*) The third Member of the Board may be appointed as Deputy Chairman when an Acting Member is appointed in the absence of the Chairman, and the Deputy Chairman is acting as Chairman;

(*b*) The Board may make partial payments to municipalities and contractors direct instead of through the Treasurer of Victoria;

(*c*) Salaries and expenses of Board members and staff shall be paid from the Country Roads Board Fund.

12035/57.—3

BUTIMINOUS SURFACING.

Early in the Board's operations, the advantages in economy and safety arising from provision of bituminous surfacing were realised, the first self-propelled sprayer being purchased in 1916. By the end of 1939, 5,728 miles of the Board's declared roads had been surface treated with bitumen, and some councils were initiating programmes of sealing on the more important subsidiary roads under their own direction and supervision. The Board's fleet of mobile sprayers then included twelve carefully-designed, self-propelled sprayers and other special plant for appropriate heating and fluxing of bituminous materials, for loading trucks with covering aggregate, and for uniformly spreading the aggregate from trucks, besides brooms, rollers, portable kitchens, and other special equipment. Much of the plant was developed and designed by the Board's civil and mechanical engineering staff to suit Australian conditions, which differ in some respects from overseas practice chiefly by reason of the necessity for combining economy with accuracy in applying such an expensive imported commodity as bitumen. Another feature of the designs was the great mobility given to the whole equipment of each gang, enabling very efficient and systematic use to be made of each highly specialized set of plant, in working to an exacting programme from day to day over the full duration of the summer.

It was the existence of this unique plant and the special knowledge acquired by the Board's engineers in this field that led in 1942 to the despatch of a large portion of the equipment and available personnel to the Northern Territory where a temporary division of the Board's staff was established to effect the bituminous surfacing of 624 miles of the Stuart Highway north from Alice Springs required for intensive military road convoys. In the post-war period, the civilian use of roads for transportation, at least on short hauls, developed quickly, especially in Victoria, a State remarkably closely settled throughout its rural districts and responsible for a high proportion of Australia's primary and secondary production. The demands for extension of bituminous surfacing increased by leaps and bounds throughout the State, necessitating vigorous expansion of the Board's mobile plant and organization. The situation was only to be met effectively and promptly in this way although use is made of privately-owned equipment within the limits of its capacity and suitability.

In the 1956–57 season, 1,712 miles of bituminous surfacing were carried out with 15,474 tons of bitumen, 1,301 miles being on the Board's declared roads. An analysis of the work is furnished in the Chief Engineer's report. Nineteen mobile gangs manned by approximately 600 men were engaged. The spraying plant was supplemented by mobile road tankers and storage tankers to transfer bitumen in bulk from the rail tankers owned by the bitumen supply contractors on to the hundreds of individual jobs which comprised the season's programme. The work done represents an increase on the Board's declared roads of 16·5 per cent. above that for 1955–56.

Throughout the State the Board's Engineers and Municipal Engineers are constantly alert to discover materials and adopt variations and procedures which may lead to economies or improvements in bituminous surfacing. Overseas contacts by members of the Engineering staff have been invaluable in following up similar efforts in other countries.

Field trials have been carried out during the year in relation to the use of agents to improve the adhesion of bitumen to stone, rubber as an additive to bitumen and the possibility of using Mallee sand as an aggregate for pre-mixed surfacing in areas where the use of stone would be very expensive.

Particulars are given in the Chief Engineer's section of this report.

CONFERENCE OF STATE ROAD AUTHORITIES OF AUSTRALIA.

The Nineteenth Conference was held at the office of the Department of Highways and Local Government, Adelaide, from the 24th to the 28th September, 1956. Representatives of each State Road Authority throughout the Commonwealth and the Director-General of the Commonwealth Department of Works attended, whilst officers of the Commonwealth Department of Shipping and Transport were present when items of special interest to that Department were being discussed.

The Conference was also attended by Mr. V. P. O'Grady of the Department of Main Roads, New South Wales, who has taken up duty as full-time Executive Engineer to the Conference.

Mr. P. A. Richmond, Commissioner of Highways, South Australia, who was appointed Chairman of the Conference, referred to the retirement of Mr. F. M. Corrigan, Deputy Chairman, Country Roads Board, and Mr. R. Jansen, Member, Country Roads Board. Their successors, Mr. C. G. Roberts and Mr. W. H. Neville, were welcomed to the Conference.

The 57 items on the agenda included the addition of further routes to the National System of numbered routes; bitumen supplies, training of road engineers for Australian conditions; specifications for various road construction materials and tests; and the issue of notes of current road research carried out and practices developed by the Conference.

The Conference also approved the issue of a brochure on its objects, functions, and accomplishments.

Arrangements were made for the next Conference of the State Road Authorities of Australia to be held in Melbourne in November, 1957, and for the various Committees of the Conference to meet as follows:—Principal Technical Committee, Brisbane, May, 1957; Bridge Design Committee, Sydney, November, 1956; Materials Research Committee, Adelaide, December, 1956; Traffic Engineering Committee, Sydney, February, 1957; Secretarial and Accountants' Committee, Melbourne, March, 1957.

CONFERENCE OF MUNICIPAL ENGINEERS.

The Thirteenth Conference of Municipal Engineers, convened by the Board, was held in the Royale Ballroom, Exhibition Building, Melbourne, on the 22nd and 23rd May, 1957. Engineers from most of the 206 municipalities throughout the State attended, together with senior engineers of the Country Roads Board.

The Conference was opened by the Hon. Sir Thomas Maltby, M.L.A., Minister of Public Works, who, in welcoming the delegates, expressed his regret at the absence, because of illness, of Mr. C. G. Roberts, Deputy Chairman of the Board. Sir Thomas remarked that costs and the volume and weight of traffic are increasing more rapidly than the increases in finance, and referred to the intention of the Government to seek an additional allocation to Victoria from fuel tax collected by the Commonwealth Government. The Minister also referred to the shortage of engineers and suggested that every endeavour be made to influence parents to have their sons trained as engineers in order to increase the strength of this important profession.

Items on the agenda included the design of river and creek crossings and the determination of waterway areas; the economics of Shire-owned road-making plant; the use of primer seals and the average vehicle running costs on an average gravel pavement compared with a sealed pavement.

On the day following the conference an inspection was made of the Standard Vacuum Refining Company's oil refinery at Altona.

MOTOR REGISTRATION.

Registrations effected during the year under the Motor Car Act totalled 716,297, an increase of $4\frac{1}{3}$ per cent. on the registrations effected during the previous year as compared with an increase in that year of $7\frac{1}{2}$ per cent. over the total for 1954–55.

The accounting for motor registration is now entirely performed on punched cards machines, an installation of "Powers Samas" equipment having now been completed in the Motor Registration Branch at a total cost to the Country Roads Board of £41,562.

Details of registrations are set out hereunder :—

Vehicles.	Financial Year 1955–56.		Financial Year 1956–57.		Increase.	Decrease.
Private—						
New	53,660		47,029			
Second-hand—						
Re-registered	19,628		20,502			
Renewals	419,714		454,569			
		493,002		522,100	29,098	..
Commercial and Hire—						
New	11,898		9,680			
Second-hand—						
Re-registered	4,594		4,973			
Renewals	81,741		84,379			
		98,233		99,032	799	..
Primary Producers—						
New	4,567		3,858			
Second-hand—						
Re-registered	3,375		3,832			
Renewals	46,924		49,935			
		54,866		57,625	2,759	
Licences under Motor Omnibus Act ..		736		748	12	..
Trailers		12,010		11,203	..	807
Tractor Engines		4		4	..	..
Motor Cycles		27,632		25,585	..	2,047
Total		686,483		716,297	32,668	2,854

STAFF.

Since the 1st July, 1956, the total number of officers on the Board's staff has increased from 532 to 582, made up :—

	Total.
Permanent Staff—339 males, 47 females	386
Temporary Staff—109 males, 87 females	196
	582

Of these officers, 343 are located at Head Office, Exhibition Building, 57 at South Melbourne, 22 at offices at Drummond Street, Carlton, and 160 in rural Divisions.

Thirty-two male officers, and 21 female officers resigned during the year, and new appointments totalling 97, comprising 63 males and 34 females were made. There is still a need for female typists, stenographers and machine operators.

As mentioned earlier (page 21) the shortage of qualified engineering officers is a matter of grave concern to the Board, particularly in view of increasing works programmes.

The following officers retired during the year 1956–57 :—

Dr. G. Marwitz, Ph.D. (Heid.)	Librarian
Mr. E. Fulton	Traffic Officer
Mr. R. M. Dempster	Senior Ledger Keeper
Mr. A. D. S. Bartholomeuse	Stores Clerk

It is greatly regretted that a number of highly valued officers, most of whom have been with the Board for many years, passed away during the year. The names of these officers, whose loss is greatly felt by the Board and staff, are as follows :—

Mr. R. R. Snell, A.C.P.A., A.C.A. (Aust.), A.I.S. (Lond.), Lic. Aud. Vic. and Tasmania	Deputy Accountant
Mr. R. W. Wade	Senior Plant Inspector
Mr. H. R. McDonald	Assistant Secretary
Mr. R. L. Selover	Engineering Assistant
Mr. N. G. Tomkinson	Engineering Assistant

Mr. J. Mathieson, M.C.E., M.I.E. (Aust.), M.S.E., M.A.P.I., Chief Engineer, during this year visited the Middle East, the United Kingdom Europe, and the United States of America. His trip was primarily of a private nature made at his own expense, but during the time when he was in the United Kingdom, Mr. Mathieson, at the Board's request, carried out an investigation into certain difficulties that had arisen in connexion with plant-mixed bituminous surfacings, and sought the latest information available

about materials used to improve the adherence of bitumen to stone. He also, at the request of the Chief Commissioner of Police, arranged with the Chief Commissioner of Police, London, to visit the Metropolitan Police Motor Driving School at Hendon. This was a valuable experience, particularly as he subsequently drove about 13,000 miles through England and several Continental countries, thereby gaining experience of roads and traffic conditions of other countries.

Mr. H. P. George, M.S.E., A.M.I.E. (Aust.), F.A.P.I., A.M.I.T. (Lond.), C.H.T. (Yale), Traffic and Location Engineer, who had attended a Traffic Engineer Course at Yale University in the United States of America visited the United Kingdom and Europe before his return to Victoria in 1956.

Mr. D. J. Delaney, B.C.E., C.H.T. (Yale), Assistant Engineer, also attended the Traffic Engineering Course at Yale University in the United States of America, being sponsored by the Myer Trust.

Mr. J. R. Robinson, B.C.E., C.E., Stud I.E. (Aust.), Assistant Engineer, visited the United Kingdom under a British Industries Scholarship, gaining valuable experience in structural engineering.

STAFF CHARITIES FUND.

This fund again received substantial support from a number of members of the Board's staff by way of contributions deducted from each fortnightly pay. The total sum contributed during the year, including special donations was £329 9s. 5d., a slight decrease over the normal contributions for the previous year.

A total amount of £345 was contributed to twenty charities throughout the State, including various metropolitan and country hospitals, the Junior Legacy Club, the Institute for the Blind, and various appeals by or on behalf of the Returned Soldiers, Sailors, and Airmen's Imperial League of Australia, such as Operation Gratitude. The usual donations on a " bulk " basis were also made to several special button-day appeals by purchasing buttons or badges for each contributor to the fund. The balance of £115 18s. 8d. on hand at the 30th June, 1957, will be used to meet commitments which will arise later in the calendar year.

EMPLOYMENT.

The number of employees for the year averaged 2,601. The peak of employment was reached in February, 1957, when 2,770 employees were working for the Board and the lowest number was 2,382 for September, 1956.

On work for other Departments, the monthly average for the year was :—

	Employees.
State Rivers and Water Supply Commission	117
Housing Commission Victoria	15
Latrobe Valley Development	1

Industrial harmony again prevailed, no disturbances being recorded for the year.

Camping conditions for employees were further improved during the year, with the issue of lighting sets and metal floorboards to mobile bituminous gangs.

PERSONNEL OF BOARD.

Following the retirement of Mr. F. M. Corrigan, and Mr. R. F. Jansen on 30th June, 1956, Mr. C. G. Roberts, M.C., B.Sc. (Eng.) Lond., A.M.I.C.E. (Lond.), A.M.I.E. (Aust.), C.E., F.A.P.I., who had been Chief Engineer since 1st January, 1945, was appointed Deputy Chairman, and Mr. W. H. Neville, J.P., A.A.S.A., who had held the position of Secretary of the Board from 1st July, 1949, was appointed a Member, as from 1st July, 1956.

ACKNOWLEDGMENTS.

The sincere thanks of the Board are tendered to the Minister for Public Works, the Hon. Sir Thomas Maltby, E.D., M.L.A., for his help and interest in its work.

The Board also desires to place on record its thanks and appreciation for the co-operation and assistance of officers of Government Departments, other State instrumentalities and municipal councils, as well as the road authorities in other States.

We have the honour to be,

Sir,

Your obedient servants,

D. V. DARWIN, Chairman.

C. G. ROBERTS, Deputy Chairman.

R. E. V. DONALDSON, Secretary.

W. H. NEVILLE, Member.

COUNTRY ROADS BOARD.

STATEMENT OF RECEIPTS AND PAYMENTS FOR YEAR ENDED 30TH JUNE, 1957.

(Adjusted to nearest pound.)

		Country Roads Board Fund.		*Commonwealth Aid Roads Act* 1954.		Loan Funds.		Commonwealth–State Flood Restoration.	Total.
		Act 3662.	Act 5931 Road Maintenance Account.	Sec. 9 (2).	Sec. 9 (3).	Permanent Works.	Restoration of Flood and Bush Fire Damage.		
RECEIPTS.	£	£	£	£	£	£	£	£	£
Balance at 1st July, 1956		91,880	..	..	..	..	..	..	91,880
Motor Car Registration Fees	6,240,044								
Additional Registration Fees	450,805								
Drivers' Licence Fees	207,892								
Fines	180,614								
	7,079,355								
Less Cost of Collection	659,899								
		6,419,456	..	..	..	..	..	..	6,419,456
Municipalities Repayments—									
Permanent Works—Main Roads	13,215								
Maintenance—Main Roads	517,203								
		530,418	..	..	..	..	..	..	530,418
Moneys provided by *Commonwealth Aid Roads Act* 1954		..	..	2,963,695	2,283,743	..	..	..	5,247,438
Proceeds from *Commercial Goods Vehicles Act* 5931		..	1,314,784	..	..	..	..	..	1,314,784
Receipts from State Loan Funds—									
Act 3662		..	..	..	..	370,000	..	..	370,000
Act 6066—Flood and Bush Fire Damage		..	..	..	..	..	34,679	..	34,679
Moneys provided under Commonwealth–State Agreement for Flood Restoration		..	..	..	..	..	..	236,641	236,641
Fees and Fines under Country Roads Acts		1,197	..	..	..	..	..	..	1,197
General Receipts		26,976	..	..	..	..	..	..	26,976
		7,069,927	1,314,784	2,963,695	2,283,743	370,000	34,679	236,641	14,273,469
PAYMENTS.									
Main Roads—									
Construction and Reconstruction		1,494,633	..	896,274	..	289,179	..	19,298	2,699,384
Maintenance		609,085	559,441*	53,131	..	..	..	..	1,221,657
State Highways—									
Construction and Reconstruction		1,177,456	..	1,347,344	..	80,821	..	97,627	2,703,248
Maintenance		365,173	515,132	495,813	..	..	..	..	1,376,118
Tourists' Roads—									
Construction and Reconstruction		61,842	..	..	147,843	..	..	..	209,685
Maintenance		4,631	32,212	..	38,599	..	..	..	75,442
Forests Roads—									
Construction and Reconstruction		41,478	..	..	24,364	..	..	..	65,842
Maintenance		13,443	22,351	..	14,752	..	..	..	50,546
Unclassified Roads—									
Construction and Reconstruction		..	..	171,133	1,771,027	..	34,679	119,716	2,096,555
Maintenance		..	185,648	..	226,579	..	..	..	412,227
Murray River Bridges and Punts		12,316	..	..	60,579	..	..	..	72,895
Traffic Line Marking		27,180	..	..	..	..	..	..	27,180
Plant Purchases		620,626	..	..	..	..	..	..	620,626
Traffic Lights		943	..	..	..	..	..	..	943
Interest and Sinking Fund Payments		792,321	..	..	..	..	..	..	792,321
Interest and Sinking Fund Payment—Great Ocean Road		14,528	..	..	..	..	..	..	14,528
Repayment of Advance—Public Account—Act 5978		500,000	..	..	..	..	..	..	500,000
Payment to Tourists Resorts Fund		76,284	..	..	..	..	..	..	76,284
General and Administrative Expenditure		839,784	..	..	..	..	..	..	839,784
		6,651,723	1,314,784	2,963,695	2,283,743	370,000	34,679	236,641	13,855,265
Balance at 30th June, 1957		418,204	..	..	..	..	..	..	418,204

* Of this amount £114,245 is repayable to the Road Maintenance Account in year 1957–58 under the *Country Roads Act* 1928.

NOTE.—Relief to Municipalities, granted under Acts 4140 and 4415, amounted in 1956–57 to £128,466.

AUDITOR-GENERAL'S CERTIFICATE.

The accounts of the Country Roads Board for the year ended 30th June, 1957, have been audited. In my opinion the above statement of Receipts and Payments fairly presents, in summary form, the transactions during that period.

R. W. GILLARD,
Auditor-General.
16th May, 1958.

R. G. COOPER,
Acting Accountant.
12th May, 1958.

COUNTRY ROADS BOARD.

Loan Liability at 30th June, 1957.

—	£ s. d.	Main Roads. £ s. d.	Developmental Roads. £ s. d.	Total. £ s. d.
Permanent Works—				
Main Roads	6,627,638 3 8			
State Highways	5,373,480 14 0			
Tourists' Roads	55,292 10 3			
Forests Roads	1,083 18 11			
		12,057,495 6 10	..	..
Developmental Roads		..	6,425,757 10 11	18,483,252 17 9
Discount and Expenses		233,017 17 2	257,610 6 11	490,628 4 1
Total Amount Borrowed		12,290,513 4 0	6,683,367 17 10	18,973,881 1 10
Less Redemption of Loans—				
Redemption Funds		85,219 1 1	646,386 7 4	731,605 8 5
Main Roads Sinking Fund		285,688 7 7	..	285,688 7 7
Developmental Roads Sinking Fund		..	55,083 0 2	55,083 0 2
State Loans Repayment Fund		1,031,062 5 9	..	1,031,062 5 3
National Debt Sinking Fund		1,128,729 5 1	1,526,101 10 4	2,654,830 15 5
		2,530,698 19 6	2,227,570 17 10	4,758,269 17 4
Loan Liability at 30th June, 1957		9,759,814 4 6	4,455,797 0 0	14,215,611 4 6

CHIEF ENGINEER'S REPORT

Country Roads Board Office,
Melbourne,
2nd December, 1957.

THE CHAIRMAN,

SIR,

I have the honour to submit a report on matters of technical interest included in work carried out during the financial year 1956–57.

MECHANICAL DIVISION.

Employees.

The total average number of employees at the South Melbourne and divisional workshops, excluding staff, transport drivers, mechanical plant operators, storemen, painters, and divisional carpenters was 302 compared with 281, 267, 250, 220, and 205 respectively for the previous years. The increases were plant inspectors 2, servicemen 4, welders 2, and fitters 13.

Volume of Work.

Tables 1, 2, and 3 show work carried out by the Board's workshops and outside establishments and also the numbers of workshop and field repair jobs for the year 1956–57 and the previous years.

TABLE 1.—PLANT OVERHAULED.

Major items only, B.S.T. Plant excluded.

Type of Plant.	South Melbourne.	Div. Workshops.	Outside Bodies.	Total 1953-54	Total 1954–55.	Total 1955–56.	Total 1956–57.
Crawler tractors	3	2	3	10	5	11	8
Wheel tractors	..	3	..	..	7	5	3
Front-end loaders	..	4	..	40	12	12	4
Heavy graders	9	3	3	24	31	27	15
Patrol graders	3	7	..	..	..	14	10
Compressors	2	..	..	15	8	13	2
Scoops	2	..	..	5	4	5	2
Crushers	1	..	..	..	1	1	1
Concrete mixers	..	..	..	..	1	5	..
Shovels	2	..	1	..	1	4	3

TABLE 2.—FITTERS SENT TO FIELD REPAIR JOBS.

1953–54	1954–55	1955–56	1956–57
790	918	719	649

TABLE 3.—NUMBER OF JOBS CARRIED OUT

—	1953–54	1954–55	1955–56	1956–57
Workshops	5,164	5,316	6,054	5,404
Drummond-street Service Station	..	804	1,111	1,245
Transport	1,338	1,658	1,600	1,501

Table 2 indicates that the policy of improving inspection both of workshops and the field with better services and maintenance, which was commenced a few years ago, is bearing fruit, as fewer fitters are now being sent out to carry out repair work in the field. Some of the improvement is, however, due to a larger number of relatively new machines which are now in operation.

Table 3 shows that the Drummond Street service station is taking an increasing share of automotive work, relieving further the South Melbourne motor shop.

Due to the priority given to bituminous surface treatment plant and the increase in that plant, the overhaul position of other plant is still far from satisfactory.

Workshops.

South Melbourne Workshops.—In view of the approaching move to the new workshops at Syndal, only essential maintenance of buildings has been done at South Melbourne. The only new machine tools obtained suitable for present and future needs were a nibbling machine, a universal metal band saw, and a hydraulic lathe copying attachment.

Divisional Workshops.—The divisional workshops have operated satisfactorily in their field, and it is hoped that their use can be improved with the new arrangements described later.

Design, Manufacture, and Purchase of New Plant.—During the year the design staff of this Division undertook the design of a new aggregate loader, the motorization of the 20,000 lb. plate testing machine and a roadman's cabin, together with numerous modifications of drawings and day-to-day co-operation with the workshops. A new 8,000-gallon capacity mobile bitumen storage tanker has been designed and constructed, and is now being used by the Asphalt Division.

The Division supervised the acquisition by contract or order of the following plant items, &c.:—

17 Bitumen tankers	11 Pulsators
12 Cars	4 Rollers
5 Compressors	2 20-ton scales
1 Crushing plant	1 Screening plant
9 Front-end loaders	1 Semi-trailer
6 Graders	3,000 Tent floor sections
1 Gravel washer	10 Tractors
36 Huts	30 Trucks
2 Jackhammers	49 Utilities
12 Land Rovers	12 Water pumps
10 Lighting plants	2 Welding sets
11 Panel vans	4 Winches

Staff.

There has been a steady increase in the work of the Division, but it has been possible to obtain only a slight increase in technical staff; even additional clerical assistance by clerks with some technical knowledge would relieve engineers of routine duties.

In order to improve the operation of Divisional workshops and their co-ordination with the Central workshops, three assistant engineers at South Melbourne have been allotted to these duties for (*a*) Warrnambool, Geelong; (*b*) Bairnsdale, Traralgon; and (*c*) Horsham and Benalla divisions. Experience to date indicates that this policy is proving satisfactory, and as other assistant engineers become available they will be allotted for the remaining divisions after suitable training.

Road Signs.

The Central workshops produced 4,697 warning, work, and special signs and tripods costing £28,795, as well as approximately 20 advanced direction and 250 direction signs to the value of £7,144. The cost and the quality of the signs compare favourably with those available from private enterprise.

Syndal.

The development of a new depot at Syndal has proceeded to the extent of the limited funds available, and it is expected that portion of the workshops will be in use early in 1958.

TRAFFIC ENGINEERING.

Transportation Survey.

A continuous weighing survey was conducted on the Hume Highway at the Seymour weighbridge, primarily to determine the percentage distribution of various axle loadings of trucks. During this survey which lasted for six days, 3,500 trucks passed the census point, of which 1,500 were actually weighed; weights of the remaining trucks were determined by reference to the load being carried. Opportunity was taken at the same time to question the drivers of the vehicles regarding the origin and destination of their trips, and to record the nature of the load. The results of the survey are summarised in Tables 4, 5, and 6.

TABLE 4.—PERCENTAGE DISTRIBUTION OF AXLE LOADS.

Axle Loads (lb.)	2 axle	3 axle	4 axle	5 axle	All Types
Equal to or less than .. 5,000	54·2	30·7	16·2	6·5	32·5
7,000	17·4	15·1	16·7	11·3	15·9
9,000	5·9	6·3	7·5	18·7	6·5
11,000	1·9	2·3	7·0	17·7	3·1
13,000	3·2	3·6	13·9	9·3	5·4
15,000	5·2	6·4	18·4	20·6	8·5
17,000	5·7	13·3	9·1	8·4	11·1
18,000	3·5	9·3	5·1	1·8	7·4
19,000	1·4	8·4	4·5	2·0	6·3
21,000	1·5	3·8	1·2	1·9	3·0
Greater than 21,000	0·1	0·8	0·4	1·8	0·5

TABLE 5.—FREQUENCY OF WHEEL LOADS FOR LOADS EQUAL TO OR GREATER THAN 5,000 LB.

Wheel Load (lb.)	Percentage.
5,000	7·0
6,000	12·0
7,000	19·0
8,000	24·5
9,000	30·0
10,000	6·5
Greater than 10,000	1·0

Considering the trucks collectively, it will be noted that 17·2 per cent. of all axle loads were in excess of the legal limit of 17,000 lb. and about 10 per cent. of the axle loads were greater than 18,000 lb.

TABLE 6.—VEHICLE TYPE.

Item.	2 axle.	3 axle.	4 axle.	5 axle.	All types.
Percentage of each type ..	27·2	59·8	12·4	0·6	..
Average trip length (miles)	157	301	415	351	277
Average gross weight (tons)	6·3	14·0	19·2	24·7	12·6

The extraordinarily long average trip mileages are brought about by the large number of vehicles travelling from Melbourne to Sydney, and to a lesser extent by a number of vehicles travelling from Adelaide to Sydney and from Adelaide to Brisbane, or in the opposite directions.

Traffic Counts.

The traffic counts conducted by the Board during the year can be broken down into four types:—

1. Annual traffic census.
2. Continuous automatic counts.
3. Seven-day automatic counts.
4. Miscellaneous counts.

1. *Annual Traffic Census.*—On 13th March, from 7 a.m. to 7 p.m., the annual census was conducted at approximately 1,000 stations throughout Victoria. The same stations are manned each year as far as practicable so that future traffic can be more accurately predicted.

2. *Continuous Automatic Counts.*—The policy of conducting continuous automatic counts at selected points to obtain hourly variations for each day over a period of at least one year has been continued, and stations are now operating at—

Western Highway, Bungaree;
Calder Highway, Diggers Rest;
Hume Highway, Cambellfield.

During the year counts were concluded at—

Princes Highway West, Pirron Yallock;
Hume Highway, Glenrowan.

A summary of results obtained at those stations operated during the year is given in Table 7.

3. *Seven-day Automatic Counts.*—Automatic counts are conducted for seven consecutive days in each month at various points, counters being operated at ten stations throughout the State and read daily by Divisional employees. Results of the counts for the year 1956–57 are summarized in Table 8.

4. *Miscellaneous Counts.*—Several manual counts were conducted during the year to determine turning movements at intersections, the percentage of by-passable traffic around country towns, and the delays caused by level crossings.

Automatic counters were used in the Divisions to determine volumes and traffic variations at particular points.

Analysis of Traffic Counts.

(*a*) *Hourly Volumes.*—Volumes at the continuous count stations are recorded in hourly periods. Table 8 lists the maximum, 10th, 20th, 30th, and 50th highest hour volumes as a percentage of the annual daily traffic for each of the stations.

(*b*) *Expansion Factors.*—It is not known how representative of the average daily traffic the annual census figures are, and the aim of this work is to establish factors which can be used to expand annual census figures to average daily traffic.

TABLE 7.—AVERAGE ANNUAL TRAFFIC VOLUMES.

Location of Station.	Princes Highway West, Pirron Yallock	Hume Highway Glenrowan.	Loddon Valley Highway, Serpentine	Calder Highway, Ouyen.	Ocean Road, Lorne.	Western Highway, Goroke Road.	South Gippsland Highway, Welshpool.	Henty Highway, Cavendish.	Princes Highway East, Nowa Nowa	Midland Highway, Mt. Clear.	Ovens Highway, Wangaratta
Period of Count ..	21·12·55–20·12·56.	30·7·55–29·7·56.	Aug., '56–July, '57.	July, '56–June, '57.	July, '56–June, '57.	July, '56–June, '57.	July, '56–June, '57.	Sept., '56–Aug., '57.	July, '56–June, '57.	July,'56–June, '57.	July, '56–June, '57.
Sunday ..	1,506	2,021	407	433	660	624	477	364	467	1,907	636
Monday ..	1,514	1,937	434	427	444	590	372	351	448	1,363	493
Tuesday ..	1,201	1,619	358	407	350	574	383	329	434	1,140	534
Wednesday ..	1,205	1,593	314	430	315	611	400	295	469	1,168	479
Thursday ..	1,430	1,673	294	433	277	577	385	349	397	1,196	488
Friday	1,415	1,895	387	433	387	634	402	329	466	1,298	536
Saturday ..	1,474	1,905	296	427	499	660	442	357	517	1,658	631
Annual average day	1,392	1,806	356	427	419	610	409	339	457	1,390	543
Annual average week day	1,353	1,743	357	426	355	597	389	331	443	1,233	506

TABLE 8.—EXPANSION FACTORS AND HOURLY VOLUMES.

(*a*) *Seven-day Count Stations.*

Expansion Factor.	Loddon Valley Highway, Serpentine	Calder Highway, Ouyen.	Ocean Road, Lorne.	Western Highway, Goroke Road.	South Gippsland Highway, Welshpool.	Henty Highway, Cavendish.	Princes Highway East, Nowa Nowa.	Midland Highway, Mt. Clear.	Ovens Highway, Wangaratta
Ratio of average daily traffic, 24 hour, to Wednesday-in-March, 24 hour.	1·49	1·03	3·16	1·00	0·97	1·48	0·90	1·19	0·88

(*b*) *Continuous Count Stations.*

Expansion Factors.	Princes Highway East, Oakleigh. 1953–1954.	Princes Highway East, Oakleigh. 1954–1955.	Maroondah Highway Box Hill.	Nepean Highway, Mordialloc.	Princes Highway West, Pirron Yallock.	Hume Highway, Glenrowan.	Princes Highway West, Corio.
Ratio of Average Daily Traffic, 24 hour, to Wednesday-in-March, 24 hour.	1·10	1·13	0·99	1·31	1·17	1·05	1·14
Ratio of Average Daily Traffic, 24 hour, to Wednesday-in-March, 12 hour.	1·43	1·50	1·32	1·75	1·42	1·46	1·32
Maximum hour to average Daily Traffic, 24 hour, %	15·1	13·8	13·5	23·2	26·6	28·8	30·2
10th highest to Average Daily Traffic, 24 hour, %	13·5	12·0	11·2	19·8	18·7	22·7	22·8
20th highest to Average Daily Traffic, 24 hour, %	13·0	11·1	10·5	18·9	16·2	18·0	21·2
30th highest to Average Daily Traffic, 24 hour, %	12·5	10·8	10·2	17·9	14·8	16·8	20·0
50th highest to Average Daily Traffic, 24 hour, %	11·9	10·3	9·9	16·8	13·4	15·5	17·8

Ratios of annual daily traffic to Wednesday-in-March traffic (the Wednesday on which the census is taken, if possible) are summarized in Table 8, and as more information becomes available from future counts it is hoped that factors for particular sections of highways or areas can be developed.

Speed and Delay Studies.

A "before-and-after" study was commenced to determine the effect on traffic speeds and delays of the duplication of the Princes Highway East between Oakleigh and Dandenong. The "before" study was conducted during the year, two cars being used, one "floating" with passenger cars and the other with trucks. The "after" study will be conducted after completion of the duplication.

BITUMINOUS SURFACING.

Extent of Work.

During the season 1956–57, 1,712 miles of bituminous surfacing work was carried out. This is 125 miles more than the total length of work done during the 1955–56 season.

The percentage comparisons with the work carried out in 1955–56 are :—

Work on declared roads ..	16·5 per cent. more than 1955–56.
Work on unclassified roads..	11·5 per cent. less than 1955–56.
Work for other authorities..	14·9 per cent. less than 1955–56.
All work..	7·9 per cent. more than 1955–56.

Table 9 sets out the mileages of work under the different headings for the 1955–56 and 1956–57 seasons. The work carried out in the latter season included the extension of the black surface on the declared system by a length of 232 miles, thus bringing the total length treated to 8,803 miles or 61 per cent. of the declared system of 14,430 miles. (See Table 10.)

TABLE 9.—LENGTH OF WORK CARRIED OUT IN 1955–56 AND 1956–57.

Type of Road and Plant Used	Miles. 1955-56	Miles. 1956-57.
(*a*) Work on C.R.B. declared roads—		
(i) Board's plant	1,089	1,267
(ii) Municipal plant ..	28	34
	—1,117	—1,301
(*b*) Work on undeclared roads to which the Board contributes—		
(i) Board's plant	284	260
(ii) Municipal plant ..	45	31
	— 329	— 291
(*c*) Work for other authorities done by Board's plant —		
(i) Municipalities	96	114
(ii) State instrumentalities ..	9	2
(iii) Commonwealth of Australia	36	4
	— 141	— 120
	1,587	1,712

A length of 173 miles of initial treatment was carried out on reconstructed lengths of previously sealed pavements. Although this represents 40 miles more than the length of similar work carried out during the previous season, it is only 2 per cent. of the treated system. Of the sealed length of the Board's road system, it was possible to retreat only 824 miles, or 9·4 per cent. of the treated system. This was a considerable improvement on the percentage treated during the previous season, but this rate of retreatment is not adequate to maintain the existing sealed surfaces properly. Of the length retreated it was possible to carry out only 13½ miles of work which provided some correction of surface irregularity, (see Table 10). Initial treatment was also carried out on approximately 68 miles of widening of existing sealed pavements and on 5 miles of duplicate traffic lanes.

Bituminous surfacing carried out on unclassified roads, as set out in Table 11, totalled 291 miles of work, and a further 120 miles of work was carried out for other authorities. (See Table 9.)

Bituminous Plant, Equipment, and Materials.

During the season, five 400-gallon and fourteen 800-gallon spraying units, manned by approximately 600 men, were engaged on the work. For the transport and storage of bulk bitumen, nineteen 2,000-gallon road tankers and twelve 2,000-gallon mobile storage tankers were used.

The total quantity of bitumen used during the season was 15,474 tons, of which 14,864 tons, or 96 per cent., was supplied in bulk. Nine hundred tons of bitumen from a Sydney refinery was used near the Victorian–New South Wales border, and the remainder of 14,574 tons was obtained from a refinery at Altona, near Melbourne. Of the total quantity of bulk material, 8,642 tons were distributed throughout the State in bulk rail tank cars, the property of the refining company, and the remainder of 6,222 tons was delivered direct to jobs in bulk road tankers. The growth of the use of rail transport for distributing bulk bitumen is indicated by the fact that this season 58 per cent. of the bulk material was despatched in rail tank cars, compared with 49 per cent. in the previous season.

The bitumen supplied this year from the Victorian refinery was derived principally from a Venezuelan crude blended with a small proportion of material produced from a New Guinea crude oil. Following the tightening up of the specification covering the quality of the material, an arrangement was made whereby an officer of the Materials Research Division of the Board worked in close co-operation with the refinery laboratories, checking bitumen at the refinery prior to its despatch to the work. The system worked well, resulting in a close control of the material and a very consistent product. As practically all the bitumen used by municipalities and other authorities in Victoria was drawn from the tank being tested by the Board, they, too, benefited greatly by this supervision.

During the season, 191,766 cubic yards of aggregate were used by the Board's surfacing units in the sprayed work programme, being 13,921 cubic yards more than the quantity handled during the previous season. Table 12 sets out the weighted average price per cubic yard of aggregate in roadside stacks for the past six years. It will be noted that the general upward trend of the cost of aggregate shows a sharp increase during the past season.

Cost of Work.

Table 13 sets out details of the cost of work carried out by the Board's plant during the season on all roads to which the Board contributed funds. The table indicates that the average costs of sprayed bituminous surfacing for this season do not differ materially from those of the previous season. The average cost of initial treatment was slightly lower, but the average cost, generally, for retreatments was slightly higher than last year. It is noted that, while generally the costs of materials were higher than in the previous season, the unit costs for labour were lower. These comparisons show that the increases in the prices of bituminous materials and aggregate were offset partly by the slightly lower unit costs for labour, probably because of the abnormally long spell of fine weather experienced during the spraying season.

Table 14, showing somewhat similar figures in respect of general construction work, is given for comparison.

Experimental Work.

The following experimental work was carried out during the season :—

Use of additives in bitumen.—It has been the practice for some years to pretreat the aggregate used in sprayed work with a small percentage of an adhesion agent in diesel fuel oil or power kerosene to assist the adhesion between the bitumen and the aggregates, many of which have a naturally poor affinity for bitumen. The process also helped to avoid loss of aggregate caused by the bitumen stripping from it when the aggregate was wet or damp, or when humid conditions prevailed.

Certain additives or adhesion agents are now available which, when incorporated in the bitumen, not only provide similar advantages, but also assist the adhesion of the bitumen to a damp or wet surface. If this process proves successful it will be invaluable in obviating costly delays now necessary when pavements or weather conditions are such that work must cease.

TABLE 10.—MILEAGE OF EACH TYPE OF WORK CARRIED OUT ON DECLARED ROADS DURING 1956–57.

Type of Road and Control of Work.		Length in Miles.																	Summary of Work.	
		Nature of the Work.																		
		Initial Treatments.									Retreatments.									
		Duplication and Widening.		One Application Seal Only		I.T. Prime and Two Application seal.		I.T. Prime and Seal.		P. M. S.	Reseals.						R.M.S.	P.M.S		
											Nominal Size of the Aggregate.					Two Application Reseal.				
Road.	Control.	Widen.	Duplication.	E.	R.	E.	R.	E.	R.	E.	¾-in.	⅝-in.	½-in.	⅜-in.	¼-in.				State Highways.	Other Declared Roads
State Highways	Direct	44·04	4·87	3·96	29·35	4·09	..	17·91	70·21	3·24	38·56	74·74	69·08	70·71	91·78	5·25	..	9·65	537·44	..
	Municipal ..	1·00	..	..	..	..	..	..	1·79	..	..	..	13·15	8·88	..	..	..	..	24·82	..
Main Tourist, and Forest Roads	Direct	3·07	..	6·46	2·81	..	..	14·24	4·93	..	1·85	2·25	17·74	..	7·41	..	..	..	..	60·76
	Municipal ..	20·15	..	52·45	27·29	2·67	..	126·87	36·09	..	29·31	74·69	147·29	120·70	37·08	..	2·63	1·25	..	678·47
		68·26	4·87	62·87	59·45	6·76	..	159·02	113·02	3·24	69·72	151·68	247·26	200·29	136·27	5·25	2·63	10·90	562·26	739·23
		73·13		122·32		6·76		272·04		3·24	810·47						13·53			
		477·49									824·00								1301·49	
		1301·49																		

Abbreviations.—E, Extension to the Bituminous Surfaced System. R, Initial Treatment on Reconstructed length of previously sealed pavement. R.M.S., Treatment with Roadmix. P.M.S., Treatment with Plantmix.

NOTE.—The Table does not include 231 miles of I.T.P. and S. Extension, 13 miles of I.T.P. and S. Reconstruction, 2 miles of Widening and 44 miles of Retreatment on undeclared roads to which the Board contributes funds.

TABLE 11.—MILEAGE OF WORK CARRIED OUT ON UNDECLARED ROADS DURING SEASON 1956–57.

Work.	Miles.
Initial Treatments—	
Extensions	231
Reconstructed lengths of previously sealed pavements	13
Widening	2
	— 246
Retreatments	45
Total	291

TABLE 12.—AVERAGE PRICE OF AGGREGATE FOR BITUMINOUS SURFACING AT PER CUBIC YARD IN STACKS BY THE ROADSIDE, 1956–57

Material	Price per cubic yard.					
	1951–52.	1952–53.	1953–54.	1954–55.	1955–56.	1956–57.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Screenings ..	39 11	40 3	41 11	44 5	44 10	51 5
Gravel ..	39 2	42 4	40 10	40 4	44 1	39 11
Sand ..	21 5	21 0	17 7	23 4	20 6	29 3
Scoria ..	18 2	17 3	15 7	12 1	18 4	26 2
Average price all aggregates	39 0	39 10	40 11	42 4	43 8	48 8

A quantity of such adhesion agents was secured and, during the normal programme of work, over 200 test sections were laid down, in which various quantities of the adhesion agent were used in the bitumen with different types of aggregate. Although much of the work was done under very good weather conditions (somewhat unfortunately for the test), it was possible to observe the effects of the agents in some cases under wet conditions, and the results to date are promising. It is proposed to continue further work in this direction during the coming year.

(*b*) *Rubber in bitumen.*—A small quantity of rubber was obtained by the Board for incorporation in bitumen, with the object of still further observing its effects when used for two particular reasons :—

(i) As an aid to early adhesion when the intensity of traffic is high ;

(ii) To improve the ability of the binder to effectively seal over a badly cracked bituminous pavement.

Two types of rubber were available for this work :—

(i) " Pulvatex "—a finely ground unvulcanised rubber powder ;

(ii) " Rodorub "—an unvulcanised rubber crumb much coarser than " Pulvatex ".

A short section of resealing was carried out on the Princes Highway East at Dandenong, where the traffic conditions were very severe. In this work, 2 per cent. by weight of " Pulvatex " was incorporated in the binder, and a very good job resulted. There appears to be no doubt that, in this case, the addition of the rubber powder was effective in assisting early adhesion.

In carrying out the resealing of a length of the Western Highway near Great Western, where an old plant mix seal coat was extensively cracked, sections of the work included 2 per cent. by weight of " Rodorub " and 3 per cent. by weight of " Pulvatex " in the binder. To date, no difference is yet apparent between the sections resealed with untreated bitumen and those in which the rubber powder was incorporated in the bitumen.

(*c*) *Sand asphalt.*—In the Board's 35th Annual Report, details are given of experimental work designed to investigate the possibilities of producing a satisfactory and stable bituminous surfacing mixture using bitumen and local Mallee sand as the basic ingredients. This work was carried out near Pier Millan on the Calder Highway, in an area where only poor quality mineral aggregate exists and where it is necessary to import aggregates for sealing work from long distances at great cost. Briefly, the work carried out comprised the processing of the Mallee sand by a variety of methods, with a binder composed of bitumen, heavily cut back with power kerosene. The material was mixed in a pugmill mixer and laid cold with a drag spreader. The general conclusions reached, afer a period of observation were :—

(i) The " Coldmix " procedure was inherently unsound because the " skin " which forms on the surface of dense fine-grained mixes prevents the desired escape of the power kerosene cutter, the mixture remaining rather unstable for a very long time ;

(ii) It was probable that a suitable stable mixture could be made if some filler could be added to the Mallee sand, which is itself naturally deficient in material passing a 200-mesh sieve, and if the binder used was straight 80/100 penetration bitumen.

The experimental work was continued in April, 1957, where, on an adjoining section of the same highway, 3¼ miles of work were laid down by a hot-mixed, hot-laid process. The mixtures were prepared and spread with a " Barber Greene " dryer, a " Barber Greene " continuous pugmill mixer, and a " Barber Greene " tamping, levelling finisher.

The basic aggregates used were Mallee sand with Mallee loam, added to provide the filler, but the experiment was expanded to include the use of sands from the River Murray, and from a deposit at Pine Plains, west of Patchewollock. These latter materials could be of value if the process was to be adopted in the vicinity of the Murray Valley, the Henty or the Ouyen Highways or adjacent roads.

In all, 23 experimental mixtures were laid as a premixed bituminous surface about three-quarters of an inch thick, on a previously primed limestone pavement. The binder content in the mixes varied between 13 gallons and 27½ gallons per cubic yard.

TABLE 13.—AVERAGE COST OF B.S.T. WORK CARRIED OUT BY C.R.B. PLANT ON ALL ROADS FOR WHICH THE BOARD CONTRIBUTED FUNDS DURING 1956—57.

(Cost in pence per square yard).

Item.	Nature of the Work.																	
	Initial Treatments.						Retreatments.											
							Resealing.											
							Nominal Size or Gauge of Aggregate used.										Two Application Re-Seal	
	Seal Only—Binder 0·25 gal. per sq. yd.		I.T., Prime and Two Application Seal.		Prime and Seal—Primer 0·20. Seal 0·25 gal. per sq. yd.		¾-in. "E".		⅝-in. "F".		½-in. "G".		⅜-in. "H".		¼-in. "I" and Sand.			
Square yards costed	1,843,131		76,076		4,330,025		743,004		1,569,572		2,207,693		1,945,425		1,279,647		93,812	
	d.	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	d.	%	*d.*	%
Materials	17·1	66·0	33·5	74·8	21·9	62·8	17·8	63·3	17·3	66·3	15·3	68·9	12·3	66·5	9·4	69·1	22·3	67·6
Labour	4·6	17·8	5·2	11·6	6·8	19·5	5·4	19·2	4·7	18·0	3·7	16·7	3·3	17·8	2·2	16·2	5·5	16·7
Stores	0·7	2·7	1·0	2·2	1·1	3·1	0·8	2·9	0·7	2·7	0·5	2·2	0·5	2·7	0·4	2·9	0·9	2·7
Plant Hire	3·5	13·5	5·1	11·4	5·1	14·6	4·1	14·6	3·4	13·0	2·7	12·2	2·4	13·0	1·6	11·8	4·3	13·0
Totals ..	25·9	100	44·8	100	34·9	100	28·1	100	26·1	100	22·2	100	18·5	100	13·6	100	33·0	100

TABLE 14.—DISTRIBUTION OF EXPENDITURE.

Construction Work (excluding Bituminous Surface Treatment Work).

Item.	Financial Year 1954–55.		Financial Year 1955–56.		Financial Year 1956–57.	
	Cost.	Per-centage.	Cost.	Per-centage.	Cost.	Per-centage
	£		£		£	
Plant ..	320,966	39·9	324,247	35·2	211,578	32·6
Labour ..	273,420	34·0	307,126	33·3	207,110	31·9
Materials ..	164,647	20·4	209,715	22·8	173,346	26·6
Stores ..	45,857	5·7	79,773	8·7	57,748	8·9
Total ..	804,890	100·0	920,861	100·0	649,782	100·0

Early impressions are that, although all mixes appear to be reasonably stable, the Mallee sand sections, without the addition of Mallee loam filler, show signs of surface fretting, which may indicate limited durability. The behaviour of the mixtures during summers when high temperatures are experienced in that area has yet to be observed.

Aggregate Supplies.

For some years considerable difficulty has been experienced in securing adequate supplies of crushed material for the use of bituminous treatment work in the north-west and west of the State, that is, in the north-westerly portion of Bendigo division and in the Horsham division. This is partly due to the lack of materials in the area, but also to a shortage of contractors prepared either to crush stone or to treat naturally occurring gravel.

In order to overcome this deficiency the Board has purchased plant over the last few years and has commenced operating on its own account. The first machine to be purchased in this programme was an imported mobile 36 ins. x 22 ins. crusher with an apron feeder and conveyor imported from America. It was intended that this would serve to break down large pieces of rock of the order of 15 ins. to 18 ins. diameter into spalls which could then be fed into 16 ins. x 10 ins. jaw, or other crushers, which are more commonly available. This crusher was sent to Stawell in June, 1955, and has remained there except for repairs at South Melbourne in 1956. It has operated in winter season only, with sprayer crews, producing four to six inch spalls to be subsequently crushed by contract and, in fact, a contract was let but the contractor abandoned his contract after producing only 1,500 cubic yards of screenings.

The second machine was a 30 inches x 15 inches crusher of English manufacture. This was used for substantially the same purpose.

The Board then purchased a complete portable crushing and screening plant which was set up at Stawell, the major items being as follow :—

1. Diesel generating set, 100 kw. with 165 h.p. engine to power a vibrating feeder, water circulation for crusher cooling, all conveyors and screens and tramp metal detector, but not the crushers.

2. Surge bin, 6½ cubic yards capacity with extensions fitted to the sides, increasing the capacity to 15 cubic yards.

3A. Electrical vibrating feeder 24 inches x 48 inches long, with the feed variable from the operating platform.

3B. Electronic tramp metal detector.

4. Belt conveyor 24 inches x 80 feet centres, 17° slope, 7½ h.p. motor, which carried up to about 110 tons per hour on test.

5. Scalping screen 8 feet x 4 feet, top deck 2¼ inches circular hole, bottom deck ⅝-in. square holes, 7½ h.p. motor. Bottom deck was varied from 1 inch down to ⅜-inch square holes.

6. Scalping bin, 12 cubic yard capacity.

7. Secondary crusher, 28-in. gyratory, 9-in. feed opening, ⅝-in. stroke, 1⅛ inches to 1¼ inches closed setting, driven by a diesel engine of 120 h.p. with circulating water cooling from 700-gallon tank.

8. Conveyor, 24 inches x 80 feet centres, 17° slope, 7½ h.p. motor. Carries up to 135 tons per hour as a maximum.

9. Oversize reject screen 12 feet x 5 feet, fitted with a ¾-in. square mesh screen to separate plus ⅝ inch from minus ⅝ inch, 15 h.p. motor.

10. Conveyor, 18 inches x 82 feet 6-in. centres, 17° slope. Oversize return carries up to 55 tons per hour, 5 h.p. motor.

11. Tertiary crusher, 28-in. gyratory, 3-in. feed opening, ½-in. stroke, ½ inch to ⅝ inch closed setting, driven by a diesel of 120 h.p. with circulating water cooling from 700-gallons tank.

12. Conveyor 18 inches x 110 feet centres, 17° slope, 7½ h.p. motor. Has carried up to 74·5 tons per hour when producing ¾-in. "E" aggregate.

13. First sizing screen, 10 feet x 4 feet x 2 deck, 10 h.p. motor, top deck 9/16-in. square mesh to pass ½ inch, bottom 7/16-in. square mesh to pass ⅜-in. material.

14. Belt conveyor, 18 inches x 26 feet centres, 17° slope, 3 h.p. motor carried up to 40 tons per hour on test.

15. Second sizing screen, 10 feet x 4 feet x 2 deck, 10 h.p. motor, top deck 5/16-in. square mesh to pass ¼ inch, bottom deck 5/32-in. square mesh to pass ⅛-in. material.

16. Bins. Capacities—

¾ inch E or ⅝ inch F.	—35	cubic yards.
½ inch G.	—20	,,
⅜ inch H.	—20	,,
¼ inch I.	—20	,,
Dust	—20	,,
Total	105	,,

The spalls produced by the primary crusher are "dozed" from the stock-pile into the surge bin. This method, which at first sight appears to be somewhat crude, was adopted because the spalling crusher was originally set up by itself to produce spalls to be subsequently crushed by contract. The remainder of the plant was added later. Had a complete plant been designed and erected as a unit, provision would have been made for some form of feed to take the spalls directly from the spalling crusher into the surge bin of the secondary crusher except in case of breakdown. It is necessary to have a reserve of crushed spalls which can be added to, or taken from, if there is any breakdown of plant or other hold-up. A vibratory feeder takes the spalls from the surge bin on to a conveyor over which an electronic detector is fitted to detect tramp iron and stop the conveyor before that reaches the crusher. This has proved of great value. This conveyor discharges on to the 8 feet x 4 feet scalping screen where material minus ⅝ inch or as dictated by feed and weather conditions, is removed and carted to waste. The scalped spalls travel from the screen into the 28-in. secondary crusher, having 9-in. feed opening.

Discharge from this crusher is conveyed to a 12 feet x 5 feet splitting screen where aggregate over ¾ inch is returned to a second 28-in. crusher used as tertiary crusher which has a 3-in. feed opening, whilst the aggregate minus ¾ inch is conveyed to the final screens where it is divided into five sizes.

The output over a period of five months was 200 cubic yards per day. The average per working day was 276 cubic yards. The maximum output of usable aggregate was 380 cubic yards per day.

The stone is quartz-porphyry which has a Los Angeles loss of 16 per cent. containing a high percentage of silica, so that crusher wear is comparatively heavy, the concave segments and mantle on the tertiary crusher having to be changed after 8,000 to 10,000 cubic yards and on the secondary every 14,000 to 16,000 cubic yards. There is also fairly heavy wear on the screens and chutes.

Twenty-eight thousand cubic yards of aggregate was obtained from 36,000 cubic yards of spalls, the percentage of useful output being—

⅝ inch O.S.	.. .. ..	37 per cent.
½ inch O.S.	.. .. ..	24 „
⅜ inch O.S.	.. .. ..	16 „
¼ inch O.S.	.. .. ..	23 „

The plant has worked satisfactorily.

MATERIALS RESEARCH.

During the year an investigation was made into the properties of certain deposits of decomposed basalt which have been used for road construction in the metropolitan area of Melbourne. These deposits contain a certain amount of hard stone, together with decomposed material which usually is highly plastic and may also be contaminated with surface clays during excavation. The investigation indicated that, where care is taken to exclude surface clay and the material is properly compacted under reasonable moisture conditions, the material might be regarded as having a California Bearing Ratio of 6, and for use in private streets should be covered with 8 to 13 inches of better material, depending on the traffic density.

Laboratory staff has been employed outside the laboratory in the supervision of plants manufacturing hot bituminous material, and has gained some insight into the operation of these plants. At the same time and to improve this supervision, a laboratory extraction test is being developed, which is a modification of one recommended by the Road Research Laboratory of Great Britain. It employs pressure filtration, using apparatus which is available commercially, and employs benzol as a solvent. Small quantities of water and methylated spirits are added at one stage to flocculate the filler and thus accelerate filtration. The bitumen content is determined directly by evaporating down an aliquot portion of the solution, and also by difference from the weight of the extracted aggregate.

The Static Cone penetrometer, described in the 40th Annual Report, was rather heavy, and lighter equipment has been designed for these tests. The new apparatus can be lifted by one man. Two sets of static cone penetration equipment are now available, and this should expedite field work and enable pavements to be designed more consistently.

The foundations for the proposed King Street bridge are very deep, particularly in Hanna Street, South Melbourne, and a number of deep cone penetration tests was carried out in the test bores put down. A cone penetrometer using strain gauges for measurement of resistance has been designed, and has been successful in its first trial, apart from some difficulties with waterproofing of the gauges. It is expected that these difficulties can be overcome. The instrument has been operated to a depth of 109 feet.

Further research work has been carried out on those basalts found in the vicinity of Melbourne, which have been found unsuitable for use when crushed to "fine-crushed-rock" on account of a break down of some of the constituent minerals, which has the effect of increasing the plasticity index of the fines beyond the allowable limit.

BRIDGES.

Prestressed Concrete.

The 43rd Annual Report described progress which had been made in developing prestressed precast slabs of 15 feet span. During the last year further developmental work was carried out, and slabs of 20 feet span are now to be made, while the design work and investigation for longer spans is in progress. These innovations should have many applications throughout Victoria.

In addition to this, work is being done in preparing specifications for the design and construction of pre-stressed concrete bridges, but progress has been hampered by the pressure of current work and some shortages of staff.

Clifton Hill Overpass.

During the year considerable progress has been made towards the completion of the overpass and grade separation at the Clifton Hill railway gates, whereby east-west traffic will pass over a north-south road, Hoddle Street and the Clifton Hill railway line, while provision will be made for north bound traffic in Hoddle Street wishing to make a right hand turn easterly to Heidelberg to do so by means of a circular ramp. This will be the first structure of this complex kind to be erected in Victoria.

King Street Bridge.

During the year, tenders were invited for the design and construction of a bridge over the Yarra at King Street, together with a viaduct along Hanna Street over City Road. As the Government was anxious that work on the bridge should be commenced as early as possible, and as the Board's staff was unable to prepare quickly complete detailed designs on which a bulk sum tender could be lodged in the time available, it was decided to prepare only an outline design giving limitations of grades, clearances, &c., and an extensive design specification, so that tenderers could prepare their own designs on which to tender. It was realized that the cost of a complete detailed design upon which a bulk sum tender could be submitted with confidence would be so high that few, if any, tenders would be received. It was decided, therefore, to invite tenders on the basis of an approximate design only. Accordingly, the specification provided that the bulk of the work would be paid for on a Schedule of Rates basis with a proviso that the total amount which would be ultimately paid in respect of any item, would not exceed the amount shown in the tender for that item, by more than 5 per cent. In addition to these schedule items which comprised the bulk of the tender, there were certain bulk sum items against which the contractor had to put his own price, and also a few prime cost items on which a given amount had to be shown in the tender, but for which the contractor would be paid for the actual amount of work directed by the Board.

The contract was advertised throughout the world, plans and specifications being made available in Great Britain and the U.S.A., and in order that prospective tenderers might be informed as fully as possible of what was required, the Engineer for Bridges and the Senior Design Engineer, Messrs. C. A. Masterton, M.C.E., A.M.I.E. Aust., and C. A. Wilson, B.C.E., A.M.I.E. Aust., were sent overseas, in order to confer with tenderers

When tenders closed on the 29th January, fourteen tenders together with one offer were received from seven companies, one being incorporated in America and the remainder registered in Victoria. The designs on which these tenders were based were prepared by consulting engineers in Victoria, New South Wales, America, the United Kingdom, and Germany.

The analysis of these tenders was a somewhat lengthy job, and the Government subsequently adopted the Board's recommendation and authorized the Board to accept the tender of Utah Australia Ltd. The total of the items in the schedule is £2,374,360, but the actual cost will be different for the reasons mentioned above. It is interesting to note that the design on which the accepted tender was based, was prepared by a company formed specifically for the purpose, comprised of a number of Melbourne consulting engineers and architects.

The estimated cost of the whole work, including land purchase, adjustment of services, &c., is of the order of £3,700,000, and it is interesting to note that this figure is only 7½ per cent. above the estimate submitted by the Board to the Government in 1955. Since that time costs generally have increased by more than 7½ per cent.

CEMENT STABILIZATION.

During the year it was considered advisable to reconstruct short sections of the Hume Highway and of the Western Highway by stabilizing existing materials with cement. In the first case, the local sand was not thought adequate in itself for the highway traffic and so had 4 per cent. of cement mixed with it; while on the Western Highway where two miles of sealed pavement constructed of sandstone, had failed, the existing surface was scarified so as to incorporate the plant mix seal with the sandstone, and the whole stabilized with 3 per cent. of cement by weight.

Details of the work on the Hume Highway are as follow:—

South of Creighton's Creek—

86·9–87·5 miles—6 inches sand *ex* Griffith's pit, stabilized 25 feet wide.

North of Creighton's Creek—

87·7–88·6 miles—6 inches sand (3 inches *ex* Griffith's pit, 3 inches *ex* Tubb's Hill), stabilized 25 feet wide.

88·6–88·7 miles—6 inches sand, *ex* Griffith's pit, outside 5 feet edges only of 25 feet pavement stabilized.

The total cost of the work on the Hume Highway was 8s. 3d. per square yard, of which the sand itself cost about 24 per cent., the cement 38 per cent., whilst spreading the cement, processing, rolling, watering, and grading and the necessary supervision amounted to 38 per cent.

The following procedure was adopted in carrying out this work:—

1. The surface was graded and prepared in advance to the same standard as for preparation prior to sealing.

2. The section was marked out in 5-ft. lanes 500 feet to 800 feet long, and cement spread by hand and levelled with rakes and brooms. No tyning was necessary.

3. Stabilizing.—After the cement was spread in the first lane, that lane was stabilized with one pass of a "P. & H." stabilizer.

4. Rolling.—As soon as the first lane was stabilized, rolling on that lane commenced, the rollers following the stabilizer as closely as possible. During rolling operations the surface was kept damp by lightly watering with a water cart.

5. Traffic.—The traffic was controlled by flagmen at either end of the job, and was allowed on to the completed work as soon as initial rolling had been carried out.

6. Finishing.—Several methods of grading for surface finish were tried. The most satisfactory for this material was as follows:—

   (*a*) During rolling operations the grader was used as a heavy planer, but no attempt was made to form the crown on the road.

   (*b*) As soon as rolling was finished the road was shaped by grading once across the road and then back again, the final cut being to waste. Light watering was generally necessary during this operation. The rollers followed the grader on the return trip across the pavement.

   (*c*) The following morning, the section was again watered and a light cut made to waste, to remove small surface irregularities.

7. Curing.—The surface was kept damp until it was primed and sealed.

The "P. & H." machine is not symmetrical as regards the operator's seat and controls, and it is thought that the technique could have been improved by commencing at the right-hand side of the road and working towards the left, rather than the reverse, as that would enable the rollers to get onto the job earlier, and so improve the consolidation and facilitate grading. Also, the method of compaction and surface finishing could be improved with the use of vibrating rollers, cylindrical steel rollers, and/or very heavy pneumatic tyred rollers. Cross rolling of high spots would possibly avoid cutting of appreciable percentage of the material to waste. Alternatively, a three-axle "tandem" roller, if used, would probably be just as effective and simpler than cross rolling.

The work on the Western Highway cost about 6s. per square yard, excluding sealing, but neglecting the pavement material itself which was already in position.

PUBLICATIONS.

Engineering Papers

During the year the following papers were presented by members of the staff:—

Paper.	Author.
Traffic Engineering Functions in the U.S.A. (Paper read at the Melbourne Division of the Australian Planning Institute, February 11th 1957.)	H. P. George, A.M.I.E. (Aust.), M.S.E., F.A.P.I., A.M.I.T. (Lond.), Cert. H.T. (Yale).
Traffic Behaviour and Road Capacity Study. (Paper presented to the 10th Congress of Permanent International Association of Road Congresses at Istanbul, Turkey, Sept. 1955.)	
Development Design in Bridge Practice. (Paper in Commonwealth Engineer, Vol. 44, No. 9, pages 79–81, April 1957.)	C. A. Masterton, M.C.E., A.M.I.E. (Aust.), M.S.E.
Some Phases of Road Research in Australia. (Paper in Institution of Engineers Australia Journal, Vol. 29, No. 1, pages 13–20, January, 1957.)	A. H. Gawith, M.C.E., A.M.I.E. (Aust). in conjunction with T.M. Coulter, B.C.E., Dept. of Main Roads, N.S.W.
Functions of the Traffic Engineer in Highway Planning. (Paper presented to Institution of Engineers Australia, Melbourne Division, 28th September, 1956.)	R. T. Underwood, Dip. C.E. Dip. Elec.E., Dip. M.E., D.T.R.P., M.A.P.I.
Roadside Trees. (Paper in Conservation News, November 1956, page 4. Repeated in Municipal Journal, Vol. 36, No. 658, pages 212–215, December, 1956.)	J. R. Joyce, Supervising Engineer.

Engineering Circulars

The following Research Memorandum, Technical Bulletin and Engineering Notes were issue during the year:—

No.	Title.	Date of Issue.
	Research Memorandum.	
13	Tentative Warrants for the Installation of Pedestrian Crossings.	March, 1957
	Technical Bulletin.	
14	Estimation of Annual Average Daily Traffic from 12 hour Random Counts.	October, 1956
	Engineering Notes.	
59	Removal of Bitumen and Tar from Paintwork of Motor Cars.	April, 1957
60	Condensed General Conditions of Contract.	June, 1957

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