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VICTORIA

COUNTRY ROADS BOARD.

TWENTY-EIGHTH ANNUAL REPORT

FOR YEAR ENDED 30TH JUNE, 1941.

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

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COUNTRY ROADS BOARD.

TWENTY-EIGHTH ANNUAL REPORT.

Exhibition Buildings,
Carlton, N.3.

13th November, 1941.

*The Honorable Sir George Goudie, K.B., M.L.C.,
Minister of Public Works,
Melbourne.*

SIR,

In accordance with the requirements of section 96 of the Country Roads Act (No. 3662), the Board has the honour to submit to you, for presentation to Parliament, the report of its proceedings for the year ended 30th June, 1941.

This Report, as compared with those of previous years, has been considerably curtailed, with a view to assisting in the Commonwealth war effort in economizing in the use of paper.

FINANCE.

The gross revenue derived from motor registration fees and paid into the Country Roads Board Fund was £1,804,139, as compared with £1,862,930 during the previous year, a decrease of £58,791, whilst the amount received under the Federal Aid Roads and Works Agreement was £541,723, as against £715,951 for the year ended 30th June, 1940. The total decrease in both sources of revenue was, therefore, £233,019.

Loan expenditure, under Acts Nos. 4188, 4414, and 4498, on metropolitan roads was £575. Of the total authorization of £500,000 under the Acts mentioned, a balance of £246,742 remained as at the 30th June, 1941.

The total cost of maintenance of State highways, main roads, tourists' roads, and Murray River bridges was £1,013,511 for the year, compared with £1,170,886 during the previous year, a decrease of £157,375.

From the amount of £541,723, received under the Federal Aid Roads and Works Agreement, £80,768 was expended on main roads, £251,876 on works of a developmental character, £14,187 on construction of tourists' roads, and the balance of £122,814 on maintaining roads previously constructed from Federal Aid Funds, restoring and rebuilding bridges, and assisting municipalities in the maintenance of main and developmental roads constructed from loan and Federal funds, and Unemployment Relief Funds provided by the Government.

For the maintenance and repair of public roads adjoining or approaching properties of the Commonwealth Government, within the State of Victoria, a sum of £7,500 was made available under the Federal Aid Roads and Works Agreement, together with an amount of £3,588 brought forward to the financial year 1940-41. £8,646 was expended, and £2,447 carried forward to the next financial year.

From Unemployment Relief Funds, provided by the State Government, construction works were completed and put in hand during the year. The sum provided by the Government was £2,000 which was supplemented by an amount of £3,891 from Federal Aid Funds. The total amount expended during the twelve months was £9,427, including £5,670 brought forward from the previous year. £2,134 was carried forward to the next financial year.

The works carried out by the Board, on behalf of the Commonwealth Government to meet defence requirements, involved an expenditure of £270,847 to the 30th June. £21,392 was also expended over the same period from the balance of the unemployment relief grant made by the Commonwealth Government.

With the early announcement by the Federal Government, before the beginning of last financial year of its intention to introduce petrol rationing in Australia, considerable difficulty was experienced by the Board in forecasting with any degree of accuracy its financial position for the twelve months.

On the rationing scheme being put into operation in October, 1940, and the announcement towards the end of the financial year of further petrol restrictions in respect of private motor vehicles as from the 1st July, 1941, the revenue of the Board both from the amount received under the Federal Aid Roads and Works Agreement and from motor registration fees was, as a matter of course, affected.

When allocating funds at the commencement of the year from the Country Roads Board Fund for declared main roads, State highways, and tourists' roads, the Board made provision merely for commitments, works of maintenance, including necessary reconstruction, and the replacement of structures which a recent survey had shown were in poor condition. As estimates disclosed that the amount available would be inadequate for ordinary maintenance after providing for commitments from the previous year and for payment of interest and sinking fund, it was found necessary to supplement to a greater extent than formerly the amount available from the Country Roads Board Fund from moneys available under the Federal Aid Roads and Works Agreement.

Towards the end of the financial year, however, it was found that much work for which provision had been made had been held up, partly owing to the enlistment of municipal engineers in the A.I.F. or to their absence on military duties. The Board's own staff was also seriously depleted by enlistments and military activities, and the Board carried out a large amount of work for the Defence Authorities, which naturally took precedence over normal work. A substantial amount of work for which funds were provided could not, therefore, be put in hand.

In addition, only 62 per cent. of the quantities of bitumen contracted for during the year were received, necessitating the use of the whole of the reserves of bitumen amounting to some 3,000 tons, in order to carry out urgent maintenance sealing. Had the contract quantities been supplied an expenditure of approximately £70,000 would have been involved.

Under the circumstances, there was a balance of funds at the end of the financial year, most of which, however, was committed for necessary works for which provision had to be made during the current year.

STATE HIGHWAYS.

General maintenance of State highways by constant patrolling was carried out over a distance of 2,809 miles at a cost of £118,793. In addition some urgent reconstruction only was carried out. Owing to the war situation considerable difficulties were met with in obtaining adequate supplies of bitumen, and, since the beginning of the war, the Board, therefore, has almost entirely suspended its programme of extending surface sealing and has concentrated on the maintenance of those highways already sealed. The sealing of only short sections requiring urgent attention was completed over a total length of 51 miles, whilst resealing was carried out over a length of 300 miles.

As the State highways are the important traffic arteries of the State, every endeavour has been made to ensure satisfactory maintenance and to facilitate the uninterrupted flow of traffic, both military and civil. Included in the maintenance programme was the important work of checking erosion on the roadsides, particularly on sections of the Calder, Hume, and Murray Valley Highways.

Reconstruction works, including the restoration of existing bridges and the replacement of worn out structures, were carried out on sections of highways where such works became an urgent necessity. The lengths of highways dealt with totalled 46 miles as compared with 108 miles during last year.

On the 30th June last, 2,810 miles of State highways had been declared, an addition of 173 miles to the mileage of previous years.

MAIN ROADS.

The restricted funds available for new construction works during last year were expended on the extension of works which formed part of the previous year's programme, the linking up of sections already constructed, the completion of works already commenced, and the erection of new bridges to replace worn-out structures. The total cost was £98,866.

Funds for these works were derived from Federal grant sources, and the amounts were generally supplemented by municipal councils.

The expenditure incurred on the maintenance, improvement, and reconditioning of 8,484 miles of declared main roads amounted to £632,096 for the year, for which provision of £585,596 was made from the Country Roads Board Fund, and £46,500 from funds under the Federal Aid Roads Agreement. This work was carried out generally by municipal councils, but, in accordance with the established practice, the Board undertook the maintenance of certain through roads, which carry traffic not of local origin, previously reconstructed or restored on behalf of the councils from either loan or Federal Aid Funds.

Owing to the difficulty in securing adequate bitumen supplies, it was necessary to hold over the sealing of many roads which in the ordinary course would have been treated as extensions of previous work. To preserve existing assets a programme of resealing was carried out over a total length of 414 miles, and first seals were confined to urgent lengths totalling 81 miles.

Improvement and reconstruction works on many of the important main roads were carried out to safely meet emergency conditions. Many bridges and sections of roads, which under normal conditions, would have met the requirements of traffic for some time were restored and strengthened. The Commonwealth Government has contributed and is still contributing towards the cost of reconstruction and maintenance in cases where the works have been primarily for military traffic.

Several main roads in remote and mountainous parts of the State have been maintained by the Board for some years past. These roads, which are as important as many of the declared main roads, traverse Crown lands or forest areas from which little or no rates are derived by the municipalities. In the national interest it is necessary to maintain them in a reasonable state of repair and funds for their maintenance have been provided from Federal-aid sources. The amount expended last year was £14,739.

During last year, a total of £8,207 was expended from the Country Roads Board Fund on the maintenance, improvement, and reconditioning of roads and bridges in the metropolitan area.

A number of roads, on which a large expenditure had been incurred either from loan funds or from Federal sources and which, by reason of the growth of traffic, had become important arteries, were declared main roads under the provisions of the Country Roads Act, so that, in future, the councils concerned will be assisted in the maintenance of these roads by the provision of funds from year to year on a contributory basis, as laid down in the Act. The total length so declared was 1,529 miles.

DEVELOPMENTAL ROADS.

Since the Federal Aid Roads Agreement came into force, works have been extended with Federal-aid funds, on roads not included in the system of roads constructed and maintained under the provisions of the Country Roads Act. In addition, large sums of money have been provided from loan sources by successive Governments for constructing developmental roads declared under the provisions of the *Developmental Roads Act* 1918, the maintenance of which is a statutory obligation devolving on the municipalities.

Assistance has been given to the municipalities from time to time for the maintenance of the more important of these roads, but it has been realized by the Board for some time past that in some cases adequate maintenance is not being carried out by the municipalities, and where councils have endeavoured to carry out maintenance the cost has gradually become a serious burden to them. It is obvious to the Board, however, that assistance must be given to the municipalities to preserve assets which have been created at considerable cost to the State.

In order to meet the position, funds were allocated towards the maintenance of certain of these roads from moneys available under the Federal Aid Roads Agreement, in preference to continuing the system of extensive new construction works from that source, and an allocation totalling £25,000 was made in January last for the maintenance of certain developmental roads during the balance of the financial year, on the basis of the councils supplementing the amount by one-half from their own funds. To assist municipalities in the north-western area of the State where drought conditions persisted over a long period, special allocations were made during the year for the supply of maintenance materials, without contribution from the councils.

Fifty-three bridges were erected on developmental roads to replace old structures. The total cost incurred during the year on new bridges, and repairing and restoring old structures was £17,017.

The expenditure from the Board's funds during last year on the construction of urgent sections of developmental roads, excluding roads to isolated farms was £216,311, of which £99,711 was carried forward from the previous year. £52,109 was expended on maintenance. In addition, a total amount of £62,333 was contributed by municipal councils.

FEDERAL AID ROADS.

During the year the sum of £541,723 was made available to the State under the Federal Aid Roads and Works Agreement, which was supplemented by an amount of £57,217 brought forward from the previous year. An expenditure of £469,645 was incurred, £251,876 on the construction of roads of a developmental nature, including roads to isolated farms, £80,768 on the improvement of main traffic roads and restoration of bridges, £14,187 on the construction of tourists' roads, and £122,814 in assisting councils to maintain roads previously constructed from loan funds or from moneys provided under the Federal Aid Roads and Works Agreement, and from Unemployment Relief Funds.

Commitments, totalling £129,295, were carried forward to the financial year 1941-42.

From the proceeds of one-twelfth of the extra $\frac{1}{2}$ d. per gallon customs duty on petrol which may be expended on the maintenance and repair of roads adjoining or abutting properties of the Commonwealth, £8,646 was spent during the year.

DEFENCE WORKS.

During the past year the Board continued in close co-operation with the Commonwealth Government in carrying out a large number of works comprising the construction and sealing of roads to and inside training camps and aerodromes, building of runways, &c., inside aerodromes, construction and reconstruction of bridges, laying of footpaths, and levelling and preparation of land to meet defence requirements.

A total length of 32·2 miles of roads was constructed during the year, 29·8 miles were reconstructed to carry increased traffic, considerable areas were paved, and landing grounds and footpaths constructed. The expenditure on roads constructed on behalf of the Commonwealth Government was £270,847 for the year, the money being provided directly by the Commonwealth Government as the works progressed. In addition, the sum of £21,392 was expended from the balance of the unemployment relief grant provided by the Commonwealth Government in 1939.

BRIDGES.

Prior to the commencement of the financial year 2,647 bridges had been completed by municipal councils and the Board. During last year 109 bridges were erected or in course of erection. Fifty-five were erected under the direct supervision of the Board and 54 by municipal councils.

A preliminary survey of the State highway and main road bridges disclosed that many structures were nearing the end of their useful life, necessitating the restriction of loads carried over them. Many of these old bridges which have given good service over a period of from 50 to 70 years will have to be replaced in the near future.

The Board, therefore, appointed a specially qualified Bridge Inspector, to examine bridges in detail and report on their condition. As a result of the inspections, the Board will be enabled to make a classification of all structures with a view to an intelligent programme of replacement and maintenance being formulated and implemented when suitable manpower and materials, now largely required for the national war effort, can be made available.

The total sum expended on new structures and in repairing and restoring existing structures was £88,229 for the year.

ISOLATED SETTLERS ROADS.

In the year under review, provision of £31,024 was made for the construction of new roads to farms isolated from the main road system. In accordance with the usual practice all allocations were made for constructing roads to a light standard capable of carrying the limited traffic using them, with a view to affording relief in the most necessitous cases. An expenditure of £37,750 including an amount of £19,824 brought forward from the previous year, was incurred, which was supplemented by a contribution of 10 per cent. from the Councils concerned.

Six hundred and forty-two roads were constructed or partially constructed to the 30th June.

TOURISTS' ROADS.

The work done on proclaimed tourists' roads comprised reconstruction and maintenance and erection of new bridges at a total cost of £51,395 for the twelve months. £39,374 was provided from the Country Roads Board Fund and £12,021 from Federal Aid funds. Maintenance by patrolmen was carried out over the full length of these roads.

Four new bridges comprising a five-span timber bridge and three small timber bridges were erected on the Grampians-road at a total cost of £5,076.

During last year the road extending from the junction of the Main Coast Road near the Anderson railway station to San Remo in the Shire of Bass and thence across the new bridge at San Remo to Cowes in the Shire of Phillip Island was declared a tourists' road under the provisions of the Tourists' Roads Act No. 4405. The total length of tourists' roads proclaimed under the Act is now 392 miles.

OFFENCES UNDER ACTS AFFECTING THE BOARD.

Under the provisions of the Motor Car Act a number of offenders was proceeded against for exceeding the limits allowed in respect of weight and speed for motor cars carrying goods for hire or in course of trade, on State highways and main roads. Fines amounting to £2,632 were imposed in 368 cases for travelling at speeds in excess of the limits allowed and in 473 instances for carrying weights in excess of those permitted under the Act.

Four drivers were also convicted for carrying on their vehicles loads in excess of the regulation width. One hundred and forty-eight persons were prosecuted and fined for allowing stock to wander unattended on State highways and three were fined for carting timber over roads which had been closed to that class of traffic, without the necessary permit.

30 prosecutions were launched against drivers of motor vehicles for crossing double traffic lines on State highways and main roads and fines and costs totalling £88 were imposed.

The total number of prosecutions for all offences under Acts administered by the Board during the year was 1,054. The total fines imposed amounted to £3,008 and costs to £209.

Eight hundred and seventy-four cattle, horses, and sheep which were found wandering on State highways were impounded during the year.

RESEARCH WORK.

It was not possible to commence any further research work during the year, owing to lack of staff and difficulties in obtaining any special apparatus required. Consequently the testing undertaken was almost entirely of a routine type. The following summary gives the number of laboratory tests carried out during the year:—

	Number of Samples.	Number of Tests.
Soil, gravel, concrete aggregate	990	1,400 approximate.
Bituminous and tarry materials	214	549
Lubricating oil	16	48
Traffic marking lacquer	30	95
Miscellaneous	10	40
Total	1,260	2,132

MUNICIPAL ENGINEERS' CONFERENCE.

In November last a well-attended conference between Municipal Engineers and the Board was officially opened by the Hon. Sir George Goudie, M.L.C., Minister of Public Works.

The conference, at which the Board's Engineers were also present, was convened to discuss technical and administrative matters with a view to effecting any possible improvements both in the technique of road construction and in administrative methods.

It is felt that the conference served an extremely useful purpose and will materially assist to secure closer co-operation between Municipal Engineers and the Board. In view of the success of the initial meeting, it is proposed to hold a similar conference annually.

GAS PRODUCER VEHICLES.

Prior to April, 1941, the Board had fitted gas producers to three rollers, four trucks and the Mercury car used by the Board, to test the suitability of the units.

Following an instruction from the State Government last financial year that 10 per cent. of the motor trucks operated by each State instrumentality be fitted with approved types of gas producer units, with a view to affecting economies in the consumption of motor spirit, the

Board collaborated with the State Producer Gas Committee. Arrangements were made to fit additional units to seven trucks and one car and contracts have recently been let for the fitting of producers to six additional trucks and nine cars which are required to cover considerable mileages annually. On completion of these contracts 26 per cent. of the Board's fleet will have been fitted with producer gas units.

A selection of different makes of producers has been made with a view to a comparison of the effectiveness of each unit.

The problem of preventing the spread of grass and bush fires through live coals from gas producers being deposited along the roads is receiving the attention of the Police, and regulations have, it is understood, been drafted to deal with this matter.

AMENDING LEGISLATION.

Country Roads Board Fund Act 1940 (No. 4752).

Provision is made in this Act for:—

- (1) Fees for licences to drive motor cars under the Motor Car Act during the financial year 1940-41 not to be paid into the Country Roads Board Fund.
- (2) Suspension of annual payment of £50,000 from consolidated revenue into the Country Roads Board Fund for the year 1940-41.

Under the original Act £10,000 of the above amount was to be used for the maintenance of main roads and State highways, and £40,000 for distribution amongst certain municipalities towards construction, renewal, and maintenance, &c., of streets and roads.

ACCOUNTS.

Statement of accounts for the year ended 30th June, 1941, of the Country Roads Board Fund and balance sheets as at that date appear in appendix.

The following statement shows the expenditure on road construction, maintenance, &c., from funds provided by the Government and from moneys at the disposal of the Board, including expenditure under special appropriations:—

	Under Board's Supervision.			Under Council's Supervision.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.
1. State Highways—									
Maintenance and reconditioning	335,034	8	1	57,475	18	7	392,510	6	8
2. Main Roads—									
Construction and restoration	£81,343	6	3						
Maintenance and reconditioning	£646,835	17	0	77,236	9	0	650,942	14	3
3. Developmental Roads—									
Construction, maintenance	£266,673	6	11						
Roads for isolated settlers	£37,311	16	8	36,217	18	6	267,767	5	1
4. State Unemployment Relief Works—									
Main and Developmental Roads, &c.				1,028	9	8	3,842	11	6
5. Tourists' Roads—									
Construction	£14,186	16	3						
Maintenance and reconditioning	£41,201	8	5	48,159	13	9	7,228	10	11
6. Murray River Bridges and Punts—									
Maintenance				3,327	4	9	341	5	9
7. Roads adjoining Commonwealth Properties—									
Maintenance				8,588	16	2	57	12	6
8. Commonwealth Defence Works (Unemployment Relief)—									
Construction and reconstruction				21,091	2	3	301	6	8
Totals	530,684	2	2	987,957	5	3	1,518,641	7	5

APPORTIONMENT OF COSTS.

In accordance with the provisions of Section 287 of the *Country Roads Act 1928*, the cost of permanent works and maintenance was apportioned for the year ended 30th June, 1940. £534 was apportioned to municipalities in respect of permanent works and £163,619 on account of maintenance.

There were no arrears of contribution at the 30th June last, every Council having paid the amount owing by it.

MOTOR REGISTRATION.

During the year a total of 262,643 motor vehicles, including traction engines and motor cycles were registered.

The number of motor vehicles of various classes registered over the past two financial years, as set out in the following comparisons of statements furnished by the Motor Registration Branch shows a nett decrease of 9,383 in the figures of last financial year:—

Vehicles.	Financial year 1939-40.		Financial year 1940-41.		Increase.	Decrease.
Private—						
New	10,972		4,944		..	6,028
Secondhand—re-registered renewals	14,512		14,627		115	..
	128,495	153,979	126,336	145,907	..	2,159
Commercial—						
New	3,467		2,142		..	1,325
Secondhand—re-registered renewals	3,498		3,258		..	240
	27,626	34,591	29,401	34,801	1,775	..
Primary Producers—						
New	2,281		882		..	1,399
Secondhand—re-registered renewals	3,661		3,263		..	398
	43,607	49,549	45,150	49,295	1,543	..
Hire		2,358		2,530	172	..
Licensed under Omnibus Act		435		629	194	..
Trailers		5,132		5,620	488	..
Traction Engines, &c.		220		289	69	..
Motor Cycles		25,765		23,572	..	2,193
Total		272,029		262,643	4,356	13,742

ENLISTMENTS AND WAR WORK.

Due to enlistments in the Navy, Army, and Air Force, the calling up of trainees for national service and the transfer of a number of technical officers to Defence Departments, a strain was placed on the Board's staff. The Board desires to express its appreciation of the efforts of the staff in carrying on under considerable difficulties, involving much overtime and close concentration. Notwithstanding that the Board's normal programme of work has been considerably reduced, the diminution in the programme was offset to a large extent by the large volume of defence works carried out on behalf of the Commonwealth Government.

The total number of officers and employees of the Board who had enlisted for active service abroad with the second A.I.F., R.A.A.F., and Naval Forces was 235.

EMERGENCY STORAGE FOR GOVERNMENT RECORDS.

Following an instruction of the State Government that a survey be made regarding the storage in safe areas in case of a national emergency of valuable, irreplaceable and other records, satisfactory arrangements have already been made by the Board to carry out its own micro-photographic work as far as its record plans are concerned.

The work done indicates that the system adopted will be a marked success and when fully developed will give every satisfaction.

Plans for additional fire-proof storage accommodation which are now in hand will be completed at an early date.

DEATH OF MR. N. S. BISSET.

The death of Mr. N. S. Bisset, Assistant-Accountant to the Board, terminated the career of a valued and conscientious officer who had been on the staff of the Board for a period of fifteen years, first as a clerk and later as Assistant-Accountant.

The passing of Mr. Bisset is deeply regretted by the Members and officers of the Board.

We have the honour to be, Sir,

Your Obedient Servants,

L. F. LODER, Chairman.

W. L. DALE, Member.

F. M. CORRIGAN, Member.

R. JANSEN,
Secretary.

CHIEF ENGINEER'S REPORT.

Country Roads Board Office,
Melbourne,
7th November, 1941.

THE CHAIRMAN,
Sir,

I have the honour to submit brief particulars of items of special engineering interest in the works carried out by the Board during the financial year.

Although there was no normal programme of road construction, maintenance problems required close attention of a depleted engineering staff. In many municipalities controlling the main road system the position was similar, and their engineers together with the Board's Senior and Divisional Engineers and their assistants have had a particularly strenuous year in adjusting and co-ordinating maintenance programmes to meet changing conditions. The conference of engineers concerned convened by the Board was of special assistance in this matter.

Simultaneously with this road maintenance work the Board's engineering staff has had direct control over a large number of projects for Commonwealth Departments. These construction works have generally been of types similar to various road and bridge building operations, and familiar principles and methods could thus be rapidly applied to such works. All the Board's construction plant, and a good deal of hired plant has been fully employed. On many jobs overtime has been worked, and the officers and employees concerned have given of their best to ensure rapid construction and to surmount the numerous special difficulties arising, and to secure due economy in cost and effort.

ROAD MAINTENANCE.

Owing to petrol rationing, traffic on many routes was reduced, especially since last summer. However, in the winter of 1941 rains, although not of abnormal intensities, were very frequent. Thus subgrades have become and remained very wet, and many weak places have developed in all types of roads. For this and other reasons it has been impossible to keep a standard of maintenance above that just necessary for safety of traffic. The Board and the municipalities have not always been able to arrange for desirable re-sheeting of waterbound types of surface, and some loss of thickness has undoubtedly occurred on many main roads.

On main roads in recent years normal re-treatment of bituminous surfaces has often been postponed in favour of desirable extensions of the "black" surfacing, whilst on State Highways (which are generally subject to heavier and denser traffic) re-treatment has perforce more nearly kept pace with the wear of the seal coats and the natural slow deterioration of the bituminous binder. Now, however, extension of bituminous seal coats has ceased except on a few sections, e.g., where with dense traffic elimination of dust was essential to safety, or where short gaps in otherwise "black" roads required to be sealed. The preservation of the asset of existing black roads became the chief consideration in allotting existing stocks of bitumen and any new supplies received. Some details of the consequent surface treatment programme are given later. It will be noted that simple re-sealing by relatively light applications of bitumen and aggregate has been widely adopted, the rates of application varying from 0.10 to 0.25 of a gallon per square yard with the state of the existing surface or the structural condition of the pavement.

SUBGRADES.

Continued use has been made of simplified soil tests in classifying and predicting the general behaviour of

subgrade materials with a view to designing suitable types of drainage or, by reference to previous experience with similar material, choosing suitable pavement thickness in given conditions.

These problems have arisen especially in the construction of aeroplane runways and aprons around hangars.

Such paved areas are much larger than in ordinary road construction, and the run-off from them is correspondingly large. To protect the subgrades either from percolation through any cracks which may form in the pavement or from soakage under the margins of the pavements, drainage systems have been deemed to be especially important. On plastic subgrades a layer of porous material, e.g., cinders or sand in conjunction with small tile drains have usually been used under the pavements and larger drains placed around the margins generally in trenches filled with 2-in. metal, while where justified open concrete marginal drains with gratings have been adopted.

The types of wheel load and the frequency of load applications are both different from those current with motor vehicle traffic. Whilst, therefore, the principles of road construction are applicable, much investigation is required before the thickness of runway pavements can be designed with confidence. It is certain, however, that the supporting capacity of plastic subgrades is reduced very rapidly by increase of moisture content, and therefore measures to prevent wetting of the subgrade are essential. Besides the provision of drainage, compaction of the subgrade itself and of the pavement over it is most important.

In one locality the recent winter conditions have exposed in timely manner a natural structural weakness in the subgrade which would have passed unnoticed had work been begun in the summer. At a depth of 1 to 2 feet there is stiff clay, and the surface soil is slightly plastic silty loam. Lenticular masses of loose "buckshot" ferruginous gravel exist at close intervals resting on the clay. The surface is generally flat and water therefore readily accumulates in the gravel and is held there in the natural basins of impervious clay. In the summer the surface loam is firm, and quite heavy loads are supported by the system of materials. When the gravel is full of water the loam behaves like a quicksand under even light loads. On this "crabhole" country formation work and compaction of surfacing materials were therefore impossible in winter. It has been necessary to loosen and mix the loam and gravel down to the surface of the clay, generally including some of the latter to a depth of about 2 feet, and to re-compact the mixed material to the desired subgrade contour, using a "sheepsfoot" roller. In this way a bad subgrade is converted into an exceptionally good one.

The tamping rollers available have been in constant use on subgrade compaction all the year in various special works where it was essential to secure as firm a foundation as possible and to get it as quickly as possible.

In various localities tests of field density attained have been compared with Proctor optimum density, and in view of the general necessity of working without much control of moisture and at moistures less than the optimum (so as to avoid delay from bogging the equipment in wet weather) the use of heavy tamping rollers as used in earth dam construction in the United States of America has proved beneficial and generally gives a high relative density. The experience gained with tamping rollers will be of great value when road construction and re-construction is resumed.

GRAVEL.

Natural gravel and fine crushed rock form the bulk of the road pavements in Victoria. The behaviour of the materials, whether sealed or maintained with water-bound surfaces is thus of very great importance. As wastage of material where the road is unsealed is unavoidable and as sealing has stopped for the present, it has become especially necessary to develop and adopt such methods of testing, selecting, and improving gravels, and of compacting and maintaining gravel pavements as will reduce the loss to a minimum. Information about this derived from various overseas sources and from the Board's investigations has been made available to engineers throughout the State during the year.

For gravel used in re-sheeting and patching, tests of grading and binding value are in use, to enable pits to be worked to the best advantage within the limitations of materials available therein. The Board's standard specifications provide for insertion by engineers of limits for grading and plasticity index. These should be fixed by reference to previous behaviour or from special trials, but as gravel pits generally contain irregular layers of different materials, constant vigilance is also necessary to secure a uniform product of the desired characteristics.

Where mixing of materials is necessary the same tests have been availed of very freely by the engineers of the Board and municipalities as a guide to the field work.

Numerous similar tests have also been made in the Board's laboratory to assist in the examination of local materials in various airport surfaces, either under construction by the Board in Victoria or under investigation elsewhere in the Commonwealth.

BITUMINOUS SURFACE TREATMENT.

1. TYPE OF WORK CARRIED OUT.

During the year on all works carried out under the Board's supervision some 10,623 tons of bitumen were used. Table A gives the total mileage of each type of work carried out on C.R.B. roads for the five-year period 1935-36 to 1939-40 for comparison with the work carried out on these roads during 1940-41. The change to a high proportion of re-treatment, as mentioned earlier, is clearly shown. The gradings of aggregates and the types and viscosities of binder were generally the same as detailed in last annual report.

TABLE A.—TOTAL MILES OF WORK ON C.R.B. ROADS CARRIED OUT BY BOTH C.R.B. AND MUNICIPALLY-OWNED PLANT.

Season.	Miles of Work.					Grand Total.
	New Work.	Re-treatments.				
		First Seals.	Reseals.	R.M.S.	P.M.S.		Total.
1935-36 ..	466.4	10.2	350.9	8.8	369.9	836.3
1936-37 ..	522.9	3.5	316.7	17.8	338.0	860.9
1937-38 ..	591.2	35.8	286.1	..	321.9	913.3
1938-39 ..	595.2	..	246.3	45.9	292.2	887.4
1939-40 ..	332.1	252.3	105.2	37.6	395.1	727.2
1940-41 ..	147.8	429.5	253.1	43.8	726.4	874.2

2. PLANT DEVELOPMENT.

Contracts are in progress for nine new aggregate loaders, which are urgently required to lessen the call upon man power during maintenance re-sealing.

3. PLANT USED.

Besides some municipal plant, one 600-gallon and eleven 400-gallon sprayers owned by the Board, and three simple plants for cold-laid plantmix work were used.

4. WORK EXECUTED.

During 1940-41 the total work executed on C.R.B. and Commonwealth roads by C.R.B. plants was 858 miles. The average for the five-year period 1936-37 to 1940-41 was 798 miles per season. The total on all roads was divided as follows:—

	Miles.	Miles.
C.R.B. plant on C.R.B. roads ..	805.5	
Municipal plant on C.R.B. roads	69	
C.R.B. plant on Commonwealth roads	52.5	
Total work on C.R.B. and Commonwealth roads		927
C.R.B. plant on Municipal roads ..		8
Grand total		935

5. COSTS.

The prices paid for imported bitumen and allied products were quite abnormal owing to high freights. Table B shows the great reduction in use of tar products which are now in demand as industrial fuel. As well as the bitumen purchased, some 3,000 tons used were obtained by transfer from existing stocks. Tables C and D show the average costs per square yard for the several types of work. Most of the aggregate used for re-seals at 0.1 gallons per square yard was scoria. The average cost of all aggregate over the whole State was 13s. 9d. per cubic yard.

TABLE B.—TOTAL MATERIALS PURCHASED.

Material.	Tons.	
	Petroleum Products.	Tar Products.
Binder	9,263	..
Primer .. .. .	..	665
Miscellaneous	1,283	124
Total	10,546	789
Percentage	93	7
Total	11,335	

TABLE C.—COST OF DOUBLE COAT AND ROAD MIX SEALS (PENNY PER SQ. YARD).

	First Seals (D.C. Method.)		Re-treatment (Roadmix Seal Method).		
	1940-41.	1939-40.	1940-41.		
			1940-41.	1939-40.	1938-39.
Area costed (sq. yards)	1,660,877	2,649,735	1,506,481	740,711	..
Loose thickness of aggregate	..	..	½"	¾"	1"
Materials ..	7.69	6.62	7.27	10.48	..
Labour ..	1.73	1.37	1.39	1.86	..
Stores ..	0.26	0.25	0.22	0.31	..
Plant ..	1.11	0.96	0.98	1.35	..
Total ..	10.79	9.20	9.86	14.00	..
Totals for Roadmix Seals—					
1937-38 .. .. .	..	..	7.87	9.96	12.92
1938-39 .. .. .	..	..	9.76	10.40	14.50
1939-40 .. .. .	..	..	8.11	11.72	18.33

TABLE D.—COST OF SIMPLE RE-SEALING (PENCE PER SQ. YARD).

Nominal rate of application of binder galls. per sq. yard ..	0·10	0·15	0·20	0·25
Area costed (sq. yards)	272,326	628,318	392,622	2,677,768
Materials	2·06	3·61	5·45	6·13
Labour	0·44	0·62	1·04	0·95
Stores	0·08	0·09	0·17	0·18
Plant	0·30	0·44	0·80	0·66
Total	2·88	4·76	7·46	7·92

6. EXPERIMENTAL WORK.

Because of the possibility that for some time to come the quantity of bitumen available might be less than the minimum required to carry out normal retreatments, an experimental length of light re-seals was put down, containing 22 different sections.

The work was carried out in fine weather on 31st March and 1st and 2nd April on the Princes Highway West near the 11 m.p. at Laverton, under job No. 501/H/459, on a section of asphaltic concrete laid in 1926 and presenting a hard surface free from excess of bitumen. The traffic along the section chosen was heavy, about 2,000 vehicles per twelve-hour period.

Eight gradings of aggregate were used, four of the $\frac{3}{4}$ -in. or $\frac{5}{8}$ -in. maximum size type, three being graded and one a "one-size" material. The other four gradings were of the $\frac{1}{2}$ -in. and $\frac{3}{8}$ -in. maximum size type, two being well graded, one badly graded, and one a "one-size" aggregate. Except on certain short portions where wet aggregate was deliberately used, care was taken to keep the stone dry.

For the four larger aggregates, binder at 0·2 and 0·15 gallon per square yard was used, while for the four smaller materials, rates of application of binder of 0·15 and 0·10 gallon per square yard were tried. The aggregate initially removed by traffic on each section was carefully collected and weighed, to enable per cent. loss by volume to be calculated.

An attempt is being made to record the gradual depreciation of each section by means of surface texture prints. (D.S.I.R. Road Research Bulletin No. 3, 1939.) The following are tentative conclusions from the tests, which should be read with due regard to the conditions of the test, that is (1) an existing non-porous smooth asphaltic concrete surface, (2) good, hard aggregate, (3) heavy traffic, and (4) no sweeping back.

7. TENTATIVE CONCLUSIONS.

(a) GRADING OF THE AGGREGATE.

(i) The more "one size" the grading of the aggregate, the greater is the uniformity of surface, and the greater is the possible economy in the use of binder.

(ii) If a graded aggregate is used, the better the grading through the intermediate sizes and the smaller the quantity passing about one-third the maximum size the better is the resulting work.

(b) CONDITION OF THE AGGREGATE AND BINDER.

(i) The use of wet aggregate can more than double the amount of "wipe off."

(ii) The use of wet aggregate and a binder of too high a viscosity at the time of spraying can in combination increase the amount of "wipe off" by more than four times.

(c) RATE OF APPLICATION OF BINDER.

(i) For light re-treatments by re-sealing, the greatest possible economy in the use of binder would be achieved by using a "one size" aggregate of $\frac{1}{2}$ -in.

maximum size. With an aggregate of this size on a smooth surface, an application of binder at the rate of 0·1 gallon per square yard, and on an average surface a rate of application of 0·125 gallon per square yard could be successfully used with existing mobile sprayers.

(ii) For medium re-treatments by the process of re-sealing the most economical result from the point of view of the quantity of binder necessary would be achieved by the use of "one-size" aggregate having a maximum size of $\frac{3}{4}$ inch. The rate of application of binder when applied on a smooth surface could be as low as 0·15 and on an average surface 0·175 gallon per square yard.

(iii) For medium re-treatments by the process of re-sealing using a well-graded aggregate of $\frac{1}{2}$ -in. maximum size and not more than 10 per cent. passing $\frac{1}{4}$ inch, a rate of application of binder of 0·2 gallon per square yard would generally give a successful job.

(d) "WIPE OFF."

(i) The lowest percentage of "wipe off" is encountered with aggregates of the "one-size" type of grading. (Approximately 10 per cent.)

(ii) For aggregates of the same maximum size, the maximum percentage of "wipe off" is met with when poorly-graded aggregates are used. (Approximately 25 per cent.)

(iii) When using well-graded aggregate, the percentage of "wipe off" appears to increase with reduction in maximum size. For $\frac{3}{4}$ -in. material it was approximately 20 per cent., and for $\frac{5}{8}$ -in. about 30 per cent.

BRIDGE MAINTENANCE.

In last year's report reference was made to the very general lack of regular bridge maintenance on Victorian roads. With the co-operation of municipal engineers a rapid survey has been made of all bridges on main roads and State highways. This has shown up the deplorable economic loss caused by past neglect, and many structures, especially those built of timber, were found to be beyond the stage when effective maintenance could be done on them. It would obviously require some years to overtake the wastage and to reduce the problem to that of a desirable régime of regular maintenance.

To establish an order of priority for reconstruction or maintenance works, more accurate knowledge of individual structures was required. The appointment by the Board of a bridge inspector, properly equipped to examine and report in detail the condition of every part and member of each structure, has enabled a start to be made towards the desired goal of planned maintenance. This inspector is to examine all bridges under the Board's direct control, and already 60 municipal councils have requested his services for the main roads under their control.

The inspection enables a classification to be made of all bridges as follows:—

- A. Bridges in sound condition and not in need of immediate maintenance.
- B. Bridges generally in sound condition but needing preventative and remedial maintenance.
- C. Bridges in which more than 40 per cent. of the existing material is in need of renewal.
- D. Bridges in need of replacement as early as funds will permit.

For each structure of Class B the inspector's report will set out fully the materials and work required and will thus form the basis of the necessary item in the next annual maintenance programme. Those structures

in Class C are generally beyond economical maintenance but are capable of continued use (if necessary with restricted loading) for a further period of five to ten years. The order of replacement of these structures and those of Class D may be fixed, due weight being given to the relative importance of the roads. Thus an intelligent programme, both for maintenance and renewals, should soon be developed so that further wastage may be at once stemmed and arrears over-

taken as suitable man power and materials (now largely required for the war effort) become available. Replacements deemed by the Board to be most urgent (e.g., on those routes of greater national importance) will be put in hand first.

Yours obediently,

D. V. DARWIN.

Chief Engineer.

1941.		£	s.	d.	£	s.	d.	£	s.	d.
To Maintenance Works—General	..	578,585	8	10	1,009,842	11	11	1,759,107	5	11
Mansfield-Woods Point Road	..	2,559	5	9	3,668	10	6	1,779,844	11	8
Woods Point Road	..	2,795	5	3	85,198	12	2	96,864	0	10
Walhalla Road	..	1,656	8	11	113,598	2	11	1,682,980	10	10
State Highways	..	384,872	10	7	..	..	..	13	10	0
Tourists' Roads	..	39,373	12	7	351,684	3	5	709	17	6
Murray River Bridges and Puntis	..	431,257	3	1	1,000	0	0	944	7	6
Contributions to Sinking Fund	..	..	..	..	10,852	1	4	200	12	5
Interest on Loans	..	..	..	..	1,264	14	4	38	12	3
Recoup to Revenue—Act No. 3944—	..	108,303	7	6	229,290	8	8	21,164	16	4
Interest—Main Roads	..	173,808	8	8	..	..	..	9	17	8
Developmental Roads	..	..	..	..	..	..	..	152	11	11
Sinking Fund Contributions	..	282,111	16	2	..	..	..	1,375	2	10
Exchange	..	25,677	19	1	..	..	..	291	12	9
Loan Conversion Expenses	..	42,028	11	7	..	..	..	1,412	14	5
Act No. 4395—Great Ocean Road—	..	1,865	16	7	..	..	..	35	14	0
Interest	..	..	..	..	..	..	..	140	7	6
Sinking Fund	..	565	1	0	..	..	..	298	5	0
Tourists' Resorts Fund—Act No. 4609	..	434	19	0	..	..	..	..	..	..
Recoup State Superannuation Payments	..	..	..	..	..	..	..	..	..	..
Relief to Municipalities	..	..	..	..	..	..	..	..	..	..
Audit Fee	..	460	15	7	..	..	..	..	..	..
Insurance of Staff	..	209	8	6	..	..	..	..	..	..
Instruments	..	60	5	3	..	..	..	..	..	..
Motor Expenses	..	6,385	5	11	..	..	..	..	..	..
Offices, Exhibition Building	..	249	9	6	..	..	..	..	..	..
District Offices	..	16	5	5	..	..	..	..	..	..
District Storeyards	..	1,145	17	1	..	..	..	..	..	..
Patrol Storeyard	..	153	8	10	..	..	..	..	..	..
Promontory Huts and Garages	..	279	15	0	..	..	..	..	..	..
Storeyard Equipment Repairs Account	..	266	14	3	..	..	..	..	..	..
New Storeyard	..	1,889	3	2	..	..	..	..	..	..
Office Expenses	..	912	17	5	..	..	..	..	..	..
Office Furniture	..	3,319	1	9	..	..	..	..	..	..
Patrolmen's Cottages and Engineers' Residences	..	2,155	12	6	..	..	..	..	..	..
Patrol Garages	..	211	4	9	..	..	..	..	..	..
Plans, Purchase	..	559	1	6	..	..	..	..	..	..
Plant, Purchase	..	26,936	18	10	..	..	..	..	..	..
Postage and Telegrams	..	1,224	12	5	..	..	..	..	..	..
Printing and Stationery	..	1,661	8	4	..	..	..	..	..	..
Salaries	..	60,609	6	8	..	..	..	..	..	..
Telephones	..	1,205	10	7	..	..	..	..	..	..
Testing Materials	..	673	4	1	..	..	..	..	..	..
Bridge Equipment	..	48	1	0	..	..	..	..	..	..
Gravel Sites and Metal Investigation	..	48	5	11	..	..	..	..	..	..
Travelling Expenses	..	1,081	2	10	..	..	..	..	..	..
Timber, &c., Revenue Account	..	21	0	0	..	..	..	..	..	..
Motor Car Acts No. 3741, sections 11-13 and 3901, sections 24-36	..	3,045	10	1	..	..	..	..	..	..
Country Roads Acts	..	1,305	4	4	..	..	..	..	..	..
Act No. 4332, Impounding of Cattle	..	1,009	9	2	..	..	..	..	..	..
Act No. 4585, Traffic Inmarking	..	5,834	1	0	..	..	..	..	..	..
Direction Boards and Warning Signs	..	1,662	18	2	..	..	..	..	..	..
Investigation Surveys	..	104	0	10	..	..	..	..	..	..
Advertising (Government Printer)	..	442	2	5	..	..	..	..	..	..
Legal Work, Crown Solicitor and Garnishee Case	..	349	5	2	..	..	..	..	..	..
Insurance Public Risk	..	85	11	6	..	..	..	..	..	..
Traffic Census	..	5	11	11	..	..	..	..	..	..
Municipal Engineers' Conference	..	33	17	10	..	..	..	..	..	..
Balance	..	..	..	..	125,661	9	6	..	..	..
					556,172	2	6	..	..	..
					2,402,534	5	1	..	..	..

2,402,534 5 1

2,007,975 1 9

APPENDIX—continued.

BALANCE-SHEET AT 30TH JUNE, 1941.

LIABILITIES.		£	s.	d.	ASSETS.		£	s.	d.
Contractors' Deposits	Country Roads Board Fund	..	..	..	153,658 10 5
Sundry Liabilities	Maintenance Expenditure—	..	..	..	..
Revenue Account	Contributions Payable by Municipalities	..	..	..	151,061 4 10
	Permanent Works—	..	..	..	..
	Contributions Payable by Municipalities—	..	..	..	..
	Outer Metropolitan Roads	..	4,795	0	5
	Other Main Roads (subject to Relief)	..	143,668	4	10
	Outstanding Accounts	..	..	..	..
	Materials—Stock—	..	..	..	..
	Storeyard	..	69,197	0	5
	Branches	..	9,921	8	9
	Trust Fund	..	..	..	79,118 9 2
	9,764 3 5
	573,155 2 1

SUMMARY SHOWING VALUE AS AT 30TH JUNE, 1941, OF BOARD'S ASSETS CHARGED TO FUND (not included in Balance-sheet).

	£	s.	d.		£	s.	d.
Patrol Cottages	12,145	15	0	Brought forward	..	..	..
District Engineers' Residences	6,425	16	0	Storeyard—New	..	..	50,241 12 5
Quarries, Gravel Pits, &c.	1,654	18	0	Motor Registration Branch	..	..	8,257 1 7
Garages, &c.	1,336	13	0	Motor Testing Branch	..	..	6,902 12 3
Shelter Huts, &c.	261	5	0	Weighbridge	..	..	21 0 0
Storeyard and Offices	3,580	15	0	Police Sergeant's Office	..	..	489 0 6
Great Ocean Road, Mortgage Mrs. A. M. Bird	2,080	0	0	Police Inquiry Section	..	..	11 14 6
Workshop Plant, Tools, &c.	3,048	15	0	Police Cycles	..	..	9 10 0
Furniture and Fittings	7,432	3	10	Police Motor Cars	..	..	980 0 0
Testing Laboratory Equipment	1,089	10	7	Board Motor Accessories	..	..	6,874 0 0
Survey Instruments	602	7	7	Loadometers	..	..	30 0 0
Pistols	14	8	4	Concrete Pipe Tester	..	..	400 0 0
Motor Cars	7,188	0	0		..	..	6 0 0
Storeyard No. 1	3,376	15	1		..	..	..
Works Films	4	10	0	Working Plant at Valuation	..	..	74,252 11 3
	..	..	..		..	..	111,895 9 6
Carried forward	50,241	12	5		..	..	186,148 0 9

APPENDIX—continued.

COUNTRY ROADS BOARD LOAN ACCOUNT, ACT NO. 3662.

RECEIPTS.		PAYMENTS.	
1941.		1941.	
£	s. d.	£	s. d.
June 30. To State Loans Repayment Fund	575 5 1	June 30. By Permanent Works	575 5 1
	575 5 1		575 5 1

BALANCE-SHEET AT 30TH JUNE, 1941.

LIABILITIES.		ASSETS.	
£	s. d.	£	s. d.
Interest on Permanent Works	.. .. .	Permanent Works	.. .. .
Loan Securities Issued	.. .. .	Interest (Capitalized on Permanent Works, Act No. 3662)	.. .. .
Less Amount Repaid	.. .. .	National Debt Sinking Fund (Cash in Hand)	.. .. .
	4,869,615 13 6		5,047,126 1 11
	80,000 0 0		18,755 17 10
	4,779,615 13 6		24,131 2 2
Deduct Discount and Expenses	.. .. .	
	70,747 17 8		
	4,708,867 15 10		
Less Securities re-purchased and Cancelled from National Debt Sinking Fund	.. .. .	
	299,741 16 3		
	4,409,125 19 7		
Less—			
Redemption Funds	.. .. .	
Main Roads Sinking Fund	.. .. .	
Repaid to State Loans Repayment Fund..	.. .. .	
	85,219 1 1		
	285,698 7 7		
	480,514 3 10		
	831,421 12 6		
State Loans Repayment Fund	.. .. .	3,577,704 7 1	
Contributions to National Debt Sinking Fund	.. .. .	338,258 6 1	
Less Net Loss on Repurchase of Securities (including Exchange)	.. .. .	
	12,011 11 10		
	335,884 10 3		
	323,872 18 5		
Loan Redemption as Itemized above	.. .. .	831,421 12 6	
		5,090,013 1 11	

APPENDIX—*continued.*

DEVELOPMENTAL ROADS LOAN ACCOUNT, ACT NO. 3662.

BALANCE-SHEET AT 30TH JUNE, 1941.

LIABILITIES.		£	s.	d.	£	s.	d.
Loan Securities Issued	.. .. .	6,297,438	17	11			
<i>Deduct</i> Discount and Expenses	.. .. .	111,577	13	1			
<i>Less</i> Securities Repurchased and Cancelled from National Debt Sinking Fund	.. .. .	6,185,861	4	10			
	.. .. .	454,292	14	3			
Redemption Funds	.. .. .	£ 5,731,568	10	7			
Developmental Roads Sinking Fund	.. .. .	646,386	7	4			
	.. .. .	55,083	0	2			
State Loans Repayment Fund	.. .. .	701,469	7	6	5,030,099	3	1
Contribution to National Debt Sinking Fund	.. .. .	.. .. .	..	..	239,896	6	1
<i>Less</i> Net Loss on Repurchase of Securities (including Exchange)	.. .. .	.. .. .	..	..	490,866	2	11
Loan Redemption itemized above	.. .. .	.. .. .	..	..	701,469	7	6
Consolidated Revenue Act No. 3662 (Sec. 84/17)	.. .. .	.. .. .	..	..	2,750	0	0
Interest Act No. 3662 (Sec. 86/1)	.. .. .	.. .. .	..	..	77,372	3	10
Contributions Postponed	.. .. .	.. .. .	..	..	16,656	13	7
	.. .. .	.. .. .	..	..	94,028	17	5
					6,559,109	17	0

DEVELOPMENTAL ROADS INTEREST—ACT NO. 3662—(SECTIONS 83/16, 84/17, AND 86/1.)

RECEIPTS.		£	s.	d.	£	s.	d.
1941. To Interest on Account of Municipalities provided by Relief—		1,375	0	0			
Act No. 3662—83/16	.. .. .	.. .. .	..	..	6,875	0	0
84/17	.. .. .	.. .. .	..	..	77,372	3	10
86/1	.. .. .	.. .. .	..	..
					85,622	3	10
					85,622	3	10

AUDITOR-GENERAL'S CERTIFICATE.

The accounts have been audited and compared with the books with which they agree. Reconciliations have also been made with the books of the Treasury. Subject to the qualification that the Balance Sheets do not include as assets Permanent Works and improvements resulting from expenditure from Revenue Moneys and extraneous Funds, the several statements, in my opinion exhibit a correct view of the affairs of the Board at the 30th June, 1941.

E. A. PEVERILL,

Auditor-General.

28th November, 1941.

ASSETS.

Permanent Works Expenditure	.. .. .	6,425,757	10	11			
National Debt Sinking Fund (Cash in Hand)	.. .. .	36,573	8	8			
Contributions Payable by Municipalities, Act 3662 (Sec. 84/17) (Subject to Relief)	.. .. .	2,750	0	0			
Contributions Payable by Municipalities, Act No. 3662 (Sec. 86/1) (Subject to Relief)	94,028	17	5			

6,559,109 17 0

EXPENDITURE.

1941. By Payments to Treasury (Relief)	85,622	3	10			
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85,622 3 10

E. J. HICKS,

Accountant.

13th November, 1941.