NEW ZEALAND.

PUBLIC WORKS STATEMENT.

1940.

BY THE

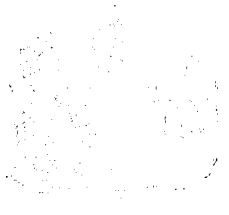
Hon. R. SEMPLE,

MINISTER OF PUBLIC WORKS.

WELLINGTON.

BY AUTHORITY: E. V. PAUL, GOVERNMENT PRINTER.

1940.



INDEX.

HON. MINISTER'S STATEMENT.

TABLES.

TABLES—*continued.*

APPENDICES.

1940.

NEW ZEALAND.

PUBLIC WORKS STATEMENT

(BY THE HON. R. SEMPLE, MINISTER OF PUBLIC WORKS).

MR. SPEAKER,—

In accordance with the provisions of section 8 of the Public Works Act, 1928, I submit my report on works carried out during the year ended 31st March, 1940, together with a statement of expenditure certified by the Controller and Auditor-General.

The estimates of expenditure, which have already been laid before the House with the Budget, show that a very substantial reduction in public-works expenditure is being effected this year.

The Government appreciates fully that, however desirable public works may be in normal times, they must of necessity give place to the exigencies of the present situation confronting our nation. The estimates for the current year have therefore been framed on the basis of the elimination of all but essential activities, and the completion of those projects which have reached an advanced stage where it would be uneconomical and undesirable to cease operations abruptly. As long as sufficient man-power and machinery are available, works in the latter category will therefore be continued. This applies particularly to hydro-electric construction, railway-construction, irrigation development, and land-improvement schemes, the two latter having an important bearing on the Dominion's effort to increase primary production.

Honourable members will realize that the Statement I now present relates principally to public-works activities undertaken during the past financial year, of which a considerable number were completed or well advanced prior to the outbreak of hostilities.

The declaration of war against Germany in September of last year resulted in heavy demands being made upon the public-works organization throughout the Dominion in order that the Government might fulfil its obligations not only in respect of defence measures in New Zealand, but also in regard to the despatch of troops overseas. The response of departmental officers and workmen was most gratifying, and no effort was spared in vigorously prosecuting a variety of works, both large and small, which demanded urgent attention. Large numbers of men, together with mechanized equipment, were promptly transferred from normal public-works operations, and every effort was concentrated upon the construction of Army and Air Force camps and buildings, including the construction of flying-fields, the levelling, drainage, and roading of building-sites, the design and layout of buildings, and the supply and installation of engineering services and equipment.

With the spontaneous co-operation of many building contractors these works were completed in quick time, and the results achieved reflect every credit upon all those concerned in the programme.

The effect of diverting men and material to defence works was that normal operations were reduced or suspended, although nominally on this account the total number of men employed on public works was not decreased for a period. In the meantime a considerable number of departmental employees offered their services in the defence of the nation, and the normal construction programme was reviewed, with the result that at the close of the financial year the total number of men

employed was 19,531, as compared with 22,728 at the commencement of the year, a reduction of 3,197. At the present date the total number of men is 17,089, but of this number, 2,226 are employed by contractors working for the Department, and 2,112 are employed by local bodies on public works subsidized by the Department, thus making the actual number of men paid directly by the Department 12,711. Included in this latter figure are 2,181 men employed solely on defence works.

It will be necessary, of course, to give special attention during the war period to the adequate maintenance of public utilities such as electric-supply installations, main highways, public buildings, irrigation schemes, &c., and steps will be taken to ensure that no undue deterioration of these assets occurs pending the restoration of normal conditions.

With regard to other schemes of less urgency in the public interests, there has already been a progressive curtailment, and this will continue in directions where the effect will not deprive married workers of their means of livelihood.

FINANCE.

The payments and receipts and accumulated totals in connection with the Public Works Fund and other associated votes and accounts for the year 1939–40 are shown in the tabulation following.

The gross expenditure amounted to £23,052,548, of which £6,100,041 was expended by other Government Departments; the recoveries in reduction of expenditure amounted to £5,661,569, of which £1,216,247 was recovered by other Departments; the net expenditure totalled £17,390,979, of which £4,883,794 was expended by other Departments.

In addition, the Department collected £1,878,645 for the supply of electric energy, irrigation receipts, and miscellaneous revenue from other sources.

Class of Work.	Expenditure, 1939-40.			Total Net Expenditure to 31st March, 1940.
	Gross.	Recoveries.	Net.	
Expenditure, Public Works Fund.				
Railways—	£	£	£	£
New construction	1,253,868	75,092	1,178,776	42,789,406
Improvements and additions to open lines	3,048,687	62,047	2,986,640	25,186,848
Roads	1,169,851	45,261	1,124,590	27,441,349*
Public buildings	1,825,390	22,584	1,802,806	17,894,401†
Lighthouses, harbour-works, and harbour defences	23,777	1,258	22,519	1,390,991
Tourist and health resorts	26,170	1,278	24,892	806,528
Telegraph extension	693,569	276,791	416,778	13,293,412
Departmental	603,081	455,509	147,572	3,744,025
Irrigation, water-supply, and drainage	444,838	28,400	416,438	1,966,767
Lands-improvement	194,347	21,822	172,525	1,408,887
Swamp-land drainage	19,077	16,377	2,700	105,565
Settlement of unemployed workers	613,302	166,544	446,758	1,858,609‡
Native-land settlement	1,052,802	694,958	357,844	1,539,620
Dairy industry loans	..	..	..	46,125
Cost and discount, raising loans, &c.	137,609	..	137,609	3,965,916
Closed accounts (for more detail see Table 1)	..	..	..	8,116,828
Totals, General Purposes Account	11,106,368	1,867,921	9,238,447	151,555,277§
Electric Supply Account (previously Aid to Water-power Works Account)—				
Construction	1,098,811	52,598	1,046,213	17,384,678‖
Working-expenses	386,701	7,195	379,506	..
Waihou and Ohinemuri Rivers Improvement Account	..	..	..	709,740¶
Totals, Public Works Fund	12,591,880	1,927,714	10,664,166	169,649,695

* Includes £4,500 expended under section 16, subsection (1), Native Land Amendment and Native Land Claims Adjustment Act, 1923. † Excludes expenditure on workers' dwellings totalling £319,918 transferred to State Advances Account; includes £154,488 expended under Reserves and other Lands Disposal Act, 1936, section 32. ‡ Includes £4,865 expended under Finance Act, 1932 (No. 2), section 6. § Does not include expenditure under Ellesmere Land Drainage Act, 1905, or £1,226,000 transferred to and included in Main Highways Construction Fund. ‖ Total capital, excluding suspense items as per accounts in Table No. 5. ¶ Excludes interest and loan charges.

Class of Work.	Expenditure, 1939–40. Gross.	Recoveries.	Net.	Total Net Expenditure to 31st March, 1940.
EXPENDITURE, OTHER VOTES AND ACCOUNTS.				
Main Highways Account—				
Annual appropriation—	£	£	£	£
Construction, reconstruction, and improvements ..	3,269,200	129,243	3,139,957**	15,538,459††
Maintenance, repairs, and renewals	1,566,913	82,702	1,484,211**	..
Administration, plant, and miscellaneous expenditure ..	213,851	47,912	165,939**	..
Interest, fees, and loan redemptions	539,256	..	539,256**	..
Permanent appropriations (rate subsidies, interest on transfer from Public Works Fund, &c.)	313,451	..	313,451**	..
Consolidated Fund—				
Maintenance, public buildings, roads, &c.‡‡	234,414	47,257	187,157	..
Aerodromes and landing-grounds	600,428	39,585	560,843	..
Plant, material, and miscellaneous services‡‡	3,699,754	3,387,156	312,598	..
Closed accounts (for details see Public Works Statement, 1933)	..	..	..	18,955,387
Labour Department (expenditure by Public Works Department): Amounts not included above	23,401	..	23,401	..
Totals, Other votes and accounts	10,460,668	3,733,855	6,726,813	34,493,846
Grand total of expenditure, Public Works Fund and other votes and accounts for the year ended 31st March, 1940 ..	23,052,548	5,661,569	17,390,979	..
Capital expenditure to date	..	..	..	204,143,541

** For annual income and expenditure accounts see Appendix E. †† As per accounts in Appendix E. ‡‡ Excludes transfers to Public Works Fund vote, &c. (£30,000.) NOTE.—£24,208 recoveries omitted for year 1938–39, adjusted 1939–40.

Class of Work.	Recoveries, 1939–40.
RECEIPTS,* PUBLIC WORKS DEPARTMENT.	
Ordinary Revenue Account—	£
Irrigation (receipts for year)	25,207
Miscellaneous receipts for year	22,427
Electric Supply Account (sales of energy, miscellaneous receipts, &c.): Receipts for year ..	1,794,237
Main Highways Account (repayment of advances, &c., and interest): Receipts for year ..	36,774
Total receipts	1,878,645

* Excludes motor-spirits tax, registration fees, &c., collected by other Departments.

Summary.

—	Public Works Department.	Other Departments.	Total.
	£	£	£
Gross expenditure	16,952,507	6,100,041	23,052,548
Recoveries and receipts	6,323,967	1,216,247	7,540,214

Of the net expenditure of £17,390,979 previously mentioned, £12,720,155 may be regarded as having been expended from loan-moneys (£9,098,028 General Purposes Account, £1,014,238 Electric Supply Account, and £2,607,889 Main Highways Account) the balance—*i.e.*, £4,670,824 being expended from loan recoveries, premiums on exchange, revenue and taxation.

The ratio which the various classes bear to the whole is shown below. It should be noted that the figures are gross—that is, before deducting recoveries, which if deducted, would detract from the true portrayal of activities.

	£	Per Cent.
Roads, including construction and maintenance of main highways	7,072,522	28·37
Hydro-electric (construction and working-expenses)	1,485,512	5·96
Railway-construction, improvements, and additions	4,302,555	17·26
Public buildings, including schools	1,825,390	7·32
Settlement of unemployed workers	613,302	2·46
Lands improvement	194,347	0·78
Irrigation	444,838	1·78
Public buildings, roads, &c. (maintenance)	234,414	0·94
Air defence, aerodromes, and landing-grounds	600,428	2·41
Telegraph extension	693,569	2·78
Native-land settlement	1,052,802	4·22
Plant, material, and services for other Departments	3,699,754	14·84
Miscellaneous	833,115	3·34
Revenue receipts	1,878,645	7·54
	£24,931,193	100·00

In regard to the ways and means of the General Purposes Account of the Public Works Fund the position is as under:—

	£	£
Balance available 1st April, 1939		638,874
Add funds received during the year—		
Finance Act, 1938, section 2 (Public Works)	6,958,076	
Finance Act, 1939, section 2 (Public Works)	2,407,745	
Miscellaneous	522,745	
		9,888,566
		10,527,440
Deduct expenditure during 1939–40—		
Under annual appropriations	9,098,029	
Under permanent appropriations	140,420	
		9,238,449
Balance available 31st March, 1940		£1,288,991

The estimated net expenditure under the General Purposes Account for the current financial year is £6,524,000, and arrangements are being made with the Minister of Finance to provide the necessary funds. This is the amount shown on the Public Works estimates, which also show an estimated net expenditure of £2,750,000 from the Electric Supply Account and £3,533,200 from the Main Highways Account, a total for all these accounts of £12,807,200.

Summary of Votes under Control of Minister of Public Works and Proposed Ways and Means of Raising the Necessary Funds—Year ending 31st March, 1941.

Vote.	Loans.	Consolidated Fund.	Special Revenue.	Total.
	£	£	£	£
Departmental	190,000	..	..	190,000
Railway-construction	700,000	..	..	700,000
Public Buildings	1,050,000	..	..	1,050,000
Lighthouses and Harbour-works	30,000	..	..	30,000
Development of Tourist Resorts	25,000	..	..	25,000
Roads	500,000	..	..	500,000
Lands Improvement	350,000	..	..	350,000
Irrigation	425,000	..	..	425,000
Electric Supply	2,050,000	..	700,000	2,750,000
Main Highways	1,700,000	..	2,150,000	3,850,000
Maintenance of Public Works and Services	..	650,000	..	650,000
Totals	7,020,000	650,000	2,850,000	10,520,000

For the current financial year 1940–41 a sum of £650,000 will be provided from the Consolidated Fund for expenditure on maintenance of Public Works and Services, including £100,000 for housing workmen engaged on farm production and £100,000 for national emergency purchases. The expenditure on main highways (including permanent appropriations estimated at £316,800) is estimated to reach £3,850,000, of which a sum totalling £2,150,000 is expected to be raised by way of special revenue. It is anticipated that the revenue from the supply of electrical energy will reach a sum of £2,050,000, which will be utilized for the payment of arrears of sinking-fund instalments, interest, and operating-expenses.

The proposed expenditure from loan-moneys and revenue for votes comprised in the Public Works Fund coming under the control of other Ministers of the Crown is set out hereunder:—

Vote.	Loans.	Consolidated Fund.	Special Revenue.	Total.
	£	£	£	£
Railway Improvements and Additions to Open Lines (Minister of Railways)	1,500,000	..	1,250,000	2,750,000
Education Buildings (Minister of Education) ..	700,000	..	..	700,000
Telegraph Extension (Postmaster-General) ..	325,000	..	..	325,000
Swamp-land Drainage (Minister of Lands) ..	9,000	..	..	9,000
Small Farms Development (Minister of Lands) ..	370,000	..	180,000	550,000
Native Land Settlement (Minister of Native Affairs)	350,000	350,000	300,000	1,000,000
Total	3,254,000	350,000	1,730,000	5,334,000

MAIN HIGHWAYS.

I have on many occasions pointed out the necessity for an adequate and safe highways system, and never before in the history of this country has it been so essential that our internal communications should be up to a high standard of efficiency.

Our national existence at the present time demands that our main arterial routes be of sufficient material strength and of adequate capacity to transport men and material in the most expeditious manner, otherwise we are likely to be severely handicapped in any military operations that may be necessary for the defence of this country.

The wisdom of the Government's policy in taking over approximately 4,000 miles of the principal arterial highways as State highways, and placing them under the direct control of the Main Highways Board, with authority to provide the full cost of improvements to a high standard of efficiency and proper maintenance of that standard, will now be apparent to honourable members.

Although the number of motor-vehicles licensed during the year constitutes a record, the consumption of motor-spirits was slightly smaller than for the previous year, this, of course, being due to the restrictions placed on the purchase of motor-spirits after the outbreak of war. Had it not been for these restrictions the consumption of motor-spirits would undoubtedly have exceeded that of any previous year. The activities of the Main Highways Board for the past financial year are described in its annual report, which is appended to this statement.

The report indicates that £2,758,808 was received from revenue sources, compared with £2,814,939 for the previous year. The total expenditure from the Main Highways Account for the financial year ended 31st March, 1940, on actual works, as distinct from loan and special charges, amounted to £4,599,000 as against £4,369,000 in the previous year.

Construction and improvement works, including the elimination of level railway-crossings, accounted for £3,106,000, whilst £1,302,000 was expended on maintenance and £190,000 on the renewal of bridges.

Notable examples of improvement work carried out on State highways during the year are to be seen on the Ngahauranga Gorge section of the Wellington–Paekakariki Centennial State Highway and the Hutt Road section of the Wellington–Masterton State Highway.

In addition to the actual works expenditure quoted above, interest and loan charges amounted to £671,154 and general rate subsidies paid to local authorities to £206,514.

The construction programme carried out during the year involved the borrowing of £2,685,727. From the Board's report it will be seen that sections of reconstruction and widening completed during the year totalled 402 miles and metalling was completed over lengths aggregating 285 miles. Although there was a definite shortage of bitumen-supplies during the latter part of the year it is interesting to note that 433 miles of dustless surfacing were added during the year, this being the greatest length of new sealing completed in any one year since the Board commenced its operations.

The replacement of bridges covering a length of 11,676 lineal feet was another fine achievement when it is realized that the shortage of reinforcing steel somewhat retarded the Board's programme. A high standard of maintenance has been continued throughout the year and every effort made to preserve the assets already created.

The amount of funds available for expenditure on highways during the current year has necessitated a reduction in the normal programme, but it is the intention of the Board to keep up the standard of maintenance and to continue as far as possible the programme for the replacement of dangerous bridges. Where considered economical, and provided the necessary supplies are available, paving will be extended.

HYDRO-ELECTRIC DEVELOPMENT.

The operation of the Government hydro-electric installations continues to be most successful, and the financial results for the year under review were again very satisfactory.

Operating Results.

North Island System.—The plants at Arapuni, Waikaremoana, Mangahao, and Horahora have been fully operated throughout the year. Some assistance from various local plants—principally the King's Wharf Station, Auckland, and the Evans Bay Station, Wellington—was necessary during the autumn and winter months to meet the ever-increasing demand for power.

The result of the year's operation was as follows :—

	£
Capital investment at end of year	10,429,240
Revenue	1,328,499
Operating-expenses	368,015
Balance	£960,484

The balance has been used in paying £345,207 for interest, £15,477 to the Depreciation Reserve to bring it up to the statutory limit of 12½ per cent. of capital, and £418,552 to bring the Sinking Fund up to statutory requirements. The balance of £181,248 has been transferred to Reserve Fund.

The Reserve Accounts established in connection with this scheme show that £1,081,075 has been credited to Depreciation Reserve, £1,159,820 to Sinking Fund, and £181,248 to the Reserve Fund.

South Island System.—The plants at Lake Coleridge, Waitaki, Monowai, and Arnold River have also been operated successfully. Throughout the year it was found practicable and necessary to carry out extensive maintenance-works and to effect minor alterations to the two latter plants which, before being taken over by the Government, were constructed and controlled by local authorities.

The year's operations resulted as under :—

	£
Capital investment at end of year	6,936,918
Revenue	613,612
Operating Expenses	174,959
Balance	£438,653

The balance has been used in payment of £246,919 for interest, £124,931 to the Depreciation Reserve, and £66,802 to the Sinking Fund.

The various Reserve Accounts established in connection with this scheme show that £755,026 has been paid to the Depreciation Reserve, £417,604 to Sinking Fund, and £87,199 to Reserve Fund. There is still a deficiency of £252,671 as against the statutory requirements of Sinking Fund.

Summarized Position: Percentage earned on Operating Capital after paying Working-expenses.

——	Average Operating-capital.	Gross Revenue.	Working-expenses.	Net Balance.	Percentage Net Balance to Operating-capital.
	£	£	£	£	Per Cent.
North Island system	9,305,621	1,328,499	368,015	960,484	10·3
South Island system	6,707,293	613,612	174,959	438,653	6·5
Totals ..	16,012,914	1,942,111	542,974	1,399,137	8·7

The general position to date is that the Electric Supply Account has been able to meet all operating and interest charges, has provided the statutory requirement of £1,836,101 for depreciation, and, in addition, has provided £1,583,094 towards the statutory sinking-fund requirement of £1,835,764. In addition, £268,447 has been paid to the Reserve Fund from profits from time to time. In other words, the electric-supply system as a whole has paid all operating and interest charges and provided £3,687,642 in reserves, of which £1,079,348 has already been utilized for the paying-off of loans which formed part of the original capital. There are, however, still to be met arrears of sinking funds amounting to £252,671.

Construction.

The demand for electric power still continues to increase, and some difficulty has been experienced in meeting all requirements during the months of peak loading. However, work on additions to existing plants and on new installations is proceeding as rapidly as possible under present conditions.

At the main Waikaremoana Station the third unit of 20,000 kW. has been completed and is now operating, whilst work on the tunnel and other features of the new development scheme below the main station has been actively prosecuted.

At Arapuni, tunnels for the two additional 21,000 kW. units have been driven, and it is expected that the installation of the machines will be commenced during the current year.

A contract has also recently been let for control works at the outlet to Lake Taupo for the purpose of regulating the amount of water that may be available for power-generation at Arapuni and any other power-plant that may be built on the Waikato River.

Work is also proceeding on the new power-station at the Rakaia River, which will use water from the Rangitata Irrigation Race.

Of the new 15,000 kW. units at Waitaki, one is practically completed and the installation of the other is well forward.

Necessary works in connection with additional transmission-lines and sub-stations to meet increasing demands for power have been continued throughout the year. On the Cobb River construction work on a hydro-electric scheme was started by a private company for the purpose of providing power for industrial and general requirements in the Nelson, Motueka, and Golden Bay districts. However, the Government considered it advisable to take over the company's enterprise and to complete the development itself. Negotiations have been finalized, and this scheme will therefore be completed by the Government, and it is anticipated that it will be ready for operation within the next eighteen months.

The present unsettled conditions have caused a certain amount of delay in the supply of plant and materials from abroad, and it is still uncertain as to when receipt of some of the important plant items may be expected. The same difficulty of uncertainty in respect of supplies of materials has in recent months retarded the extension of the reticulation work carried out by the various distributing authorities. At present all applications for extensions must be reviewed and approved by the Electricity Controller appointed by the Minister of Supply, and in order to conserve materials for essential work it has been found necessary to require local authorities to defer in the meantime certain extensions which would have absorbed comparatively large quantities of material for services that could be reasonably met by some other means.

RAILWAYS-CONSTRUCTION.

As a result of war conditions it will not be possible to maintain the normal rate of progress in railway-construction. This is due to the fact that many skilled and experienced workers have enlisted for military service and also that inevitable delays will occur in obtaining delivery of materials from overseas. There were indications that had such circumstances not intervened, the railways under construction would probably have been completed according to programme, but the uncertain conditions now prevailing make it impossible to adhere to a time schedule.

Dargaville Branch Railway. — The Kirikopuni – Tangowahine section of the railway has been maintained and a goods and passenger service has been continued under the operation of the Public Works Department. On the Tangowahine–Dargaville section all main-line earthworks, with the exception of the formation of the Dargaville Station Yard, have been completed.

Rail connection to Dargaville was established on 25th March, 1940, by junction with the Kaihu Line and goods are now being railed directly to Dargaville.

The final ballasting operations and the construction of the Dargaville Station Yards are in progress.

Paeroa–Pokeno Railway.—The construction of this line has been suspended for the duration of the war.

From the Pokeno end work was in progress during the past year over a length of 14 miles, of which nearly 8 miles were brought to an advanced stage towards completion.

On the Paeroa end formation work across the Hauraki Plains was continued, including the special measures necessary to consolidate the swamp sections.

The extensive use of up-to-date earth-moving machinery on this railway has enabled nearly 850,000 cubic yards of material to be handled since the commencement of the work.

East Coast Main Trunk Railway: Extension to Opotiki.—Following the survey of three trial routes between Waimana Gorge and Waimana, a general route has now been adopted for this railway-extension, and further detailed investigation is in hand. Survey work is being continued, and the route of the line has been permanently pegged as far as the proposed Waimana Station site. Trial lines from Kutarere to Opotiki are being examined.

Gisborne–Napier Railway.—On the 1st July, 1939, the completed sections from Raupunga to Wairoa and from Wairoa to Waikokopu were handed over to the Railways Department, which has since operated regular goods and passenger services, including passenger rail-cars, between Napier and Wairoa.

Progress generally on the construction of the Waikokopu–Gisborne portion of this railway during the latter part of the past year has been unavoidably retarded owing to conditions following the outbreak of war, but, on the other hand, there have been practically no setbacks occasioned by abnormal storms and floods.

The enlistment of many tunnellers and other specialist workmen will necessarily affect somewhat the future rate of progress on the construction of the remainder of the Gisborne–Napier Railway, and other factors arising from the war, such as difficulty in obtaining certain materials, may also affect the position.

On the Kopuawhara section, excavation carried out during the year brought the total to date up to 796,400 cubic yards of material. Two reinforced-concrete bridges, spanning the Waikokopu Stream and the Kopuawhara River respectively, were completed, and the erection of three bridges across the Waiau Stream was commenced. Tunnelling has proceeded satisfactorily on this section, while platelaying and ballasting reached a point some 29 miles beyond Wairoa.

Progress on the Wharerata section has been steadily maintained. Heavy earthworks are all completed except for trimming and cleaning up, and tunnelling has reached the stage where, if the present rate of progress is maintained, finality should be reached within the next twelve months. Material excavated during the year amounted to 32,146 cubic yards, making the total to date on this section 555,262 cubic yards. Sixty per cent. of the bridging has been completed, and the remainder of that portion of the programme is proceeding according to schedule.

Work done on the Gisborne section during the past year was confined largely to the erection of bridges, together with some platelaying and ballasting. Earthwork has been practically completed, the 23,260 cubic yards of material excavated last year making a total to date for this section of 183,893 cubic yards of material. All concrete piers required for the remaining bridges have been constructed, and

more than two-thirds of the steel girders are in position. The permanent track on this section has now been laid for a distance of approximately 12 miles, and a commencement made with the construction of a telephone system paralleling the railway.

Turakina–Okoia Railway Deviation (Wellington – New Plymouth Railway).—Progress on this deviation, which will shorten the length and improve the grading and curvature of the existing main line, has been satisfactory during the year, all earthwork having been completed except for bridge approach fillings and a small section at the northern end of the Turakina Tunnel.

A short tunnel of 213 ft. was completed during the past year, and at 31st March, 1940, only 70 ft. of the Turakina Tunnel, which is 104 chains in length, remained to be driven.

Construction of the Wangaehu and Turakina Bridges is proceeding steadily despite delays caused by heavy flooding, and the construction of the Wangaehu Station Yard is well in hand.

Following the completion of a substantial portion of the programme of work, several buildings were dismantled and transferred elsewhere, including some to military camps under construction.

Palmerston North Railway Deviation.—With the exception of the goods-yard cutting, formation work on this main-line deviation was completed during the year up to a distance of 6 miles 17 chains, leaving a balance of only 38 chains. Trimming has been carried out as far as the progress of excavation allowed, and the main passenger yard is now about two-thirds complete.

Material excavated since work was resumed in 1938 has reached a total of 197,000 cubic yards, and, including the previous period of construction between 1926 and 1929, the quantity totals 517,000 cubic yards, out of an estimated total of 836,000 cubic yards.

Platelaying and ballasting on the eastern track has been completed over a distance of 5½ miles, and the second lift of ballast for approximately 3½ miles. On the western track platelaying has been carried out over about 2½ miles, but has not yet been ballasted.

Construction of the Mangaone Bridge and also culverting and main-line fencing have been practically completed, while 50 chains of the Whakaronga Deviation, which is 2 miles 15 chains in length, have been formed.

Plimmerton–Paekakariki Railway Duplication.—The portion of this work undertaken by the Public Works Department was completed at the end of December, 1939.

South Island Main Trunk Railway.—The northern end of this Railway, extending from Wharanui to the Kahautara Bridge, comprises the Clarence and Kaikoura sections.

During the year operations carried out on the Clarence section were principally in connection with excavation and drainage of the Blue Slip. All railway bridges and culverts in this section have been completed, and highway and overbridges are rapidly approaching finality. A commencement has been made with an extensive forestry scheme, designed to stabilize some 1,800 acres of sandhills and waste land adjacent to the railway southwards from Wharanui to Waipapa Bay.

On the Kaikoura section formation has been almost completed over 25 miles of the 28½ miles in this length of line, and work is well advanced on the remaining portion. Sea-protection measures have been continued, while only 2 chains of tunnelling requires to be done to complete the last of the six tunnels on this section. The erection of the Clarence River Bridge, 1,524 ft. in length, is proceeding steadily, and several smaller bridges were completed during the year or are in course of construction, Owing to rails not being available, platelaying and ballasting has been held up temporarily, though sleepers and permanent-way fittings are on hand.

Regular goods and passenger services were commenced during the year between Parnassus and Hundalee, on the southern end of the railway. Formation has been completed from Hundalee to Claverley Station Yard, and good progress has been recorded on excavation work between Claverley and the Okarahia Stream. The long tunnel through the Amuri Bluff has reached the stage where the headings are expected to meet at an early date, and the driving of other tunnels is proceeding satisfactorily. Further extensive sea-protection work on this section has been carried out where the line of railway closely follows the coast.

Considering the natural obstacles encountered in the construction of the South Island Main Trunk Railway, the depletion in staff and specialist workmen owing to enlistments for war service, and the difficulty in securing adequate supplies of certain materials, it can be said that very satisfactory progress has been maintained.

Westport–Inangahua Railway.—Throughout the year work trains have been run over the Westport – Cascade Creek section of this railway.

On the Cascade–Inangahua Junction section formation work reached an advanced stage. Bridge-construction has progressed most satisfactorily, four bridges having been completed, including those spanning the Stable, Newman, and Welshman Creeks. The three remaining bridges are in the course of erection, while the necessary culverting has been almost completed.

Over 5 miles of platelaying were completed during the period, as well as nearly 3 miles of ballasting.

The use of bulldozers proved particularly effective in reducing unstable batters in the vicinity of Tiroroa and Inangahua Junction.

RAILWAYS: IMPROVEMENTS AND ADDITIONS TO OPEN LINES.

The net expenditure out of the Public Works Fund was £2,785,130 for the year ended 31st March, 1940, the amount expended being as follows:—

	£	£
Wellington new station		68,901
Wellington–Paekakariki electrification		17,886
Christchurch new station and yard		63,795
Oamaru foreshore protection		10,000
Dunedin bus garage and social hall		19,865
Duplication of lines—		
Morningside – Mount Albert	5,149	
Papakura–Horotiu	211,207	
Levin–Koputaroa	6,772	
Plimmerton–Paekakariki	102,790	
Tawa Flat – Porirua	3,817	
St. Leonards – Sawyer's Bay	51,810	
		381,545
Grade and curve easements—		
Swanson–Waitakere	27,108	
Glen Eden – Henderson	5,686	
Greatford–Kakariki	4,989	
Picton	12,057	
Miscellaneous	33,422	
		83,262
Deviations—		
Turakina–Okoia	107,268	
Scroggy Hill	13,562	
Palmerston North	59,866	
		180,696
Otira substation		23,850
Extensions of crossing-loops, additional sidings, and improvements to station-yards		43,019
Overbridges and elimination of level crossings		11,500
Dwellings		79,655
Workshops buildings and facilities		106,200
Stock-yards, turn-tables, rail-car sheds		23,032
Signalling and communications		44,527
Miscellaneous works and additions		35,519
Rolling-stock—	£	
J locomotives	678,445	
Ka, Kb locomotives	235,276	
Cars, vans, wagons, and service vehicles	678,157	
		1,591,878
		£2,785,130

The extension of the Featherston Street wing of the Wellington Station building was completed and occupied during the year. Good progress was made with the electrification of the Wellington–Paekakariki section of line. Christchurch station and yard re-arrangement was continued, and a number of small depots and the car-storage facilities were completed.

Further progress was made on the Oamaru foreshore-protection work.

The new railway-bus terminal and social hall at Dunedin were completed and are in occupation.

The duplication of the line from Papakura to Horotiu is progressing, the portions between Huntly and Ohinewai and between Papakura and Paerata being opened for traffic during the year.

The Plimmerton–Paekakariki duplication (except $1\frac{3}{4}$ miles where five tunnels are situated) was brought into operation.

Progress is being made with the piercing of the tunnel on the St. Leonards–Sawyer's Bay duplication. The work of easing grades and curves in various localities and the deviation of lines at Turakina, Scroggy Hill, and Palmerston North was continued. Approximately 3 miles of track were laid at the south end of the Palmerston North deviation.

A new power substation at Otira is being constructed to handle the electric current which will be drawn from the Public Works Department's electric power-supply lines. This will replace the existing steam-generating plant at Otira.

Seventy-nine new dwellings were erected throughout the Dominion for the housing of railway employees.

Further additions and improvements were effected in the equipment for signalling and communications.

Forty new type J steam-locomotives were imported, and further work was carried out in the New Zealand Railway Workshops in constructing new KA and KB locomotives, also cars, vans, and wagons.

SETTLEMENT AND OTHER ROADS.

During the year under review perhaps the most notable major roadwork completed was the coastal deviation between Plimmerton and Paekakariki. This section was formally opened to traffic on 4th November, 1939, and proved to be of considerable value in the safe handling of motor traffic during the period of the New Zealand Centennial Exhibition held at Wellington. The deviation eliminates the old section of highway traversing the Paekakariki Hill, reducing the distance by just over four miles. The highest point on the Paekakariki Road was 815 ft. above sea-level, as against 290 ft. on the coastal route, while the steepest grade on the old route is 1 in 9, compared with 1 in 17 on the new route. This coastal section has since been incorporated into the State highways system.

Further progress was made with the construction of other important arterial connections, such as the Rotorua–Waikaremoana, Waiouru–Tokaanu, Taumarunui–Tokaanu, Main South Westland, Haast Pass, and Hollyford–Lake McKerrow Roads. However, towards the end of the year the scale of operations was reduced in consequence of war conditions and the fact that numbers of workmen enlisted or were transferred to other employment.

With regard to settlement roads, activities were continued throughout the year in the direction of improving and metalling access to producing areas in backblock districts.

Altogether 402 miles of road were formed, 699 miles were metalled either directly by the Public Works Department or by local authorities in receipt of financial assistance in the form of Government grants and subsidies.

In addition 6,563 lineal feet of bridging was completed, and culverts aggregating a length of 56,122 ft. were installed.

The net expenditure from the "Roads" vote of the Public Works Fund for the year ended 31st March, 1940, amounted to £1,124,590, compared with £1,290,838 for the year immediately preceding.

IRRIGATION AND WATER-SUPPLY.

Irrigation works which will have an important bearing on the development of the Dominion are receiving increasing attention by the Government, and the major schemes at present under construction in Canterbury will be the means of placing a large number of additional men on farming work in the near future.

The completed schemes continue to function in a satisfactory manner, and production was assisted by the good rainfall that was experienced during the irrigation season.

In Otago, irrigation was practised on the thirteen completed schemes; 51,295 acres were regularly irrigated, and the annual revenue amounted to £25,896, being £244 in excess of last year's revenue.

On the two completed schemes in Canterbury, commanding 17,403 acres, 3,000 acres were irrigated, and £687 of revenue was received. This revenue was double that received last season and represents a satisfactory increase for newly-operating schemes, and shows that the Canterbury farmers are realizing the importance of the practice of irrigation.

The beneficial rainfall experienced in Central Otago had the effect of reducing water sales on the Omakau Scheme, where the water is sold on the demand basis.

The year's construction activity was confined to the large Canterbury schemes, which are dependent on the water-supply from the Rangitata River.

Work on the Rangitata irrigation and hydro-electric power-race was continued vigorously during the year, and is now reaching an advanced state of completion. The total excavation amounts to approximately 3,000,000 cubic yards, and the quantity excavated to date is 2,263,000 cubic yards, of which 1,000,000 cubic yards were completed during the year. The construction of the large syphons on this race has been put in hand, and good progress is being made.

Concurrent with the construction of the Rangitata race, two large irrigation schemes dependent on the race for their water-supply have been actively proceeding. These schemes are known as the Ashburton-Lyndhurst Scheme of 34,000 acres, and the Mayfield-Hinds Scheme of 54,000 acres. The Ashburton-Lyndhust Scheme is now 84 per cent. completed, and the Mayfield-Hinds Scheme 30 per cent. completed. These works are fully mechanized, but progress was curtailed slightly owing to the withdrawal of certain mechanical units for urgent defence works.

The operation of a demonstration area of 36 acres on the Ashburton-Lyndhurst Scheme has been continued, and the average carrying-capacity for the year was nine sheep per acre.

The Downlands Water-supply Scheme, which is to supply stock water over an area of 153,000 acres situated in the Levels, Waimate, Mackenzie, and Geraldine Counties near Timaru, has been proceeding vigorously during the year. This work entails the construction of several large reservoirs and the laying of some 800 miles of piping.

The delivery of piping is now nearing completion, and the headworks, main pipe-line, two service reservoirs, and 70,000 acres of reticulation are completed, and 20,000 acres are now receiving a water-supply. It is expected that the whole scheme will be in operation in twelve months' time.

In view of the importance of irrigation and water-supply, and its direct bearing on national production, it is my endeavour to continue these works as actively as possible during the difficult war period.

PUBLIC BUILDINGS.

The net expenditure for last year in the various classes of buildings was :—

	£
General Government buildings	269,228
Courthouses	11,436
Prison buildings and works	4,348
Police-stations	60,664
Post and Telegraph buildings	362,730
Mental Hospitals buildings	175,552
Health and Hospital institutions	67,136
Total	£951,094

New Departmental Buildings.

Since my last report further progress has been made with the provision of improved accommodation for Government Departments.

Contracts for the completion of the new departmental buildings at Auckland and Wellington were let early in the year on the basis of revised specifications, and good progress has been made. At the Stout Street building in Wellington practically the whole of the granite which covers the street frontage up to the first-floor window sill-level was fixed, and most of the concrete below the second floor, and a portion of the second-floor slab poured. Steady progress was made with the Auckland departmental buildings also, the stonework and concrete backing being completed to the second-floor level and partitions on the ground-floor and first-floor beams and slab have been concreted.

All work in connection with the Government Life Insurance buildings at Wellington and Nelson is practically completed.

A commencement was made with preparatory work for the foundations of the new Government Printing Office, a contract having been completed for driving sheet-steel piling. Plans for the excavation and foundations, including the provision of exterior walls up to ground-level, were completed.

Agriculture.

Substantial progress was made during the year in the provision of laboratory accommodation at the animal-research stations at Wallaceville and Ruakura, and the Department's officers are now in a much better position to efficiently undertake the exhaustive programme of research into live-stock diseases which the Government has initiated. At Flock House a new dining staff block has been provided, while a commencement was made at Massey and Lincoln Agricultural Colleges with a building programme embracing the erection of certain new farm buildings and the extension and renovation of others.

Courthouses.

Although some progress has been made during the year in the replacement of old and unsuitable courthouses, progress has not been maintained at the rate desired. Immediately following the outbreak of war a complete review of all proposals under consideration was made, and it was decided that, subject to the necessary material being available, all projects then in hand should as far as possible be completed.

The erection of the new courthouse at Invercargill is well advanced and should be completed within the next few months. At Whangarei the foundations for the new building have been completed, and tenders called for the erection of the main structure.

Land for new buildings is held at a number of centres, whilst new buildings have been approved for Ruatoria, Omakau, Thames, and Helensville.

Health and Hospital Institutions.

During the year the new male block at Queen Mary Hospital, Hanmer, was completed, and progress on the boiler-house was well advanced.

The new Dental Clinic in Willis Street, Wellington, was also completed during the year and was officially opened by Her Excellency Lady Galway on the 14th May, 1940.

As regards St. Helens Hospitals, plans in respect of the new hospital at Christchurch are now nearing completion, and it is hoped to make a start with the work in the near future. At Wellington negotiations are being made for extensions to the hospital. Extensive repairs were also undertaken at the Wellington Dental Hostel.

In regard to work contemplated, special mention should be made of the new sanatorium and bathhouse at Rotorua. This work is being expedited in order to meet possible requirements in relation to sick and wounded soldiers.

Mental Hospitals.

During the year such services as laundries, water-supply, telephones, drainage, roading, and fire-fighting appliances have been renewed or extended as circumstances demanded.

At Kingseat two villas for male patients have been completed, and the erection of the Nurses' Home has been continued. The erection of a new villa for male patients at Tokanui has been commenced, and the erection of the new bakehouse and butcher's shop at Porirua completed.

The Nurses' Home at Ngawhatu has been completed, and a start has been made on the erection of three male villas.

At Hokitika two new villas have been completed.

Police-stations.

The gross expenditure on police-stations during the year was £65,698, the principal items included in that amount being £12,230 expended on the completion of the new police-station at Palmerston North, and £11,750 on the purchase of land adjoining the site of Central Police-station at Auckland for the rebuilding of that station.

New police-stations were erected at Clive, Roslyn (Dunedin), Katikati, Little River, Mosgiel, Oturehua, and Whakatane. Offices were erected at Papakura and Waitara, a new lock-up at Blenheim, and a residence for the Senior Sergeant at Oamaru.

Contracts were let for new police-stations at Rotorua and Port Chalmers, and these buildings are now nearing completion.

A house and land for use as a police-station were purchased at Mount Roskill (Auckland), also a residence for the Senior Sergeant at Blenheim. Residences for the Superintendent and Inspector of Police at Wellington were acquired at Kelburn and Northland respectively.

Plans are being prepared for a number of police buildings which are urgently required to replace structures that have outlived their usefulness, and these will be proceeded with as far as financial circumstances permit.

Post and Telegraph Buildings and Land.

During the year 1939–40 the following post-office buildings were completed: Burnham Military Camp, Mahoenui, Ngaruawahia Military Camp, Otorohanga, Papakura Military Camp, Stockton Mine, Trentham Military Camp. Residences for Postmasters were erected at Marton, Okaihau, Otorohanga, Papakura, Taumarunui, and Waimate. Other buildings completed were automatic telephone-exchanges at Mount Pleasant and New Brighton, line store and garage at Ashburton and Whakatane, and an additional garage at Kaikoura. A new building for the district line depot and the Accountant's Branch of the General Post Office was erected at Wellington.

Major additions and alterations were carried out to the chief-post-office buildings at Oamaru and Palmerston North and to the post-office buildings at Ellerslie, Kaipara Flats, Kaiwaka, Ohingaiti, Okaihau, Opotiki, and Waiau. Alterations and additions providing improved accommodation were made to the post-office buildings at Granity, Greymouth, Kaitaia, Manurewa, Mount Eden, Murchison, and Rangiwahia.

Several buildings and sites which were no longer required were disposed of during the year. Sites and additional land for departmental purposes were acquired at eleven places.

At the end of the year the following buildings were in course of erection: Avondale (automatic-telephone exchange); Awarua Radio (receiving-station); Christchurch (chief post-office, Hereford Street block); Dunedin (store and workshops); Gisborne (automatic-telephone exchange); Hamilton (chief post-office); Invercargill (chief post-office); Kaukapakapa (post-office and quarters); Mosgiel (post-office and residence); Nelson (line store, garage, and workshops); Taupo (post-office and quarters); Wanganui (chief post-office).

Also in progress were large additions to the chief post-office building at Auckland, alterations to the Newmarket store and workshops buildings, an addition to the Devonport automatic-telephone exchange building, and additions to the post-office buildings at Huntly, Ngongotaha, and Waikaka.

Prisons.

In view of prevailing conditions, expenditure during the year has been kept down to the minimum, consistent with efficient management. The installation of an electric-light plant at the Hautu Prison Farm has been completed, and progress has been made with the provision of a new kitchen and mess. For the adjoining Rangipo Prison Camp an electric-light plant has been ordered, but, due to the outbreak of hostilities, some delay in delivery has taken place.

At the Waikeria Borstal Institution a commencement has been made with the installation of pasteurizing-plant and extra equipment in one of the dairies in order that milk produced under the most hygienic conditions may be made available. Here also a comprehensive sanitary drainage scheme was commenced. This, together with the building of extra cottages, will make conditions more congenial for the staff.

A new garage and workshop, which are badly needed at Wellington Prison, are at present under consideration.

Scientific and Industrial Research.

At the Research Orchard, Appleby, Nelson, extensions to the fruit-packing shed were completed.

At Auckland two glasshouses and one insectary for the Plant Diseases Division were erected and the electrical installation in the main building completed.

For the Agronomy Division at Christchurch an electric heating system was installed in the main building. Plans for glasshouses and a building extension were prepared.

At Palmerston North a new corrugated-iron building was erected for the Grasslands Division. The building comprises a seed-store, boiler and sterilizing-room, implement and drying shed, farm foreman's office, and a carpenter's workshop. Also the agronomy barn at Palmerston North, a concrete building, was altered and converted to a chemical laboratory. The necessary alterations to and additional installations in connection with electric-power, gas, water, and drainage for the new buildings were made. Plans and specifications were prepared for the caretaker's cottage, which is to be erected on the property of this Division.

EDUCATION BUILDINGS.

Further progress has been made in the improvement of school accommodation. Several old schools were replaced during the year, and additional buildings provided where the attendance had increased. The gross expenditure on school buildings, additions, teachers' residences, and the purchase of sites amounted to £878,770. This sum includes £25,291 provided by the Consolidated Fund to meet the cost of minor works.

The following table shows the capital expenditure on school buildings and sites during the last four years :—

	1936–37. £	1937–38. £	1938–39. £	1939–40. £
Public schools	162,894	331,558	467,255	583,918
Education Board offices	..	..	3,850	15,816
Secondary schools	24,092	58,924	56,819	69,545
Technical schools	77,836	97,740	82,568	60,283
Training colleges	6,730	1,984	27,071	29,325
Native schools	12,172	34,180	39,632	77,666
University colleges	3,022	39,086	58,710	22,456
Massey Agricultural College	525	..	..	..
Child-welfare institutions	..	351	..	5,344
Special schools	2,473	312	840	12,683
School for Deaf, Sumner	..	4,841	6,295	..
N.Z. Institute for the Blind	..	..	1,000	..
Kindergartens	..	881	1,181	1,734
Refund portion purchase money sale of Education Board offices	..	..	1,500	..
Gross total	289,744	569,857	746,721	878,770
Less credits-in-aid	7,848	7,913	66,411	7,600
	£281,896	£561,994	£680,310	£871,170

AERODROMES AND SUBSIDIARY SERVICES.

During the year under review my Department has carried out a considerable amount of work in connection with Air Force Stations, aerodromes, and subsidiary services for both internal and overseas air routes. Since the outbreak of hostilities the principal objective has been to accelerate the completion of flying-fields and buildings at the Royal New Zealand Air Force Stations. Arising from war conditions, the Department has also undertaken the maintenance of several civil aerodromes which at present are not required for civil aviation, but for Air Force purposes.

Air Force Stations.

The resources of my Department have been fully utilized in the construction work required at Air Force Stations, particularly as regards the erection of buildings of all kinds, the installation of engineering services, and the construction or extension of flying-fields. Modern earth-moving machinery has proved invaluable in speeding up flying-field construction and in securing a maximum degree of consolidation to enable the ground to be used with safety immediately after grassing.

The activities at these Stations have been governed by the requirements of the Air Department, and arrangements have been made whereby the maintenance of buildings and flying-fields at the Stations is also carried out by my Department on behalf of that Department.

The following is a brief summary of the work completed at the principal Air Force Stations :—

Hobsonville Air Base, Auckland.—Accommodation for personnel has been increased, aircraft-maintenance buildings and extra stores buildings have been erected, and various other technical buildings provided.

Whenuapai Station, Auckland.—The construction of a flying-field comprising 400 acres has been completed, a large proportion of which is in use. One timber hangar and certain residential and technical buildings were completed, while further large works are proceeding. The two reinforced-concrete hangars will be in use very shortly.

Ohakea Flying Training School, Bulls.—This Station has been almost completed; the flying-field is in use and all of the principal technical and residential buildings in the main scheme, which includes two reinforced-concrete hangars, each of 57,500 square feet, have been completed.

Woodbourne Flying Training School, Blenheim.—At this Station where work on buildings had just been commenced before the outbreak of war, four hangars and other technical and residential buildings covering a total area of 356,200 square feet have been erected, and the expansion programme has been almost completed.

Wigram Flying Training School, Christchurch.—Extensions are still in progress on the flying-field, while major extensions to residential and technical accommodation have been completed. Work on building additions is in progress.

In addition to these peace-time Air Force Stations, my Department has supervised the construction of Elementary Flying Training Schools at New Plymouth, Harewood (Christchurch), and Taieri (Dunedin), and the Ground Training School at Weraroa.

Civil Aviation and Air-route Services.

The construction of civil aerodromes and landing-grounds which were commenced prior to the outbreak of war has proceeded, but no new major construction works on civil aerodromes have since been commenced. Although civil aviation has been considerably curtailed, the internal air lines which have continued in operation show that the number of passengers and the quantity of freight carried compare very favourably indeed with the figures for the preceding year.

Services ancillary to the construction and maintenance of civil aerodromes and emergency-landing grounds have been continued throughout the year. These services comprise the establishment of radio-direction-finding stations, radio-communication facilities serving aerodromes along air routes, and a meteorological information service. In connection with these facilities the Department has had

the co-operation of the Aeradio Committee, the Radio Section of the Post and Telegraph Department, and the Meteorological Branch of the Air Department. The permanent establishment of an aeradio and meteorological reporting station in the Pacific has been commenced, and when in operation the station will be of special value in compiling information for overseas air lines.

Overseas Airway Services.

The Overseas Air Terminal at Mechanics Bay, Auckland, has been completed and brought into active use with the inception of the trans-Tasman flying-boat service. In addition to the erection of buildings and facilities at the Terminal, new aeradio stations have been completed or commenced. Emergency alighting areas and moorings have been provided in some localities and others are being surveyed.

General.

My Department has also continued its services in connection with the compilation of the "New Zealand Air Pilot," the plotting of direction-finding maps, aviation strip maps, meteorological information at aerodromes, air photography and aerial surveys, and the inspection of aerodromes in regard to maintenance, &c., for licensing purposes.

TELEGRAPH EXTENSION.

The expenditure on telegraph extension by the Post and Telegraph Department during the last financial year in respect of telephone, telegraph, and radio facilities throughout the Dominion amounted to £416,778, as against £575,943 for the year ended the 31st March, 1939.

The long-distance toll service was further improved during the year by the establishment of the following carrier telephone systems:—

Whangarei–Kaitaia: One single-channel system.
Auckland–Kaitaia: One single-channel system.
Auckland–Wellington: One three-channel system.
Auckland–Napier: One three-channel system.
Auckland–Thames: One single-channel system.
Auckland–Tauranga: One three-channel system.
Hamilton–Tauranga: One single-channel system.
Tauranga–Gisborne: One single-channel system.
Palmerston North – Napier: One three channel system.
Wellington–Wanganui: One three-channel system.
Christchurch–Greymouth: One three-channel system.
Dunedin–Cromwell: One single-channel system.
Dunedin–Roxburgh: One single-channel system.

In addition to providing improved toll facilities between the terminals mentioned, the establishment of these systems has enabled additional toll outlets to be provided between Auckland and New Plymouth and between Palmerston North and Hamilton, while it has also been possible to provide much-needed direct high-grade circuits between Wellington and Hawera, Auckland and Gisborne, and Auckland and Whakatane.

Other improvements to the plant and equipment used in connection with the toll and telegraph services included the installation of toll switchboards at a number of exchanges, the provision of direct dialling facilities between various exchanges throughout the Dominion, and the provision of new outlets for toll traffic by the erection of additional open aerial circuits between various centres.

Additional multi-channel voice-frequency telegraph equipment was installed during the year, a six-channel system being established between Wellington and Auckland, one eighteen-channel system between Wellington and Palmerston North, and one similar system between Auckland and Hamilton.

There has been a continuation of the demand for telephone-exchange service, and the net gain in subscribers totalled 7,546, as against 9,755 for the previous year. The grand total of telephone-stations (main and extensions) in the Dominion on the 31st March was 217,869, which is 11,653 in excess of the previous year's figures.

The installation of the automatic-telephone-exchange switching-apparatus at Napier was completed, and the exchange was cut-over to automatic working on the 2nd December. This exchange system comprises 2,700 subscribers' lines and will be capable of providing reliable high-grade service for many years.

The equipment which was ordered in October, 1938, for the new automatic-telephone exchange at Gisborne is arriving in the Dominion, and the installation work is proceeding as rapidly as possible. It is expected that this exchange will be cut-over to automatic working towards the end of this year or early in 1941.

The installation of the initial equipment for the Mount Pleasant and New Brighton (Christchurch) sub-exchanges was completed during the year, and the exchanges were cut into service on the 10th January and 27th May, 1940, respectively. Additional equipment was also installed and brought into use at the St. Albans (Christchurch) and Christchurch Central automatic exchanges.

A considerable proportion of the automatic-switching equipment ordered last year for exchanges in the Auckland metropolitan area has been received, and a comprehensive programme for the extension of the automatic-switching system in that area has been commenced.

Additional automatic-switching equipment was provided during the year at the Whangarei, Remuera, Mount Eden, Takapuna, Hamilton, Hastings, Palmerston North, Hawera, Khandallah, Lower Hutt, Wellington Central, Wellington South, Courtenay Place, Miramar, Dunedin Central, and South Dunedin exchanges. A temporary automatic exchange was established at Mount Albert (Auckland) to cater for telephone growth in that area. The steady demand for telephone service also necessitated increases in the switching-capacity at a number of manual exchanges, including the installation of lamp-signalling branching-multiple switch-boards at Thames and Tauranga.

At Wellington-Radio six steel towers have been erected to support a new aerial system, the medium-wave section of which has been completed, the short-wave section being in course of erection. Improvements in aerials and equipment have also been made at other radio stations.

DEVELOPMENT OF TOURIST RESORTS.

The expenditure for the year ended 31st March last was £24,892, as compared with £24,552 for the previous year.

During the year under review extensions to the Rotorua electrical system were proceeded with, and a commencement was made with the erection of a reservoir for the water-supply system at Rotorua. Constructional work in connection with roads and tracks was carried out at various places throughout the Dominion.

LANDS IMPROVEMENT.

During the year under review the Government provided assistance by subsidy or grant towards a considerable number of miscellaneous projects in connection with general land-improvement works. The principal types of work were in respect of flood-control and river-protection schemes, sand-dune and tidal-flat reclamation, water-supplies, and stream-clearing and drainage.

Major flood-control schemes were undertaken by the Department or local authorities in the Hawke's Bay, Canterbury, and Westland districts, and included the Ngaruroro, Ashburton, Hinds, and Karamea Rivers. Sand-dune reclamation was continued in the North Auckland, Auckland, and Wellington (Manawatu) districts by the planting of marram-grass, lupin, and pinus trees utilizing young plants raised in departmental nurseries specially established for the purpose. Water-supply installations in the Hauraki Plains and Awatere districts were subject to monetary contributions by the State, and financial aid was granted similarly in respect of clearing willows and drainage improvements in the Auckland and Taumarunui districts. Tidal-reclamation activities were confined to the Auckland district.

Flax-Industry Development.

During the year the Government decided to take by Proclamation under the Public Works Act an area of approximately 4,621 acres near Foxton, known as the Moutoa Estate, for development in connection with the flax industry. The Proclamation over this area was issued on 23rd November, 1939, and since then

the Flax Plan Industrial Committee (which was appointed by the Hon. the Minister of Industries and Commerce to prepare plans for the rehabilitation of the flax industry) has appointed a sub-committee, representative of the various Government Departments involved, to submit plans for the development of the area.

Early in December all available men from Scheme 13 were transferred from Foxton to the work of ring-barking willows on the Moutoa Estate, and 36 acres of grasslands have been ploughed and are being planted with pedigree varieties of flax.

Plans are now under way for the clearing and other developments of part of the area which will eventually supply the full requirements of fibre for woolpacks.

Land-Clearing.

In many parts of the Dominion some of the best dairying and cropping land was originally covered with timber forests, and the clearing of this land of stumps, logs, and second growth after the timber had been milled presented a work of considerable magnitude, and often required a generation of labour to bring it into a satisfactory state of production. Although very large areas of our most productive land of this type have already been reclaimed, considerable areas in Westland, Southland, and the central districts of the North Island still require clearing.

The usual methods of clearing are primitive and involve the expenditure of labour at a cost varying from £15 to £40 per acre, and it was thought that the introduction of high-powered modern plant would obviate this vast expenditure of labour and at the same time reduce the cost of clearing to a reasonable figure that would prove economic as a farming proposition. With this end in view arrangements were made for a demonstration of the use of heavy machinery on land clearing at Westport.

The result of this demonstration was very promising, and in consequence it was arranged to utilize some of the Department's heavy construction machinery on a general land-clearing scheme. This decision was timely, as on the outbreak of the war it was soon apparent that increased production was one of the best means of helping the nation. Further demonstrations were held at Ohakune and Southland, and by the end of the year the scheme was in operation in Westport, Ohakune, and Southland, and further arrangements have been made to operate at Murchison, Rotorua, Makerua, and Dannevirke. The estimated cost of the work is recovered from the farmers, and actually ranges from £3 per acre in Southland to £7 per acre in Ohakune, where the largest stumps are encountered.

It is my intention to continue this work as long as the demand exists, but it is not possible to undertake the development of light scrub lands on private property where the cost of the present methods is well within the range of farming possibilities and can be undertaken by farmers or farming contractors with the use of small tractors.

With the curtailment of the usual departmental activities due to war conditions it may be possible to release a limited number of small tractors should they be required by farmers or contractors to cope with the extra work of increasing production.

SETTLEMENT OF UNEMPLOYED WORKERS.

At the commencement of the year the Department was developing for settlement by the Small Farms Board three blocks of land in the Wellington Land District, comprising a total area of 6,321 acres.

As the operations on these blocks had become largely of a farming character it was found desirable to transfer control to the Superintendents of Land Development (attached to the Department of Lands and Survey) who are now in charge of all small-farms development in these districts. The transfers were effected about the middle of the year.

The total expenditure from the vote for the year was £613,242, but it must be explained that the bulk of this was incurred by the Small Farms Board under its own control.

The total area of land under development by the Small Farms Board at 31st March, 1940, was 130,040 acres.

The operations of the Small Farms Board are fully reviewed in the report of the Department of Lands and Survey.

SWAMP LAND DRAINAGE.

In the Hikurangi Drainage Area, Whangarei County, no work was carried out during the year, and the only expenditure incurred was in connection with the overhaul and disposal of plant not now required.

In the Hauraki Plains Drainage Area the new works comprised the construction of 33 miles 63 chains of new drains and the deepening and widening of 23 miles 2 chains of existing drains. In addition, maintenance-work was carried out on the existing drains.

Full details of the work carried out in the various Swamp Land Drainage Areas will be found in the report of the Chief Drainage Engineer contained in the Land and Survey Department's annual report.

PLANT AND MECHANICAL EQUIPMENT.

As mentioned in my last Statement, the amount of plant on hand was reasonably sufficient for the scale of operations in progress, but further purchases would be necessary for replacements. During the year under review only moderate purchases were therefore effected. I have also indicated previously that the types of machinery obtained were selected because of their utility value. The wisdom of this policy has been proved by the use of considerable construction plant on urgent defence works since the outbreak of war.

Particular attention has been given to the adequate maintenance of all mechanical equipment, and although most of the machines have been subjected to severe strain during the latter part of the year a high standard of efficiency has been maintained. The local manufacture of spare parts has been continued with most satisfactory results as regards both quality and cost in comparison with overseas supplies.

HARBOURS.

Work in connection with the wharf and equipment at Jackson's Bay on the West Coast has been carried out by the Public Works Department, and a survey has been made of the site for a proposed wharf at Bruce Bay.

LIGHTHOUSES.

Further progress has been made with the erection of radio-beacon stations and the electrification of lights, but delivery of material from abroad has necessarily held up the work. At Cape Reinga a commencement has been made with the construction of an access road; the site for the buildings has been surveyed, and all arrangements made for the dismantling of the station at Cape Maria and re-establishment at Cape Reinga as soon as the road access is put through. At Baring Head the lead batteries have been replaced by NIFE batteries. At Puysegur Point a commencement has been made with the access road, and preliminary surveys have been carried out. The Stephens Island beacon is now in operation and is working satisfactorily, and a wireless telephone has been installed. The Cape Campbell beacon, completed last year, is functioning satisfactorily. At Cuvier Island the light has been electrified and the heavy work completed for power-station, &c. The radio-beacon equipment has been received but is not yet installed owing to competent radio engineers being engaged on defence matters. The position in regard to Moko Hinau beacon station is identical with that at Cuvier.

At the Brothers Lighthouse a wireless-telephone set has been installed complete with masts and aerials, and an oil-engine winch completed. At Centre Island three dwellings have been completed during the year and are occupied. A wireless telephone has been purchased and is ready for installation when convenient to Awarua. A wireless telephone for Dog Island has been purchased and is ready for installation.

At Godley Head a survey has been completed for removing the light to a lower position.

The light and buoy have been installed at Fairchild Rock, while the equipment necessary for automatic lights at False Head and Jackson's Bay is on order. The material has also been ordered for an automatic light at Tutukaka Heads.

NATIVE-LAND SETTLEMENT.

The net expenditure from the Public Works Fund for the year under review was £357,818, as compared with £493,695 for the previous year. The gross expenditure this year was £1,052,777, as against £1,166,103 last year. The difference between the gross expenditure and the net capital expenditure this year—viz., £694,959—is represented by grants from the Consolidated Fund for promotion of employment of Maoris (£400,000) and farm receipts from Native lands in course of development and settlement totalling £294,959.

With the exception of £38,953 expended under the Native Housing Act, 1935 (an additional amount of £22,657 advanced during the year 1939–40 from the Special Housing Fund for disbursement by the Maori Land Boards is reflected in the Native Trustee's Account), the above figures represent expenditure on the development, settlement, cultivation, and improvement of Native lands, and the progress achieved in regard to these activities is indicated in the following statement, which shows the position at 31st March, 1940 :—

Area gazetted for development (acres)		903,000
Area under development (acres)		269,000
Individuals settlers established		1,900
Labourers employed		3,000
Dependants (excluding settlers and labourers)		17,000
Houses erected to date (total)		1,222
Live-stock tallies—		
Dairy stock		53,000
Run cattle		24,000
Sheep		199,000
Receipts for year—		
Butterfat (Department's proportion only, 40 per cent.)	£ 118,600	
Wool	55,900	
Live-stock	107,500	
Sundries	12,959	
		£ 294,959

The development and settlement of Native lands, the construction and repair of houses for Maoris, and the promotion of employment amongst the people are measures which are directed by the Board of Native Affairs and controlled by the Native Department. A full report dealing with the operations of the Board, and the policy adopted to encourage and assist the Maori people in their establishment as self-supporting members of the community, is contained in parliamentary report G.–10.

Further detailed particulars in respect of public works activities are included in the attached reports by the Engineer-in-Chief, the Government Architect, and the Chief Electrical Engineer.

In accordance with section 24 of the Main Highways Act, 1922, the annual report of the Main Highways Board for the year ended 31st March, 1940, together with a statement of accounts duly audited by the Audit Office, is also attached, *vide* Appendix E.

TABLE No. 1.

SUMMARY SHOWING THE TOTAL EXPENDITURE ON PUBLIC WORKS AND OTHER SERVICES OUT OF PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT) TO 31ST MARCH, 1940, AND THE LIABILITIES ON THAT DATE.

Number of Table containing Details.	Works.	Total Net Expenditure to 31st March, 1939.	Expenditure during Twelve Months ended 31st March, 1940.	Recoveries on Account of Services of Previous Years.	Total Net Expenditure to 31st March, 1940.	Liabilities on 31st March, 1940.	Total Net Expenditure and Liabilities.	Works.
		£	£	£	£	£	£	
3	Railways*	63,811,339	4,165,416	500	67,976,255	117,073	68,093,328	Railways.*
..	Roads†	26,317,129	1,124,590	370	27,441,349	79,819	27,521,168	Roads.†
4	Public buildings‡	16,145,717	1,802,806	54,123	17,894,400	69,113	17,963,513	Public buildings.‡
..	Telegraphs	12,876,634	416,778	..	13,293,412	1,270	13,294,682	Telegraphs.
..	Departmental	3,596,455	147,572	2	3,744,025	9,414	3,753,439	Departmental.
..	Charges and expenses of raising loans	3,828,307	137,609	..	3,965,916	..	3,965,916	Charges and expenses of raising loans.
..	Lighthouses, harbour-works, and harbour defences	1,368,472	22,519	..	1,390,991	3,507	1,394,498	Lighthouses, harbour-works, and harbour defences.
..	Irrigation and water-supply§ ..	1,550,349	416,438	20	1,966,767	34,775	2,001,542	Irrigation and water-supply.§
..	Lands improvement‖	1,293,467	172,525	10,980	1,455,012	11,253	1,466,265	Lands improvement.‖
..	Tourist and health resorts	781,636	24,892	..	806,528	3,180	809,708	Tourist and health resorts.
..	Settlement of unemployed workers¶ ..	1,411,851	446,758	..	1,858,609	6,462	1,865,071	Settlement of unemployed workers.¶
..	Swamp land drainage	103,009	2,700	144	105,565	742	106,307	Swamp land drainage.
..	Native land settlement	1,187,025	357,844	5,249	1,539,620	39,721	1,579,341	Native land settlement.
		134,271,390	9,238,447	71,388	143,438,449	376,329	143,814,778	
	Closed accounts :—							Closed accounts :—
..	Immigration	3,312,661	..	..	3,312,573	..	3,312,573	Immigration.
..	Purchase of Native lands	2,054,024	..	88	2,054,024	..	2,054,024	Purchase of Native lands.
..	Defence	1,389,488	..	..	1,389,449	..	1,389,449	Defence.
..	Development of mining	830,855	..	39	830,855	..	830,855	Development of mining.
11 of 1877	Aiding works on Thames goldfields ..	48,859	..	..	48,859	..	48,859	Aiding works on Thames goldfields.
..	Plant, material, and services ..	138,656	..	..	134,826	..	134,826	Plant, material, and services.
..	Interest and sinking fund	218,500	..	3,830	218,500	..	218,500	Interest and sinking fund.
..	Rates on Native lands	68,672	..	..	68,672	..	68,672	Rates on Native lands.
..	Motor transport services	33,635	..	..	33,635	..	33,635	Motor transport services.
..	Thermal springs	14,600	..	..	14,600	..	14,600	Thermal springs.
10 of 1878	Coal-exploration and mine-development	10,835	..	..	10,835	..	10,835	Coal-exploration and mine-development.
		8,120,785	..	3,957	8,116,828	..	8,116,828	
..	Transfer to Main Highways Account, Construction Fund	1,226,000	..	..	1,226,000	..	1,226,000	Transfer to Main Highways Account, Construction Fund.
	Totals	143,618,175	9,238,447	75,345	152,781,277	376,329	153,157,606	Totals.

* Does not include expenditure on Hutt Railway and Road Improvement, Wellington-Manawatu Purchase, and Railway Improvement Accounts. Includes £150,000 paid to Midland Railway bondholders. † Includes £4,500 expended under section 16 (1), Native Land Amendment and Native Land Claims Adjustment Act, 1923. ‡ Includes £12,500 expended under Finance Act, 1929, Section 32. Includes £154,488 expended under Reserves and other Lands Disposal Act, 1936, section 32. § Includes £115,000 previously expended under Irrigation and Water-supply Account, 1911–12 to 1915–16 and part 1917–18, now included in Public Works Fund; also £6,727 previously expended on irrigation under Lands Improvement now transferred to Irrigation and Water-supply. ‖ £6,727 previously expended on irrigation under this item now transferred to Irrigation and Water-supply; does not include £300,930 expended and included under Roads Class. Includes £46,125 advanced on account of Dairy Industry Loans. ¶ Includes £4,865 expended under Finance Act, 1932 (No. 2), section 6.

TABLE No. 2.

GENERAL SUMMARY.

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT), 1918–19 to 1939–40.

N.B.—The figures in italics, prefixed by "*Cr.*," are either recoveries on account of services of previous years or receipts-in-aid applied in reduction of expenditure.

Description of Services.	Total Net Expenditure to 31st March, 1918.	Expenditure.										
		1918–19.	1919–20.	1920–21.	1921–22.	1922–23.	1923–24.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.
	£	£	£	£	£	£	£	£	£	£	£	£
Immigration	2,342,131	*Cr. 12,018*	*Cr. 62,561*	*Cr. 7,806*	247,528	90,611 *Cr. 140*	92,600 *Cr. 1,267*	136,353 *Cr. 16*	107,521 *Cr. 443*	184,918	67,157	50,266 *Cr. 283*
Public Works, Departmental	1,319,955	115,419 *Cr. 4,119*	121,677	143,280 *Cr. 6,280*	128,002 *Cr. 525*	111,367 *Cr. 131*	110,445 *Cr. 69*	127,556 *Cr. 19*	126,596 *Cr. 129*	115,866 *Cr. 35,948*	130,951 *Cr. 13,328*	142,252 *Cr. 88,499*
Irrigation and Water-supply	153,781	22,919	34,115	55,345 *Cr. 9,854*	83,313	58,131	95,467	127,995	56,227 *Cr. 31*	56,937	49,735 *Cr. 2,798*	55,198 *Cr. 8*
Railways	34,211,662	387,923 *Cr. 4,924*	748,649 *Cr. 105,196*	1,365,466 *Cr. 388*	3,133,200 *Cr. 751*	2,110,859 *Cr. 3,171*	1,776,413 *Cr. 1,167*	1,878,729 *Cr. 37,924*	1,988,614 *Cr. 16,875*	1,480,807 *Cr. 95,647*	1,141,822 *Cr. 1,699*	1,216,277 *Cr. 2,595*
Payment to Midland Railway Bondholders	150,000	..	..	..	..	..	..	..	..	..	..	..
Roads:—												
Miscellaneous Roads and Bridges	10,003,430	221,887 *Cr. 997*	376,097 *Cr. 603*	527,854 *Cr. 81*	552,895 *Cr. 197*	643,156 *Cr. 244*	751,370 *Cr. 188*	603,968 *Cr. 231*	564,694 *Cr. 4,810*	575,898 *Cr. 981*	669,833 *Cr. 540*	780,990 *Cr. 330*
Roads to give access to Outlying Districts	..	..	..	..	..	..	..	..	..	..	33,642	51,582
Roads on Goldfields..	1,075,759	4,186	12,465	11,050	11,264	4,850	2,867	2,755	3,934	2,230	2,330 *Cr. 467*	1,005
Development of Thermal Springs and Natural Scenery ..	16,023	..	..	..	..	..	..	..	..	..	..	..
Lands Improvement Account*	300,930	..	..	..	..	..	..	..	..	..	..	..
Total, Roads	11,396,142	225,076	387,959	538,823	563,962	647,762	754,049	606,492	563,818	577,147	704,798	833,247
Development of Mining	889,496	518 *Cr. 1,000*	1,173 *Cr. 7,008*	2,153 *Cr. 1,606*	2,130 *Cr. 51*	*Cr. 98* *Cr. 1,785*	1,363 *Cr. 2,310*	..	..	..	.. *Cr. 1,130*	.. *Cr. 260*
Purchase of Native Lands	1,569,926	..	*Cr. 57*	*Cr. 59*	*Cr. 52*	..	..	..	..	*Cr. 535*	*Cr. 56*	..
Native Lands Purchase Account	491,980	..	..	..	..	..	..	..	..	..	..	..
Total, Land Purchases	2,061,906	..	*Cr. 57*	*Cr. 59*	*Cr. 52*	..	..	..	..	*Cr. 535*	*Cr. 56*	..
Telegraph Extension	3,624,986	198,611	249,379	336,468	590,981	512,657 *Cr. 11,082*	717,409	957,294	931,661	558,042	625,540	624,414

* Excludes expenditure subsequent to 1900 included under separate class "Lands Improvement."

[*Continued on page 3.*

TABLE No. 2—*continued.*

GENERAL SUMMARY—*continued.*

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT), 1918–19 to 1939–40—*continued.*

Description of Services.	Expenditure.											Total Net Expenditure to 31st March, 1940.
	1929–30.	1930–31.	1931–32.	1932–33.	1933–34.	1934–35.	1935–36.	1936–37.	1937–38.	1938–39.	1939–40.	
	£	£	£	£	£	£	£	£	£	£	£	£
Immigration	41,756	33,544	5,265	..	..	..	..	..	..	..	..	3,312,573
			Cr. 210	*Cr. 583*	*Cr. 532*	*Cr. 370*	*Cr. 362*	*Cr. 146*	*Cr. 144*	*Cr. 108*	*Cr. 88*	..
Public Works, Departmental	132,783	131,816	151,377	104,904	98,703	76,486	99,384	137,769	188,040	216,091	147,572	3,744,025
	Cr. 51,671	*Cr. 16,381*	*Cr. 33,947*	*Cr. 52,639*	*Cr. 33,872*	*Cr. 31,154*	*Cr. 28,178*	*Cr. 17,709*	*Cr. 19,489*	*Cr. 177*	*Cr. 2*	
Irrigation and Water-supply*	69,657	62,614	37,749	53,290	66,838	91,241	85,414	11,062	71,659	164,481	416,437	1,966,765
				Cr. 96						*Cr. 32*	*Cr. 21*	
Railways	1,812,521	1,987,196	952,388	160,853	132,111	125,600	258,011	1,019,094	2,412,990	3,798,083	4,165,416	67,826,255
	Cr. 1,296	*Cr. 792*	*Cr. 20,568*	*Cr. 9,056*	*Cr. 20*		*Cr. 134,696*	*Cr. 461*	*Cr. 700*		*Cr. 500*	
Payment to Midland Railway Bondholders	..	..	..	..	..	..	..	..	..	..	..	150,000
Roads :—												
Miscellaneous Roads and Bridges	1,005,330	1,379,810	1,078,270	396,559	359,671	371,573	444,377	913,720	1,126,757	1,290,838	1,124,590	25,749,714
	Cr. 415	*Cr. 472*	*Cr. 564*	*Cr. 1,171*	*Cr. 445*	*Cr. 471*	*Cr. 250*	*Cr. 172*	*Cr. 253*	*Cr. 68*	*Cr. 370*	
Roads to give access to Outlying Districts	53,693	91,126	3,940	..	..	..	..	..	..	..	..	233,983
Roads on Goldfields	1,885	4,586	..	..	..	..	..	..	..	..	..	1,140,699
Development of Thermal Springs and Natural Scenery ..	..	..	..	..	..	..	..	..	..	..	..	16,023
Lands Improvement Account	..	..	..	..	..	..	..	..	..	..	..	300,930
Total, Roads	1,060,493	1,475,050	1,081,646	395,388	359,226	371,102	444,127	913,548	1,126,504	1,290,770	1,124,220	27,441,349
Development of Mining	..	..	..	..	..	..	..	..	..	..	..	879,714
	Cr. 260	*Cr. 260*		*Cr. 50*			*Cr. 143*	*Cr. 17*	*Cr. 1,141*			
Purchase of Native Lands	..	..	..	..	*Cr. 7,123*	..	..	..	..	..	..	1,562,044
Native Lands Purchase Account	..	..	..	..	..	..	..	..	..	..	..	491,980
Total, Land Purchases	..	..	..	..	*Cr. 7,123*	..	..	..	..	..	..	2,054,024
Settlement of Unemployed Workers	..	..	..	118,723	172,109	222,309	151,345	92,016	310,665	344,684	446,758	1,858,609
Telegraph Extension	594,383	419,756	249,978	99,999	144,160	135,933	195,380	232,513	312,260	575,944	416,779	13,293,413
			Cr. 32									

* Includes £6,727 previously included under Lands Improvement class.

TABLE No. 2—*continued.*

GENERAL SUMMARY—*continued.*

Showing Net Yearly Expenditure out of Public Works Fund (General Purposes Account), 1918–19 to 1939–40—*continued.*

Description of Services.	Total Net Expenditure to 31st March, 1918.	Expenditure.										
		1918–19.	1919–20.	1920–21.	1921–22.	1922–23.	1923–24.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.
	£	£	£	£	£	£	£	£	£	£	£	£
Public Buildings:—												
General (including Miscellaneous)	380,260	43,168	64,207	39,504	87,057	113,553	8,160	30,791	29,369	119,864	42,553	4,272
								Cr. 35	*Cr. 345*	*Cr. 429*	*Cr. 1,065*	*Cr. 420*
Parliamentary	484,330	..	..	..	..	..	..	..	..	..	..	35
Judicial—Courthouses		..	868	1,400	4,358	2,018	2,448	5,363	7,209	1,261	7,531	8,387
						Cr. 13		*Cr. 19*		*Cr. 13*	..	*Cr. 95*
Judicial—Prisons	956,433	16,299	20,981	30,038	41,740	23,113	26,484	25,279	24,197	22,812	22,358	12,573
				Cr. 800			*Cr. 2,568*	*Cr. 86*		*Cr. 908*	*Cr. 524*	*Cr. 321*
Judicial—Police-stations		6,157	24,944	36,843	22,544	6,298	12,838	18,553	16,594	7,411	5,561	6,925
									Cr. 102	*Cr. 13*	*Cr. 970*	*Cr. 605*
Post and Telegraph	1,276,275	26,072	66,543	93,364	112,906	77,211	108,395	65,917	89,865	86,052	77,194	62,087
				Cr. 560	*Cr. 675*	*Cr. 69*		*Cr. 210*	*Cr. 453*	*Cr. 1,114*	*Cr. 834*	*Cr. 1,980*
Customs	49,441	..	..	..	..	..	..	..	..	..	..	..
Quarantine Stations	6,255	..	35,490	15,529	4,581	154	171	284	..	..	..	..
Mental Hospitals	858,609	14,640	18,277	27,368	41,838	13,852	26,541	68,438	77,835	68,635	51,119	96,782
									Cr. 283		*Cr. 3,600*	
Public Health	32,745	..	..	..	..	..	..	..	..	..	..	..
Health and Hospital Institutions	152,959	2,332	8,484	4,099	26,131	20,981	7,420	27,951	31,177	15,840	14,361	19,637
						Cr. 1,399			*Cr. 300*		*Cr. 310*	
School Buildings	2,551,667	115,656	195,500	244,722	2,469	..	..	..	..	..	..	..
					Cr. 9,255	*Cr. 368*	*Cr. 1,090*	*Cr. 905*	*Cr. 1,050*	*Cr. 7,953*		*Cr. 2,428*
Agricultural	59,967	4,229	7,227	9,345	1,115	514	282	3,242	7,932	4,164	2,863	2,808
						Cr. 27	*Cr. 171*	*Cr. 686*	*Cr. 865*	*Cr. 310*		*Cr. 2,395*
Workers' Dwellings	285,951	7,293	26,674	..	..	..	..	..	..	..	..	..
Total, Public Buildings	7,094,901	235,846	469,195	500,852	334,809	255,818	188,910	243,877	280,780	315,299	216,237	205,262
Lighthouses, Harbour-works, and Harbour-defences:—												
Lighthouses	205,930	1,663	253	758	16,359	3,260	4,473	2,850	5,690	5,758	7,979	2,637
									Cr. 750			
Harbour-works	391,062	3,729	3,245	4,080	2,424	6,524	6,334	423	3,717	13,263	15,891	14,425
									Cr. 131	*Cr. 204*	*Cr. 165*	
Harbour-defences	546,059	..	..	..	..	..	..	..	..	..	..	..
						Cr. 1,235	*Cr. 16*					
Total, Lighthouses, &c.	1,143,051	5,392	3,498	4,838	18,774	8,549	10,791	3,273	8,526	18,817	23,705	17,062
Rates on Native Lands	68,672	..	..	..	..	..	..	..	..	..	..	..

[*Continued on page 5.*

TABLE No. 2—*continued.*

GENERAL SUMMARY—*continued.*

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT), 1918–19 to 1939–40—*continued.*

Description of Services.	Expenditure.											Total Net Expenditure to 31st March, 1940.
	1929–30.	1930–31.	1931–32.	1932–33.	1933–34.	1934–35.	1935–36.	1936–37.	1937–38.	1938–39	1939–40.	
Public Buildings :—	£	£	£	£	£	£	£	£	£	£	£	£
General (including Miscellaneous)	14,106*	85,204	33,189	2,107	594	30,713	39,447	57,668	258,978	790,452	236,638	2,313,852
	Cr. 3,156	*Cr. 55*	*Cr. 4,231*	*Cr. 2,067*	*Cr. 1,075*	*Cr. 14,087*	*Cr. 125,964*	*Cr. 59*	*Cr. 201*	*Cr. 1,917*	*Cr. 42,896*	
Parliamentary	27,142	15,723	37	..	..	..	..	27	..	78	3,127	530,499
Judicial — Courthouses	15,765	19,572	3,513	970	72	533	8,701	2,655	16,403	34,873	11,436	1,750,681
	Cr. 29	*Cr. 16,403*	*Cr. 529*	*Cr. 222*	*Cr. 255*	*Cr. 93*	*Cr. 4,278*	*Cr. 644*	*Cr. 200*	*Cr. 274*	*Cr. 15*	
Judicial — Prisons	18,814	2,504	2,621	2,026	1,018	1,605	2,123	4,621	9,476	7,656	4,348	
	Cr. 285	*Cr. 134*	*Cr. 67*	*Cr. 71*				*Cr. 20*		*Cr. 2,033*		
Judicial — Police-stations	8,442	8,360	2,535	1,022	74	2,754	6,710	7,149	11,086	77,745	60,664	
	Cr. 319	*Cr. 54*	*Cr. 91*	*Cr. 80*	*Cr. 79*	*Cr. 240*	*Cr. 35*	*Cr. 172*	*Cr. 546*	*Cr. 197*	*Cr. 581*	
Post and Telegraph	104,157	138,671	104,505	2,763	21,078	100,484	232,285	158,005	248,145	280,951	362,730	3,819,672
	Cr. 197	*Cr. 1,391*	*Cr. 3,179*	*Cr. 4,823*	*Cr. 1,502*	*Cr. 582*	*Cr. 2,760*	*Cr. 1,436*	*Cr. 36,844*	*Cr. 8,166*	*Cr. 9,208*	
Customs	..	..	..	..	..	..	..	..	..	..	..	49,441
Quarantine Stations	..	..	..	..	..	..	..	..	..	..	..	62,464
Mental Hospitals	152,096	134,140	45,938	28,756	73,021	98,629	67,465	142,109	125,829	128,840	175,552	2,530,989
			Cr. 860			*Cr. 40*		*Cr. 177*			*Cr. 360*	
Public Health	..	..	..	..	..	..	..	..	..	..	..	32,754
Health and Hospital Institutions	16,651	17,338	3,316	301	1,248	656	2,191	12,921	15,747	88,099	67,137	554,704
			Cr. 1	*Cr. 113*	*Cr. 150*							
School Buildings	..	..	259,149	52,623	52,239	51,506	122,357	268,884	546,846	660,666	844,126	5,940,593
		Cr. 1,110	*Cr. 40*		*Cr. 805*	*Cr. 217*	*Cr. 933*	*Cr. 2*	*Cr. 412*	*Cr. 187*	*Cr. 1,062*	
Agricultural	2,963	1,509	..	..	48	88	85	60,902‡	2,269‡	111,158‡	37,049	308,753
	Cr. 1,721	*Cr. 194*	*Cr. 1,927*	*Cr. 1,535*	*Cr. 437*	*Cr. 32*		*Cr. 115*	*Cr. 34*	*Cr. 557*		
Workers' Dwellings†	..	..	..	..	..	*Cr. 319,918*	..	..	..	..	..	..
Total, Public Buildings	354,429	403,680	443,878	81,657	145,089	*Cr. 48,241*	347,394	712,316	1,196,542	2,167,187	1,748,685	17,894,402
Lighthouses, Harbour-works, and Harbour-defences :—												
Lighthouses	4,460	4,103	5,046	688	1,276	4,021	3,320	630	8,260	21,638	19,609	329,402
	Cr. 500											
Harbour-works	10,736	6,742	6,987	*Cr. 5,277*	11,988	2,581	*Cr. 399*	669	3,417	12,212	2,910	516,781
								Cr. 2	*Cr. 200*	*Cr. 200*		
Harbour-defences	..	..	..	..	..	..	..	..	..	..	..	544,808
Total, Lighthouses, &c.	14,696	10,845	12,033	*Cr. 4,589*	13,264	6,602	2,921	1,297	11,477	33,650	22,519	1,390,991
Rates on Native Lands	..	..	..	..	..	..	..	..	..	..	..	68,672

* Includes £12,500 expended under Finance Act, 1929, section 32.

† Transferred to State Advances Account.

‡ Includes £154,488 expended under Reserves and other Lands Disposal Act, 1936, section 32 (Flock House purchase).

TABLE No. 2—*continued.*

GENERAL SUMMARY—*continued.*

Showing Net Yearly Expenditure out of Public Works Fund (General Purposes Account), 1918-19 to 1939-40—*continued.*

Description of Services.	Total Net Expenditure to 31st March, 1917.	Expenditure.										
		1918–19.	1919–20.	1920–21.	1921–22.	1922–23.	1923–24.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.
	£	£	£	£	£	£	£	£	£	£	£	£
Contingent Defence	1,043,691	8,809 *Cr. 922*	10,187	8,701	15,586	1,702 *Cr. 463*	4,931 *Cr. 280*	27,133 *Cr. 589*	89,670 *Cr. 33*	34,014 *Cr. 751*	39,986 *Cr. 465*	67,652 *Cr. 648*
Tourist and Health Resorts	259,440	1,620	6,194	19,041	17,996 *Cr. 110*	5,435	27,264	12,343 *Cr. 81*	43,486	31,981	36,673 *Cr. 516*	39,254 *Cr. 440*
Lands Improvement*	132,881	*Cr. 4,268*	2,964	2,064	17,478	26,204	18,182	34,172	70,493 *Cr. 19*	56,267 *Cr. 135*	72,898 *Cr. 2,574*	85,861 *Cr. 87*
Charges and Expenses of raising Loans	1,253,076	..	..	184	174,280	62,399	311,905	241,930	297,180	155,373	100,297	438,238 *Cr. 3,811*
Interest and Sinking Funds	218,500	..	..	..	..	..	..	..	..	..	..	..
Coal-exploration and Mine-development	10,835	..	..	..	..	..	..	..	..	..	..	..
Thermal Springs	14,600	..	..	..	..	..	..	..	..	..	..	..
Plant, Material, and Services	91,006	20,638 *Cr. 31*	47,682	169,910	122,801	*Cr. 4,983*	*Cr. 49,159* *Cr. 16*	*Cr. 30,956* *Cr. 1*	36,930 *Cr. 855*	*Cr. 9,334* *Cr. 1,992*	*Cr. 17,610* *Cr. 8,985*	*Cr. 6,551* *Cr. 1,224*
Motor Transport Service	..	..	..	..	..	22,679	962	5,000	4,994	..	..	..
Transfer to Main Highways Account :— Construction Fund	..	..	..	..	..	..	..	226,000	..	400,000	200,000	200,000
Total Ways and Means Credits	..	*11,993*	*112,864*	*19,628*	*11,616*	*20,127*	*9,142*	*40,793*	*27,474*	*146,933*	*40,026*	*106,429*
Grand Total—Net Expenditure	67,480,712	1,195,489	1,907,850	3,121,132	5,449,351	3,892,320	4,056,423	4,558,570	4,588,111	3,841,126	3,360,638	3,870,577

* Expenditure prior to 1901 (totalling £300,930) included under separate class "Roads."

[*Continued on page 7.*

TABLE No. 2—*continued.*

GENERAL SUMMARY—*continued.*

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT), 1918–19 to 1939–40—*continued.*

Description of Services.	Expenditure.											Total Net Expenditure to 31st March, 1940.
	1929–30.	1930–31.	1931–32.	1932–33.	1933–34.	1934–35.	1935–36.	1936–37.	1937–38.	1938–39.	1939–40.	
	£	£	£	£	£	£	£	£	£	£	£	£
Contingent Defence	46,766 *Cr. 1,325*	13,812 *Cr. 586*	.. *Cr. 4,039*	.. *Cr. 624*	.. *Cr. 76*	..	.. *Cr. 704*	.. *Cr. 64*	.. *Cr. 40*	.. *Cr. 11,552*	.. *Cr. 40*	1,389,448 ..
Tourist and Health Resorts	20,547 *Cr. 1,213*	60,288 *Cr. 2,494*	87,609 *Cr. 85*	14,454 *Cr. 877*	13,510 *Cr. 21*	12,880 *Cr. 705*	13,683 *Cr. 20*	16,789	23,159	24,552	24,892	806,528
Lands Improvement*	79,454 *Cr. 112*	70,534 *Cr. 1,041*	38,899 *Cr. 506*	38,906 *Cr. 248*	71,825 *Cr. 329*	82,092 *Cr. 722*	37,909 *Cr. 1,006*	62,673 *Cr. 10,366*	147,436 *Cr. 10,699*	134,677 *Cr. 4,415*	172,020 *Cr. 10,980*	1,408,382
Swamp Land Drainage	..	..	..	14,807	13,959 *Cr. 297*	15,019 *Cr. 231*	12,922 *Cr. 263*	24,965	19,402	5,324 *Cr. 2,598*	2,700 *Cr. 144*	105,565
Dairy Industry Loans..	..	..	..	..	..	..	10,750	30,510	4,565	300	..	46,125
Flaxmilling Industry (Rehabilitation Plan)	..	..	..	..	..	..	..	..	..	..	505	505
Charges and Expenses of raising Loans	518,158	164,535	98,098	15,851	14	600	..	..	..	..	137,609	3,965,916
Interest and Sinking Funds	..	..	..	..	..	..	..	..	..	..	..	218,500
Coal-exploration and Mine-development	..	..	..	..	..	..	..	..	..	..	..	10,835
Thermal Springs	..	..	..	..	..	..	..	..	..	..	..	14,600
Plant, Material, and Services	*Cr. 35,092* *Cr. 360*	*Cr. 42,824* *Cr. 216*	*Cr. 103,571* *Cr. 1,338*	*Cr. 45,463* *Cr. 161*	1,421 *Cr. 22*	*Cr. 10,513* *Cr. 165*	22,438 *Cr. 418*	‡ *Cr. 1,642*	.. ..	*Cr. 688* ..	*Cr. 3,830*	134,826
Native Land Settlement	..	..	..	..	179,485 *Cr. 52*	125,790 *Cr. 9,662*	71,901 *Cr. 9,491*	112,318 *Cr. 3,423*	254,869 *Cr. 25,018*	493,695 *Cr. 3,387*	357,845 *Cr. 5,249*	1,539,621
Motor Transport Service	..	..	..	..	..	..	..	..	..	..	..	33,635
Transfer to Main Highways Account:— Construction Fund	200,000	..	..	..	..	..	..	..	..	..	..	1,226,000
Total Ways and Means Credits	*62,859*	*41,583*	*72,214*	*74,416*	*47,092*	*378,689*	*309,501*	*36,630*	*95,921*	*36,556*	*75,346*	..
Grand Total—Net Expenditure	4,854,314†	4,769,076	2,994,624	984,446	1,369,370	1,163,891	1,578,298	3,333,039	6,022,337	9,226,481	9,163,103	152,781,278

* Expenditure on Irrigation and Water-supply—1905–6, £22; 1906–7, £750; 1907–8, £1,554; 1908–9, £1,966; 1909–10, £2,435, now transferred to Irrigation and Water-supply. † Includes £12,500 expended under Finance Act, 1929, section 32. ‡ Now provided for under Consolidated Fund.

TABLE No. 3.

EXPENDITURE ON RAILWAYS TO 31ST MARCH, 1940.

Lines of Railway.	Mileage opened for Traffic.	Total Expenditure by General Government to 31st March, 1939.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1939-40: New Works.		Total Expenditure by General Government to 31st March, 1940.	Valuation of Works constructed by Provinces and Midland Railway Company.
				Construction and Surveys.	Railways Improvement and Works on Open Lines.		
	M. ch.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Kaihu Valley	24 32	179,143 14 9	..	..	..	179,143 14 9	..
Opua Wharf to Whangarei and Onerahi	58 06	622,043 3 9	..	..	..	622,043 3 9	..
Otiria to Ngapuhi	13 45	127,448 8 0	..	..	1,008 13 3	128,457 1 3	..
Whangarei Branch (Kioreroa to Waiotira)	19 79	421,087 19 9	..	..	659 18 2	421,747 17 11	..
North Auckland Main Trunk—							
Ngapuhi Northwards	11 00	876,439 15 6	..	*Cr.* 891 12 10	..	875,548 2 8	..
Helensville Northwards	83 39	2,998,059 0 0	..	..	5,496 16 9	3,003,555 16 9	..
North Auckland Main Trunk to Dargaville	..	505,497 7 6	..	34,450 15 4	..	539,948 2 10	..
Helensville to Te Awamutu	148 67	6,134,513 14 10	..	..	323,007 14 5	6,457,521 9 3	..
Waiuku Branch (Paerata to Waiuku)	12 69	208,912 9 6	..	..	447 9 10	209,359 19 4	..
Huntly to Awaroa	8 75	184,379 5 0	..	..	..	184,379 5 0	..
Waikokowai Branch	..	3,442 0 0	..	..	..	3,442 0 0	..
Frankton to Thames	62 58	520,897 12 6	..	..	8,418 16 11	529,316 9 5	..
Cambridge Branch (Ruakura Junction to Cambridge)	12 02	62,650 13 1	..	..	*Cr.* 31 6 3	62,619 6 10	..
Morrinsville to Rotorua	69 33	447,051 18 5	..	..	3,145 6 9	450,197 5 2	..
Marton to Te Awamutu	209 69	3,185,829 4 0	..	..	42,125 13 8	3,227,954 17 8	..
Waipa Gravel Access Branch	..	114 0 0	..	..	..	114 0 0	..
Raetihi Branch	8 50	89,452 2 1	..	..	..	89,452 2 1	..
Rotorua to Taupo	..	37,862 13 11	..	806 8 2	..	38,669 2 1	..
Paeroa to Pokeno	..	130,451 2 4	..	121,123 13 8	..	251,574 16 0	..
Paeroa to Tauranga	50 65	1,256,950 14 8	..	..	..	1,256,950 14 8	..
Tauranga to Taneatua, including Te Maunga to Maunganui Branch	59 17	1,497,753 4 11	..	..	1,319 1 11	1,499,072 6 10	..
Taneatua to Opotiki	..	2,006 7 0	..	1,829 2 4	..	3,835 9 4	..
Gisborne to Motu	49 32	627,303 1 3	..	..	823 18 0	628,126 19 3	..
Gisborne to Ormond Tramway	..	4,975 1 7	..	..	..	4,975 1 7	..
Napier to Gisborne—							
Gisborne Southwards	11 51	284,625 13 5	..	..	..	284,625 13 5	..
Waikokopu Northwards	..	1,665,469 1 7	..	411,830 16 4	..	2,077,299 17 11	..
Wairoa Northwards	..	20,681 12 6	..	..	..	20,681 12 6	..
Napier Northwards	38 62	2,575,903 15 8	..	65,267 6 11	3,949 14 7	2,645,120 17 2	..
Waikokopu Branch	..	674,873 18 7	..	5,193 9 8	..	680,067 8 3	..
Wellington to Napier—							
Napier to Woodville and Palmerston North	114 06	1,184,670 13 2	..	..	7,339 5 3	1,192,009 18 5	..
Wellington to Woodville, including Te Aro Extension	129 30	3,361,008 2 5	..	1,362 11 9	35,805 6 9	3,398,176 0 11	..
Featherston to Martinborough	..	399 0 0	..	..	..	399 0 0	..
Wellington to Waitara—							
Wellington to Longburn	83 37	4,373,574 19 3	..	..	245,838 5 0	4,619,413 4 3	..
Foxton to Waitara and Moturoa	196 22	2,476,230 15 10	..	*Cr.* 1 2 8	212,149 0 5	2,688,378 13 7	..
Mount Egmont Branch	6 00	70,536 1 6	..	..	..	70,536 1 6	..
Moturoa to Opunake	..	3,105 0 0	..	..	..	3,105 0 0	..
Opunake Branch (Te Roti to Opunake)	22 63	447,884 17 11	..	..	26 12 11	447,911 10 10	..
Manaia Branch (Kapuni to Manaia)	..	9,483 6 0	..	..	..	9,483 6 0	..
Rangitikei River Quarry Line	..	206 0 0	..	..	..	206 0 0	..

TABLE No. 3—*continued.*

Expenditure on Railways to 31st March, 1940—*continued.*

Lines of Railway.	Mileage opened for Traffic.	Total Expenditure by General Government to 31st March, 1939.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1939–40: New Works.		Total Expenditure by General Government to 31st March, 1940.	Valuation of Works constructed by Provinces and Midland Railway Company.
				Construction and Surveys.	Railways Improvement and Works on Open Lines.		
	M. ch.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Stratford to Okahukura	89 00	3,117,344 18 4	..	*Cr.* 12 1 0	5,971 19 3	3,123,304 16 7	..
Nelson to Greymouth—							
Nelson to Inangahua	64 47	723,636 7 10	..	*Cr.* 448 4 2	..	723,188 3 8	78,307 0 0
Stillwater to Inangahua	57 32	238,276 9 1	..	..	761 18 11	239,038 8 0	279,685 0 0
Ngahere to Blackball	3 40	147,881 12 11	..	..	144 9 2	148,026 2 1	..
Westport to Ngakawau	19 56	214,568 9 3	..	..	1,081 2 6	215,649 11 9	..
Ngakawau to Mokihinui	7 12	33 9 6*	..	..	..	33 9 6	..
Mokihinui to Colliery Line	3 69	†					
Westport to Cape Foulwind	7 00	‡					
Westport to Inangahua	5 74	992,099 14 8	..	127,089 8 11	..	1,119,189 3 7	..
Greymouth to Rewanui	2 44	265,075 12 9	..	..	25 10 0	265,101 2 9	..
Point Elizabeth Branch	8 70	74,363 10 11	..	..	..	74,363 10 11	..
Greymouth to Ross and Mikonui	36 68	445,068 11 7	..	..	677 0 8	445,745 12 3	..
Picton to Waipara—							
Picton Southwards	56 06	1,443,994 13 10	..	181,310 6 10	21,261 1 4	1,646,566 2 0	..
Waipara Northwards	44 14	1,252,981 2 1	..	301,199 1 7	..	1,554,180 3 8	..
Christchurch to Greymouth—							
Rolleston to Bealey	73 07	1,016,599 10 6	..	..	4,647 7 6	1,021,246 18 0	61,579 0 0
Whitecliffs Branch	11 38	25,098 13 11	..	..	..	25,098 13 11	..
Greymouth to Bealey	58 12	2,002,134 3 11	..	..	39,799 4 5	2,041,933 8 4	263,889 0 0
Hurunui to Waitaki—							
Main Line (Waiau to Waitaki)	219 07	2,822,188 4 9	..	..	93,565 1 1	2,915,753 5 10	316,135 0 0
Oxford Branch (Rangiora to Oxford West)	21 76	49,697 17 2	..	..	..	49,697 17 2	..
Eyreton Branch (Kaiapoi to Bennett's)	20 07	44,257 0 0	..	..	..	44,257 0 0	..
Lyttelton Branch	6 26	231,064 19 2	..	..	14,279 19 2	245,344 18 4	340,500 0 0
Southbridge Branch (Hornby to Southbridge)	25 31	92,466 15 8	..	..	34 4 10	92,501 0 6	..
Little River Branch (Lincoln to Little River)	22 46	112,292 4 6	..	..	..	112,292 4 6	..
Rakaia to Methven	22 20	77,504 3 0	..	..	282 8 5	77,786 11 5	..
Ashburton to Springburn	27 29	64,025 11 3	..	..	..	64,025 11 3	..
Orari to Geraldine	..	321 0 0	..	..	..	321 0 0	..
Fairlie Branch (Washdyke Junction to Fairlie)	36 05	70,502 15 5	..	..	..	70,502 15 5	75,124 0 0
Waimate Branch	12 63	80,862 4 6	..	..	..	80,862 4 6	..
Canterbury Interior Main Line—							
Oxford to Malvern	11 44	46,248 0 0	..	..	1 2 9	46,249 2 9	..
Whitecliffs to Rakaia	..	542 0 0	..	..	..	542 0 0	..
Temuka to Rangitata	..	5,152 0 0	..	..	..	5,152 0 0	..
Waitaki to Bluff—							
Main Line, including Port Chalmers Branch	252 71	4,420,824 18 7	..	..	141,848 12 0	4,562,673 10 7	82,259 0 0
Duntroon Branch (Pukeuri to Kurow)	37 33	86,243 8 6	..	..	..	86,243 8 6	37,500 0 0
Ngapara Branch (Waiareka Junction to Ngapara)	14 76	25,551 8 0	..	..	*Cr.* 40 2 6	25,511 5 6	58,009 0 0

* The funds for this extension—namely, **£35,501 2s. 11d.**—were provided by the Westport Harbour Board.

† The funds for purchase of this line—namely, £15,745—were provided by the Harbour Board.

‡ The funds for this line—**namely, £93,450**—were provided by the Westport Harbour Board.

TABLE No. 3—*continued.*

Expenditure on Railways to 31st March, 1940—*continued.*

Lines of Railway.	Mileage opened for Traffic.	Total Expenditure by General Government to 31st March, 1939.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1939–40: New Works.		Total Expenditure by General Government to 31st March, 1940.	Valuation of Works constructed by Provinces and Midland Railway Company.
				Construction and Surveys.	Railways Improvement and Works on Open Lines.		
Waitaki to Bluff—*continued.*	M. ch.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Livingstone Branch (Windsor to Tokarahi)	11 75	75,350 15 4	..	..	..	75,350 15 4	..
Waihemo Branch (Palmerston to Dunback)	8 55	32,961 8 11	..	..	..	32,961 8 11	..
Fernhill Railway	1 60	1,330 0 0	..	..	..	1,330 0 0	..
Brighton Road Branch	..	6,474 0 0	..	..	..	6,474 0 0	12,829 0 0
Outram Branch (Mosgiel to Outram)	8 78	12,051 0 7	..	..	..	12,051 0 7	29,691 0 0
Lawrence Branch	58 67	724,072 5 5	..	..	519 19 11	724,592 5 4	..
Balclutha to Tuapeka Mouth	..	2,489 0 0	..	..	..	2,489 0 0	..
Catlin's River Branch (Balclutha to Tahakopa)	42 67	463,709 6 3	..	..	..	463,709 6 3	..
Heriotburn Branch (Waipahi to Edievale)	26 23	124,808 4 5	..	..	..	124,808 4 5	..
Waikaka Branch (McNab to Waikaka)	12 65	68,423 0 0	..	..	..	68,423 0 0	..
Gore to Lumsden	36 39	112,857 18 2	..	..	..	112,857 18 2	..
Edendale to Glenham	9 36	50,490 13 11	..	..	*Cr.* 60 0 0	50,430 13 11	..
Riversdale to Switzers	13 70	82,285 4 0	..	..	..	82,285 4 0	..
Seaward Bush to Catlin's (Appleby to Tokanui)	32 79	185,229 5 5	..	..	*Cr.* 25 0 0	185,204 5 5	..
Otago Central (Wingatui to Cromwell)	147 27	1,457,163 11 7	..	..	4,773 18 10	1,461,937 10 5	..
Invercargill to Kingston—							
Main Line	87 04	381,062 1 4	..	..	3,338 11 3	384,400 12 7	91,937 0 0
Mararoa Branch (Lumsden to Mossburn)	10 40	27,508 4 4	..	..	..	27,508 4 4	..
Winton to Heddon Bush	..	140 0 0	..	..	..	140 0 0	..
Makarewa to Orepuki and Waiau	56 34	362,249 16 5	..	..	514 5 4	362,764 1 9	37,097 0 0
Thornbury to Wairio	22 15	104,658 13 9	..	..	512 10 9	105,171 4 6	23,200 0 0
Forest Hill (Winton to Hedgehope)	12 40	23,337 0 0	..	..	23 12 3	23,360 12 3	..
Expenses of Railway Commissions and other Expenditure not chargeable to Individual Lines	..	10,337 0 0	..	..	..	10,337 0 0	..
Surveys of New Lines—							
North Island	..	31,235 10 1	..	*Cr.* 2,006 3 5	..	29,229 6 8	..
South Island	..	5,880 9 6	..	61 18 1	..	5,942 7 7	..
Rolling-stock	..	14,198,413 16 10	..	..	1,564,883 7 5	15,763,297 4 3	..
Motor-omnibus Service, Wellington	..	60,571 1 11	..	..	..	60,571 1 11	..
General	..	42,104 9 7	..	*Cr.* 24,441 11 8	*Cr.* 17 16 10	17,645 1 1	..
Depreciation provided for out of Railway Revenue and actually repaid to Public Works Fund	..	*Cr.* 762,612 9 4	..	..	..	*Cr.* 762,612 9 4	..
Stock of Permanent-way Materials	..	8,942 15 9	..	*Cr.* 2,510 14 3	..	6,432 1 6	..
Totals	..	75,355,343 7 11*	..	1,221,213 9 7	2,790,334 16 9	79,366,891 14 3*	1,787,741 0 0†

* The £10,400,000 accrued depreciation of assets referred to in section 23 (2), Government Railways Amendment Act, 1931, not deducted.

† Includes value for £150,000 paid to debenture holders under the Midland Railway Petitions Settlement Act Amendment Act, 1903.

TABLE No. 4.

EXPENDITURE ON PUBLIC BUILDINGS OUT OF PUBLIC WORKS FUND TO THE 31ST MARCH, 1940, AND THE LIABILITIES ON THAT DATE.

—	Total Expenditure to 31st March, 1939.	Expenditure for Year ended 31st March, 1940.	Total Expenditure to 31st March, 1940.	Liabilities on Authorities, Contracts, &c., to 31st March, 1940.	Total Expenditure and Liabilities.
	£	£	£	£	£
General—					
Alexandra Depot, Wellington*	8,084	..	8,084	..	8,084
Government House, Wellington (land and new building)	77,770	..	77,770	..	77,770
Offices for public Departments†	1,489,679	121,553	1,611,212	17,384	1,628,596
Air Defence	345,040	..	345,040	..	345,040
Miscellaneous	198,735	71,733	270,468	332	270,800
Parliament Buildings—					
Old buildings	76,553	..	76,553	..	76,553
New buildings	393,976	3,127	397,103	..	397,103
Alterations to streets surrounding grounds and purchase of land	57,089	477	57,566	..	57,566
Judicial‡	1,674,828	75,852	1,750,680	3,084	1,753,764
Postal and telegraph‖	3,466,150	353,522	3,819,672	17,637	3,837,309
Customs	49,441	..	49,441	..	49,441
Quarantine-stations	62,464	..	62,464	..	62,464
Mental hospitals	2,355,797	175,192	2,530,989	13,021	2,544,010
Health and hospital institutions§	520,321	67,136	587,457	10,604	598,061
School buildings	5,097,529	843,064	5,940,593	16,038	5,956,631
Agricultural	272,261¶	32,209	304,470	4,097	308,567
Totals	16,145,717	1,743,845	17,889,562	82,197	17,971,759

* Expenditure *re* Defence requirements only. Other expenditure included in "Judicial" class. † Includes £12,500 expended under Finance Act, 1929, section 32. ‡ Includes Courthouses, prisons, and police-stations. ‖ Includes £134,485 for land transferred from Railway Department. § Includes £32,754 previously shown under "Public Health." ¶ Includes £154,448 expended under Reserves and other Lands Disposal Act, 1936, section 32 (Flock House purchase).

TABLE No. 5.

ELECTRIC SUPPLY ACCOUNT.—STATEMENT OF ACCOUNTS AT THE 31ST MARCH, 1940.

GENERAL BALANCE-SHEET

AT 31ST MARCH, 1940, COMPARED WITH POSITION AT 31ST MARCH, 1939.

Liabilities.	1939–40. £ s. d.	£ s. d.	1938–39. £ s. d.
Aid to Water-power Works and Electric Supply Accounts—			
Debentures Stock issued—			
At 2½ per cent. interest	1,300,000 0 0		*1,300,000 0 0*
At 3 per cent. interest	3,149,372 9 6		*3,149,372 9 6*
At 3½ per cent. interest	1,449,225 0 0		*1,449,225 0 0*
At 3¾ per cent. interest	567,490 0 0		*573,555 0 0*
At 4 per cent. interest	1,643,470 0 0		*1,647,600 0 0*
At 4½ per cent. interest	2,623,913 18 0		*2,623,913 18 0*
At 5 per cent. interest	3,159,227 13 6		*3,159,227 13 6*
Debentures not yet converted	..		*50 0 0*
Treasury Bills—			
At 1½ per cent. interest	110,000 0 0		..
At 3 per cent. interest	75,000 0 0		..
Treasury Notes—			
At 4½ per cent. interest	93,500 0 0		..
		14,171,199 1 0	*13,902,944 1 0*
Consolidated Fund—			
Interest accrued on loans to 31st March, 1940	133,218 9 4		*133,577 6 10*
Sundry creditors for interest unclaimed	..		*12 0 0*
		133,218 9 4	*133,589 6 10*
Temporary loan	..		*12,000 0 0*
Temporary transfers from other accounts	..	175,000 0 0	*210,000 0 0*
Interest reserve, being excess of interest charged to schemes over interest actually paid on capital liability	..	82,606 13 5	*82,126 3 2*
Carried forward	..	14,562,024 3 9	*14,340,659 11 0*

Assets.	1939-40. £ s. d.	£ s. d.	1938–39 £ s. d.
North Island scheme—			
Assets as per separate balance-sheet	11,039,964 16 8		*10,280,338 13 5*
Investments, Sinking Fund	2,175 7 5		..
		11,042,140 4 1	*10,280,338 13 5*
South Island scheme—			
Assets as per separate balance-sheet	7,294,627 0 0		*7,013,536 11 10*
Investments, Sinking Fund	10,547 0 5		*10,321 2 3*
		7,305,174 0 5	*7,023,857 14 1*
Surveys and General	..	18,519 14 6	*18,665 8 5*
Carried forward	..	18,365,833 19 0	*17,322,861 15 11*

TABLE No. 5—*continued.*

ELECTRIC SUPPLY ACCOUNT.—STATEMENT OF ACCOUNTS AT THE 31st MARCH, 1940—*continued.*

GENERAL BALANCE-SHEET—*continued.*

AT 31st MARCH, 1940, AS COMPARED WITH POSITION AT 31st MARCH, 1939—*continued.*

Liabilities.	1939–40.		1938–39.	*Assets.*	1939–40.		1938–39.
	£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.	£ s. d.
Brought forward	..	14,562,024 3 9	*14,340,659 11 0*	Brought forward	..	18,365,833 19 0	*17,322,861 15 11*
Sundry Creditors—				Balance in Electric Supply Account at the end of year—			
North Island scheme	123,739 19 2		*100,632 17 2*	Cash in Public Account	50,887 1 2		*7,000 5 9*
South Island scheme	46,844 4 9		*36,102 10 8*	Imprests outstanding	..		*8,926 5 2*
Surveys and general	2 10 0		..			50,887 1 2	
		170,586 13 11	*136,735 7 10*				*15,926 10 11*
Depreciation Reserve—				Suspense Account	..	..	*100 4 9*
North Island scheme	1,081,075 9 4		*1,042,932 14 2*				
South Island Scheme	755,025 16 10		*637,799 5 1*				
		1,836,101 6 2	*1,680,731 19 3*				
Sinking Fund—							
Amount utilized for redemption of loans	1,079,347 18 3		*496,364 8 4*	Stocks—Surveys and General	..	130 0 0	*70 0 0*
Available for further redemptions ..	498,076 19 11		*595,513 18 8*				
		1,577,424 18 2	*1,091,878 7 0*				
Reserve Fund—							
North Island scheme	181,248 2 9		..				
South Island scheme	87,199 6 0		*87,199 6 0*	Sundry Debtors—Surveys and General ..	..	5 0 0	..
		268,447 8 9	*87,199 6 0*				
Sundry credit balances—							
North Island scheme	781 7 2		*9 8 11*				
South Island scheme	1,508 12 1		*1,744 11 7*				
		2,289 19 3	*1,754 0 6*	Interest paid in advance	..	18 9 10	..
Total	..	£18,416,874 10 0	*£17,338,958 11 7*	Total	..	£18,416,874 10 0	*£17,338,958 11 7*
Contingent Liability.							
Arrears of appropriation to Sinking Fund	252,670 11 5						

NOTE.—No charge for cost of exchange on interest payments made in London is included.

J. W. SCOTT, A.R.A.N.Z., Chief Accountant, Public Works Department.

I hereby certify that the General Balance-sheet has been duly compared with the relative books and documents submitted for audit, and correctly states the position as disclosed thereby, subject to the departmental note enfaced thereon.—CYRIL G. COLLINS, Controller and Auditor-General.

TABLE No. 5—*continued.*

NORTH ISLAND HYDRO-ELECTRIC-POWER SUPPLY.

PROFIT AND LOSS ACCOUNT FOR YEAR ENDED 31ST MARCH, 1940.

Gross Revenue Account.

To Generating-expenses (hydro-electric)—	£ s. d.	£ s. d.	By Sales of electrical energy—	£ s. d.	£ s. d.	£ s. d.
Arapuni	31,372 4 7		Bulk for resale		1,264,605 13 2	
Horahora	6,412 12 4		Other than for resale—			
Mangahao	12,339 16 6		Traction	5,108 15 0		
Tuai	11,599 2 6		Industrial	43,919 7 2		
		61,723 15 11	Retail	3,015 9 1		
Generating-expenses (fuel)—					52,043 11 3	
Penrose	307 1 6					1,316,649 4 5
Waihi Grand Junction	..		Rents—			
Huntly	35 10 9		Land and buildings		10,378 4 3	
		342 12 3	Lines and plant		571 0 4	
Purchase of power in bulk	..	103,638 13 3				10,949 4 7
Standby charges	..	65,304 8 9	Miscellaneous revenue		..	900 13 5
		231,009 10 2				
Transmission and communication system: Patrol and maintenance	..	31,775 14 3				
Substations: Operation and maintenance	..	34,422 10 0				
Distribution: Maintenance	..	2,048 16 4				
System operation, testing, &c.	..	13,827 6 2				
Management and general expenses	..	54,930 17 3				
Balance, to Net Revenue and Appropriation Account	..	960,484 8 3				
		£1,328,499 2 5				£1,328,499 2 5

Net Revenue and Appropriation Account.

	£ s. d.	£ s. d.		£ s. d.
To Interest (gross) for year ended 31st March, 1940	364,664 5 7		By Balance from Gross Revenue Account	960,484 8 3
Less interest capitalized	19,456 19 3			
		345,207 6 4		
Depreciation on completed works	..	15,476 15 10		
Sinking Fund	..	418,552 3 4		
Reserve Fund	..	181,248 2 9		
		£960,484 8 3		£960,484 8 3

TABLE No. 5—*continued.*

NORTH ISLAND HYDRO-ELECTRIC-POWER SUPPLY—*continued.*

Depreciation Reserve Account.

	£ s. d.		£ s. d.
To Replacements, Renewals, &c.	19,051 6 10	By Balance from previous year's statement	1,042,932 14 2
Balance	1,081,075 9 4	Interest at 4 per cent. per annum	41,717 6 2
		Amount set aside as per Net Revenue and Appropriation Account ..	15,476 15 10
	£1,100,126 16 2		£1,100,126 16 2

Sinking Fund Account.

	£ s. d.		£ s. d.
To Balance	1,159,820 3 11	By Balance at close of previous year	741,037 17 0
		Interest	230 3 7
		Amount set aside as per Net Revenue and Appropriation Account ..	418,552 3 4
	£1,159,820 3 11		£1,159,820 3 11

Reserve Fund Account.

	£ s. d.		£ s. d.
To Balance	181,248 2 9	By Amount set aside as per Net Revenue and Appropriation Account ..	181,248 2 9
	£181,248 2 9		£181,248 2 9

TABLE No. 5—*continued.*

NORTH ISLAND HYDRO-ELECTRIC-POWER SUPPLY—*continued.*

BALANCE-SHEET AT 31ST MARCH, 1940.

Liabilities.	£ s. d.	£ s. d.
Depreciation Reserve		1,081,075 9 4
Sinking Fund—		
Utilized for redemption of loans	739,092 13 2	
Available for further redemptions	420,727 10 9	
		1,159,820 3 11
Reserve Fund		181,248 2 9
Sundry creditors—		
Public Works Department	32,717 15 11	
Other Government Departments	2,382 12 1	
Non-departmental	88,639 11 2	
		123,739 19 2
Sundry credit balances		781 7 2
Head Office Account		8,495,475 1 9
		£11,042,140 4 1
Contingent Liability.		
Arrears of appropriation to Sinking Fund	Nil.	

Assets.	£ s. d.	£ s. d.
Hydro-electric plants—		
Arapuni	2,646,143 19 2	
Horahora	328,466 3 8	
Mangahao	1,404,321 18 3	
Waikaremoana	704,747 8 7	
		5,087,679 9 8
Fuel-plants—		
Penrose	65,431 7 8	
Waihi Grand Junction	8,798 10 8	
Huntly	11,412 1 11	
		85,642 0 3
Transmission-lines and communication system		1,845,213 3 4
Substations		1,209,854 7 10
Distribution system		62,342 8 8
Offices, stores, land, buildings, &c.		64,916 13 0
Cost of raising loans		296,955 12 2
Interest during construction—		
On assets in operation	963,962 2 3	
On assets not in operation	19,546 18 5	
		983,509 0 8
Works under construction		797,127 10 7
		10,429,240 6 2
Plant, motor-vehicles, and tools		76,725 4 9
Stocks of materials		224,590 9 6
Sundry debtors—		
Public Works Department	6,709 10 6	
Other Government Departments	4,735 17 3	
Non-departmental	297,963 8 6	
		309,408 16 3
Sinking Fund investments		2,175 7 5
		£11,042,140 4 1

TABLE No. 5—*continued.*

SOUTH ISLAND HYDRO-ELECTRIC-POWER SUPPLY.

PROFIT AND LOSS ACCOUNT FOR YEAR ENDED 31ST MARCH, 1940.

Gross Revenue Account.

To Generating-expenses (hydro-electric)—	£ s. d.	£ s. d.	By Sales of electrical energy—	£ s. d.	£ s. d.	£ s. d.
Lake Coleridge	12,668 3 5		Bulk for resale		402,773 19 9	
Lake Waitaki	8,437 8 6		Other than for resale—			
Kaimata	1,215 14 10		Traction	21,089 4 11		
Monowai	7,709 0 4		Industrial	79,340 15 4		
		30,030 7 1	Retail	96,689 10 4		
Generating-expenses (fuel) Dobson		12,816 15 8			197,119 10 7	
Purchase of power in bulk		337 16 11				599,893 10 4
Standby charges			Rents—			
		43,184 19 8	Land and buildings		3,641 11 4	
Transmission and communication system: Patrol and maintenance		17,281 2 1	Lines and plant		785 6 0	
						4,426 17 4
Substations: Operation and maintenance		20,671 17 5	Miscellaneous revenue			9,291 17 8
Distribution: Maintenance		19,473 12 10				
System operation, testing, &c.		7,826 12 1				
Management and general expenses		66,521 8 7				
Balance, to Net Revenue and Appropriation Account		438,652 12 8				
		£613,612 5 4				£613,612 5 4

Net Revenue and Appropriation Account.

To Interest (gross) for year ended 31st March, 1940	£ s. d.	£ s. d.	By Balance from Gross Revenue Account	£ s. d.
	252,569 17 10			438,652 12 8
Less interest capitalized	5,651 0 0			
		246,918 17 10		
Depreciation on completed works		124,931 6 1		
Sinking Fund		66,802 8 9		
Reserve Fund				
		£438,652 12 8		£438,652 12 8

TABLE No. 5—*continued.*

SOUTH ISLAND HYDRO-ELECTRIC-POWER SUPPLY—*continued.*

Depreciation Reserve Account.

	£ s. d.		£ s. d.
To Replacements, Renewals, &c.	33,216 13 8	By Balance from previous year's statement	637,799 5 1
Balance	755,025 16 10	Interest at 4 per cent. per annum	25,511 19 4
		Amount set aside as per Net Revenue and Appropriation Account	124,931 6 1
	£788,242 10 6		£788,242 10 6

Sinking Fund Account.

	£ s. d.		£ s. d.
To Balance	417,604 14 3	By Balance at close of previous year	350,840 10 0
		Interest	*Dr.* 38 4 6
		Amount set aside as per Net Revenue and Appropriation Account	66,802 8 9
	£417,604 14 3		£417,604 14 3

Reserve Fund Account.

	£ s. d.		£ s. d.
To Balance	87,199 6 0	By Balance at close of previous year	87,199 6 0
	£87,199 6 0		£87,199 6 0

TABLE No. 5—*continued.*

SOUTH ISLAND HYDRO-ELECTRIC-POWER SUPPLY—*continued.*

BALANCE-SHEET AT 31ST MARCH, 1940.

Liabilities.	£ s. d.	£ s. d.
Depreciation Reserve	..	755,025 16 10
Sinking Fund—		
Utilized for redemption of loans	340,255 5 1	
Available for further redemptions	77,349 9 2	
		417,604 14 3
Reserve Fund	..	87,199 6 0
Sundry creditors—		
Public Works Department	13,887 8 4	
Other Government Departments	10,096 0 11	
Non-departmental	22,860 15 6	
		46,844 4 9
Sundry credit balances	..	1,508 12 1
Head Office Account	..	5,996,991 6 6
		£7,305,174 0 5
Contingent Liability.		
Arrears of appropriation to Sinking Fund	£252,670 11 5	

Assets.	£ s. d.	£ s. d.
Hydro-electric plants—		
Lake Coleridge	861,473 14 11	
Lake Waitaki	1,775,897 3 3	
Kaimata	143,307 12 11	
Monowai	202,263 2 1	
		2,982,941 13 2
Fuel-plants—		
Dobson	133,640 5 0	
Lyttelton	2,805 7 7	
		136,445 12 7
Transmission-lines and communication system	..	1,074,544 17 5
Substations	..	652,966 16 4
Distribution system	..	851,305 19 7
Offices, stores, land, buildings, &c.	..	18,712 19 0
Cost of raising loans	..	529,647 5 2
Interest during construction—		
On assets in operation	476,533 11 11	
On assets not in operation	4,762 0 0	
		481,295 11 11
Works under construction	..	209,057 6 9
		6,936,918 1 11
Plant, motor-vehicles, and tools	..	114,801 16 2
Stocks of materials	..	121,872 6 8
Sundry debtors—		
Public Works Department	6,796 9 11	
Other Government Departments	2,591 7 4	
Non-departmental	111,646 18 0	
		121,034 15 3
Sinking Fund investments	..	10,547 0 5
		£7,305,174 0 5

APPENDICES

TO THE

PUBLIC WORKS STATEMENT, 1940.

APPENDIX A.

AUDITED STATEMENT OF EXPENDITURE ON PUBLIC WORKS OUT OF THE PUBLIC WORKS FUND FOR THE YEAR 1939-40.

Prepared in compliance with Section 8 of the Public Works Act, 1928.

Public Works Department, Wellington, 27th June, 1940.

SIR,—

In compliance with the 8th section of the Public Works Act, 1928, I enclose a statement of the expenditure during the preceding financial year on all works and services chargeable to the Public Works Fund.

I have, &c.,

R. SEMPLE,
Minister of Public Works.

The Controller and Auditor-General, Wellington.

STATEMENT OF NET EXPENDITURE ON ALL WORKS AND SERVICES CHARGEABLE TO THE PUBLIC WORKS FUND FOR THE YEAR 1939-40.

Vote No.	Summary.	Appropriation.	Gross Expenditure.	Credits in Aid.	Net Expenditure.
	General Purposes Account—	£	£ s. d.	£ s. d.	£ s. d.
37	Public Works, Departmental	210,000	602,282 1 8	454,821 6 7	147,460 15 1
38, 39	Railways	4,555,000	4,302,554 16 8	137,139 0 10	4,165,415 15 10
40, 41	Public Buildings	2,150,000	1,817,803 11 6	22,583 12 0	1,795,219 19 6
42	Lighthouses and Harbour-works ..	42,100	23,776 16 4	1,258 2 2	22,518 14 2
43	Development of Tourist Resorts ..	50,000	26,169 16 0	1,278 1 5	24,891 14 7
44	Roads, Bridges, and other Public Works	1,400,000	1,169,850 17 7	45,260 14 5	1,124,590 3 2
45	Telegraph Extension	600,000	693,569 2 2	276,790 12 5	416,778 9 9
46	Lands, Miscellaneous	330,000	194,347 9 5	21,822 2 7	172,525 6 10
47	Irrigation, Water-supply, and Drainage	390,000	444,837 17 0	28,400 10 9	416,437 6 3
48	Swamp Land Drainage	14,000	19,073 0 4	16,376 16 7	2,696 3 9
49	Settlement of Unemployed Workers ..	695,000	613,241 18 9	166,543 14 2	446,698 4 7
50	Native Land Settlement	675,000	1,052,777 11 8	694,958 2 7	357,819 9 1
51	*Defence	2,200,000	..	..	..
	Unauthorized—				
	Services not provided for	..	5,664 5 6	687 17 11	4,976 7 7
	Totals, General Purposes Account ..	13,311,100	10,965,949 4 7	1,867,920 14 5	9,098,028 10 2
	Electric Supply Account—				
52	Development of Water-power	1,878,000	1,485,511 6 3	59,793 0 4	1,425,718 5 11
	Totals, Public Works Fund ..	15,189,100	12,451,460 10 10	1,927,713 14 9	10,523,746 16 1

* Expenditure under Vote "Defence" charged to War Expenses.

APPENDIX A—*continued.*

Vote No.	Name of Vote.	Appropriation.	Gross Expenditure.	Credits in Aid.	Net Expenditure.
	PUBLIC WORKS FUND.				
	General Purposes Account—	£	£ s. d.	£ s. d.	£ s. d.
37	Public Works, Departmental	210,000	602,282 1 8	454,821 6 7	147,460 15 1
	Railways—				
38	Railway-construction	1,255,000	1,253,868 1 7	75,092 1 10	1,178,775 19 9
39	Railways Improvements and Additions to Open Lines	3,300,000	3,048,686 15 1	62,046 19 0	2,986,639 16 1
40	Public Buildings	1,250,000	..	..	..
	Subdivision I—Public Buildings, General	..	272,379 18 11	3,152 4 9	269,227 14 2
	Subdivision II—Courthouses ..	..	16,759 0 8	5,322 17 9	11,436 2 11
	Subdivision III—Prison Buildings and Works	..	4,372 12 11	25 0 8	4,347 12 3
	Subdivision IV—Police-stations ..	..	65,698 5 7	5,034 4 3	60,664 1 4
	Subdivision V—Postal and Telegraph	..	363,335 16 0	605 13 5	362,730 2 7
	Subdivision VI—Mental Hospitals ..	..	176,235 5 6	683 11 0	175,551 14 6
	Subdivision VII—Health and Hospital Institutions	..	67,296 8 5	159 19 2	67,136 9 3
41	Education Buildings	900,000	851,726 3 6	7,600 1 0	844,126 2 6
42	Lighthouses and Harbour-works ..	42,100	23,776 16 4	1,258 2 2	22,518 14 2
43	Development of Tourist Resorts ..	50,000	26,169 16 0	1,278 1 5	24,891 14 7
44	Roads, Bridges, and other Public Works	1,400,000	1,169,850 17 7	45,260 14 5	1,124,590 3 2
45	Telegraph Extension	600,000	693,569 2 2	276,790 12 5	416,778 9 9
46	Lands, Miscellaneous	330,000	194,347 9 5	21,822 2 7	172,525 6 10
47	Irrigation, Water-supply, and Drainage ..	390,000	444,837 17 0	28,400 10 9	416,437 6 3
48	Swamp Land Drainage	14,000	19,073 0 4	16,376 16 7	2,696 3 9
49	Settlement of Unemployed Workers ..	695,000	613,241 18 9	166,543 14 2	446,698 4 7
50	Native Land Settlement	675,000	1,052,777 11 8	694,958 2 7	357,819 9 1
51	Defence	2,200,000	..	..	..
	Unauthorized—				
	Services not provided for	..	5,664 5 6	687 17 11	4,976 7 7
	Totals, General Purposes Account ..	13,311,100	10,965,949 4 7	1,867,920 14 5	9,098,028 10 2
	Electric Supply Account—				
52	Development of Water-power	1,878,000	1,485,511 6 3	59,793 0 4	1,425,718 5 11
	Totals, Public Works Fund ..	15,189,100	12,451,460 10 10	1,927,713 14 9	10,523,746 16 1

NOTE.—This statement includes only the expenditure on works, and does not include expenditure such as interest, sinking funds, and charges and expenses of loans.

J. W. SCOTT, A.R.A.N.Z.,
Chief Accountant.

J. WOOD,
Engineer-in-Chief and Under-Secretary.

The expenditure charged to the Public Works Fund has been examined and found correct subject to the remark that, as the Appropriation Act, 1939, made no provision for subdivisions in vote, "Public Buildings," the allocation of expenditure to the several subdivisions of that vote has not been checked.—CYRIL G. COLLINS, Controller and Auditor-General.

APPENDIX B.

ANNUAL REPORT ON PUBLIC WORKS BY THE ENGINEER-IN-CHIEF.

The Engineer-in-Chief to the Hon. the Minister of Public Works.

Sir,—

I have the honour to submit the following report upon the various works under my control completed and in progress throughout the Dominion during the financial year ended the 31st March, 1940.

RAILWAYS.

Dargaville Branch Railway.

The length of the Dargaville Branch Railway is approximately 19 miles 70 chains, and, with the exception of the formation of the Dargaville Station Yard, all main earthworks have been completed. At Dargaville rail connection with the Kaihu Branch Line was established at 18 m. 25 ch. on 25th March, 1940.

During the year the Kirikopuni–Tangowahine Section (0 m. to 10 m. 17 ch.) was maintained to standard and a goods and passenger service was continued under the Department's operation. This section was completed during the year ended 31st March, 1939, having been nearly completed when construction was stopped during the year ended 31st March, 1931.

On the Tangowahine–Dargaville Section (10 m. 17 ch. to 19 m. 70 ch.) all main-line earthworks, culverts, a 200 ft. bridge, platelaying, and second lift have been completed. A goods service only is being operated by the Public Works Department on this length. The formation of the Dargaville Station Yard and ballasting operations for final lift on the main line are in hand.

The following is a summary of the works completed for the year: Earthworks 65,000 cubic yards; ballast placed, 15,100 cubic yards; culverting, 470 lineal feet; platelaying, 3 miles 49 chains; second and third lifts, 4 miles 33 chains; first, second, and third lifts, 1 mile 4 chains; first and second lifts, 2 miles 29 chains.

The construction of the large embankment between 17 m. 56 ch. and 17 m. 71 ch. required almost double the yardage shown on plan quantities, owing to heavy subsidences and corresponding lateral uplift. In order to meet this situation the ruling grade of 1 in 80 was increased to 1 in 60.

Tauraroa Quarry.—The output of crushed metal for the year was 37,234 cubic yards, as compared with 32,095 cubic yards and 9,869 cubic yards respectively for the two preceding years. Large quantities were again supplied to the Railways Department, and ballasting requirements for the Dargaville Branch Railway were mainly responsible for the increase in the quantity crushed for the Public Works Department.

Paeroa–Pokeno Railway.

Pokeno End.—Progress of construction works has been well maintained, though retarded somewhat since the outbreak of war. The permanent-line survey of the full length of 21 miles of this section has been completed, and earthwork, culverting, fencing, drains, and bridging were in hand over 14 miles of this length, while approximately 8 miles are nearing completion. Bridge-work has been delayed owing to difficulty in obtaining materials.

During the year 299,000 cubic yards of earthwork were excavated, making the total excavation completed to date 503,367 cubic yards. This work has been carried out by machinery (an average of seven earth-moving machines), and 120 workmen were employed.

Paeroa End.—On the Paeroa section of 19 miles, formation work across the Hauraki Plains was continued from 2 m. 23 ch. with material from borrow drains and completed to 11 m. 42 ch., with the exception of gaps totalling 1 mile 20 chains at station-yards. On the swamp section between Ngatea and Mangatarata 13 m. 26 ch. to 17 m. 18 ch., a 6 ft. drain has been excavated on both sides to consolidate the peat.

The Mangatarata cutting (17 m. 20 ch. to 27 ch.) was commenced as a borrow for the clay filling over the swamp section and this filling is in hand from 16 m. 19 ch. to 17 m. 20 ch. Three excavators and drag-lines have been employed on earthworks, while the No. 1 Waihou suction dredge has been engaged pumping sand into dumps at Ngahina and Rangiora Road. Earthwork for the year totalled 203,400 cubic yards, making a total of 332,200 cubic yards to date.

Fourteen concrete-pipe culverts, totalling 372 ft., were constructed, while sixty-six married and and twenty-six single quarters were erected at Pukahu, Kerepeehi, Ngatea, and Mangatarata Camps.

Construction of this line has since been suspended for the duration of the war.

East Coast Main Trunk Railway: Extension to Opotiki.

During the year three trial routes were surveyed between Waimana Gorge and Waimana, and a definite general route has now been adopted, and is being given more detailed investigation. This route has been permanently pegged to the proposed Waimana Railway-station site at 108 m. 47 ch. All field-work was completed and plotted to 107 m., and the grading and quantities completed to 105 m. The survey party is now working from Kutarere to Opotiki investigating trial lines. An aerial survey was carried out, and this is proving valuable for investigating trial lines. Progress on the survey has been somewhat hampered owing to shortage of staff as a result of enlistments for the war.

Napier–Gisborne Railway.

The Raupunga–Wairoa and the Wairoa–Waikokopu Sections totalling 44 miles, were handed over to the Railways Department on 1st July, 1939, and since that date a regular passenger and goods service has been run between Napier and Wairoa, and goods trains only between Wairoa and Waikokopu.

Since the line was handed over, however, some additional work has been carried out by the Public Works Department in order to meet the full operational requirements of the Railways Department at the Wairoa Station. At this station additional cottages have been erected, and there are now fifteen new and six old cottages, the latter being renovated before being taken over by the Railways Department. In the new cottage settlement kerbs and channels have been provided and roads and footpaths sealed.

Owing to conditions following the outbreak of war, progress generally on the construction of the Waikokopu–Gisborne section of this railway was unavoidably retarded. Particulars of the more important items of construction carried out during the year are as follows:—

Kopuawhara Section (length, 11 m. 20 ch.).—A total length of 400 chains of permanent fencing was erected on this section during the year.

Excavation totalling 67,450 cubic yards has been completed, and all cuttings are clear up to 28 m. 60 ch. The work of removing the large slip at 29 m. 15 ch. brought down by the rains of April, 1938, is now being carried out by a shovel and angle-dozer unit. The total excavation carried out on this section to 31st March, 1940, was 796,400 cubic yards. It may be possible shortly to release plant for work on the northern end of the section, so that little of the work on the cuttings should be outstanding at the end of the present year.

Trimming, preparatory to platelaying, has been completed to 28 m. 50 ch. A retaining-wall, 40 ft. long, at 28 m. 60 ch. has been completed. Wire-mesh and boulder groynes have been placed in the Kopuawhara Stream at 29 m. 12 ch. and 30 m. 70 ch., a total of 600 cubic yards being constructed. The 6 ft. flat-top culvert at 25 m. 50 ch., 17 ft. long, and 3 ft. culvert, 54 ft. long, at 31 m. 18 ch. are complete, and a total length of 120 ft. of smaller culverting has been placed.

The Waikokopu Stream Bridge at 23 m. 21 ch. and the Kopuawhara River Bridge at 27 m. 47 ch., both of reinforced concrete, were completed during the year, the former bridge comprising four 34 ft. spans and the latter three 25 ft. and three 45 ft. spans.

The Waiau Stream Bridge at 30 m. 15 ch., a reinforced-concrete structure, has a length of 530 ft., and comprises a central arch span of 180 ft., rise of 95 ft., with one 30 ft. and eight 40 ft. approach spans. All foundations were practically completed, and some of the superstructure was commenced.

Construction commenced in September last on the Waiau Stream Bridge at 32 m. 1 ch., a reinforced-concrete structure, and foundations of three piers were completed. The solid sandstone is covered by an average depth of 16 ft. of large bounders. The total length of the finished structure will be 377 ft., comprising seven 45 ft., one 22 ft., and two 20 ft. spans.

A reinforced-concrete bridge over the Waiau Stream at 33 m. 27 ch. will shortly be commenced.

The driving of steel piles for the Waiau Stream Bridge at 33 m. 33 ch. was completed in readiness for constructing the concrete piers and steel girder spans.

The shortage of skilled tradesmen and the delay in obtaining delivery of reinforcing steel have adversely affected progress on these two major bridges.

The tunnel at 30 m. 9·45 ch., 156 ft. long, has been completed and work commenced on the tunnel at 30 m. 52·16 ch.

The tunnel at 31 m. 40·22 ch. is complete, the total length being 359 ft. The southern portal and 33 ft. of lining on the tunnel at 32 m. 5·77 ch. were completed when the party was withdrawn to carry out concreting in the large Waiau-Tikiwhata Tunnel at 33 m. 36·50 ch.

On this latter tunnel driving has been carried on continuously during the year at the south end, and recently the ground encountered has been of a poorer nature requiring the concreting to be carried close to the working-face. The amount of work done during the year comprised 1,630 ft. of excavation and 1,395 ft. of concreting, making the totals to date 3,315 ft. of excavation and 2,852 ft. of concreting. A length of approximately 46 chains separates the south and north headings of this tunnel, and it is anticipated that a break-through should be made by the end of the present year. Progress on the north end of the tunnel is described under the Wharerata section.

Platelaying is practically completed to 28 m. 39 ch. First and second lifts of ballasting are complete to 28 m. 19 ch. and 28 m. 14 ch. respectively. The passing-loop between 27 m. 50 ch. and 27 m. 70 ch. has been installed, and temporary sidings established at 27 m. 60 ch., so that rail traffic may be handled from this point instead of Waikokopu at 23 m.

Including work in Opoutama Station Yard, the following lengths have been placed: Platelaying, 11,730 lineal yards; Ballast—first lift, 11,035 lineal yards; second lift, 10,925 lineal yards.

Wharerata Section (length, 19 m. 17·75 ch.).—Steady progress was made during the year on this section, which traverses rugged hill country with heavy earthworks and three long tunnels. Except for one large slip, no major setback occurred to delay the work, as has been the case in previous years. Heavy earthworks are all completed, though a considerable amount of trimming and cleaning up has still to be done. Tunnelling is well advanced, and should be completed by the end of this year. Delay in delivery of bridge girders has hindered the platelaying programme, and no permanent-way has been laid on this section. The problem of dealing with the water on the steep coastal section, where high banks are numerous, was a difficult one, and required very careful consideration.

In the Waikoura Valley (14 m. to 17 m. 50 ch.) approach fillings to all bridges have been completed, and formation should be thoroughly consolidated and ready for the track when trimmed. South of the Waikoura Tunnel, in the troublesome section from 18 m. 45 ch. to 19 m., a large slip occurred in the cutting at 18 m. 56 ch. The removal of the slip, totalling 9,750 cubic yards, is almost finished, but the work was made more difficult by the presence of huge blocks of sandstone rock.

The two big fillings at 20 m. 27 ch. and 35 m. 73 ch. respectively have been built up with tunnel spoil, and are completed except for trimming and making up any subsidence which occurs. Between 35 m. 65 ch. and 35 m. 76 ch., in the Tikiwhata Valley, excavation for the foundations of some 280 ft. of retaining-wall was completed. These foundations did not come up to expectations, and it is proposed to adopt a half-bridge section in reinforced concrete instead of a retaining-wall.

Excavation during the year amounted to 32,146 cubic yards, including 15,867 cubic yards of slip material. The quantity of earthwork completed to date on the section amounts to 555,262 cubic yards, or approximately 99 per cent. of the total.

The total length of bridging on the section is 875 ft., of which approximately 60 per cent. is completed.

At 14 m. 55 ch. piers and abutments for Mangakaiwharangi No. 1 Bridge were completed, and three 30 ft. steel spans launched. The 60 ft. span will be placed as soon as it is available. At 14 m. 71 ch. the Mangakaiwharangi No. 2 Bridge was completed except for the "bedding-down" of five 40 ft. and one 15 ft. girder spans. The piers and abutments of Mangakaiwharangi No. 3 Bridge at 15 m. 15 ch. were also completed.

Tunnelling, which comprises the major work on this section, has progressed steadily, the total length being 14,393 ft., of which approximately 10,508 ft., or 73 per cent., has been completed.

The Waikoura Tunnel, of a total length of 4,730 ft., was pierced in May, 1939, and lining was finished in July. A number of minor cracks in the arch, caused by swelling of the surrounding rock over a length of several chains, were successfully remedied by pressure grouting.

Good progress was made with the enlarging and lining of the Coast Tunnel (3,074 ft.). Soft ground at the north end necessitated the construction of 18 in. lining, with a concrete invert, for a distance of 405 ft. from the portal. Otherwise the ground has been more stable than anticipated. The rate of progress was improved by employing a separate party on the concreting of this and the Waiau–Tikiwhata Tunnel alternately. Lining now completed amounts to 1,589 ft., or 52 per cent. of the total, while the equivalent of 1,974 ft., or 64 per cent., has been fully excavated.

The Waiau–Tikiwhata Tunnel, of a total length of 9,802 ft., pierces the main ridge between the Waiau and Tikiwhata Streams, the highest point of the ridge being nearly 1,000 ft. above the level of the tunnel. The ground encountered has been variable, and soft seams and faulted ground in unexpected places have caused minor delays. This experience has proved the wisdom of keeping the lining reasonably close to the working-face. On the north end, 1,716 ft. of excavation and 1,730 ft. of lining were completed during the year, making the total to date 3,354 ft. of excavation and 2,969 ft. of lining, equal to 34 per cent. and 30 per cent. of the respective totals.

The excavation of the three tunnels at 35 m. 40 ch., 46 ch., and 58 ch., aggregating 980 ft. in length, was completed. Lining is progressing, using the concreting-plant provided for the north end of the Waiau–Tikiwhata Tunnel, and 203 ft. of lining and two portals have been finished.

At 14 m. 40 ch. the formation of the Wharerata Station Yard was extended to provide additional length of siding. The yard was metalled and partly ballasted ready for platelaying.

Gisborne Section (length, 14 m. 7·35 ch.).—Work done on this section was largely confined to bridging, platelaying, and ballasting. Unfortunately, considerable delay occurred in the delivery of bridge girders, resulting in the temporary suspension of platelaying work and ballasting for several months. Earthwork was completed with the exception of trimming formation.

The deviation from 13 m. 60 ch. to 14 m. 10 ch., necessitated by the floods of February, 1938, was finished, including a considerable amount of protection work at the Mangakotukutuku Stream. This stream was diverted into its original channel, which was enlarged and deepened. The spoil, consisting of large boulders, was used to form a very solid stop-bank protecting the railway-works.

The amount of excavation completed during the year was 23,260 cubic yards, making a total of 183,893 cubic yards to date.

Of the sixteen bridges on this section, only five were uncompleted at the beginning of the year. All concrete piers are now constructed, while 1,665 lineal feet of steel girders out of a total of 2,245 ft., are in position, and the remainder will be launched as soon as they are available.

On the Maraetaha No. 1 Bridge (11 m. 27 ch.) one 60 ft. steel span is in position, and two 40 ft. and two 20 ft. temporary timber spans were erected to carry the track over the bridge. As a result of the 1938 flood it was considered necessary to raise the level of the bridge by 6 ft. At 12 m. 60 ch. three 30 ft. steel spans are in position for Maraetaha No. 3 Bridge, one 60 ft. span being required to

complete the bridge. The Maraetaha No. 4 Bridge at 13 m. 26 ch. has three 45 ft. steel spans placed in position, and requires two additional 60 ft. spans. Both abutments were protected with heavy buttresses of boulders.

The permanent track was laid from 10 m. 41 ch. to 12 m. 42 ch., and the second lift of ballast completed to the bridge gap at 12 m. 18 ch.

At the Matawhero Station Yard (2 m.) points and crossings and approximately 80 per cent. of the sidings were laid. This yard, which will handle a big stock traffic, contains more than 1½ miles of sidings.

The ballasting of the Muriwai Station Yard at 9 m. was completed, facilitating the handling of construction materials, which are transported by rail to 12 m. 16 ch. In order to speed up the platelaying and obviate the delay caused through lack of bridge girders, arrangements have been made to transport platelaying materials by road and lay the track between bridges where possible.

A start was made on the construction of the telephone system paralleling the railway.

Turakina–Okoia Railway Deviation.

Progress on this deviation, which is 10 miles 20 chains in length, has been satisfactory, all earthwork having been completed with the exception of bridge-approach fillings and a small section at the north end of the Turakina Tunnel.

The short tunnel at 5 m. has been completed, the total length being 213 ft.

On the Turakina Tunnel 2,702 ft. of top heading have been driven, leaving only 70 ft. to complete as at 31st March. There is a length of 499 ft. of lining to complete.

Piers A and B of the Wangaehu Bridge have been completed, piles having been driven at pier C and four piles were driven at pier D, but were damaged by flood in February. All piles have been fabricated and cast ready for driving. Several delays have been caused through flooding.

The erection of the Turakina Bridge was commenced, but this work also was delayed by heavy floods.

Standard boundary fencing totalling 55 chains has been erected in gaps left open to facilitate earthwork formation, and all gates have been erected for private crossings and station-yards.

The trimming of formation is well in hand, 146 chains having been completed during the year, making a total to date of 5 miles 60 chains, and in addition the Wangaehu Station Yard is well advanced. The Wangaehu Valley Road ramp has been widened from 20 ft. to 34 ft.

A number of buildings, including the camps at each end of the Fordell Tunnel, have been dismantled, and several suitable structures transferred to other works and Military Camps.

The average number of men employed throughout the year was 192, there being 153 men on the pay-roll at the 31st March, 1940.

Palmerston North Railway Deviation.

The formation of the main-line deviation, with the exception of the goods-yard cutting, is completed for 6 m. 17 ch. out of a total of 6 m. 55 ch. The formation of the goods-yard cutting where the bulk of the earthwork is situated is well in hand, and approximately 65 per cent. complete. The main-line formation has been trimmed as far as excavation has been completed, and the main passenger yard, which is being raised by 1 ft. overall, is now approximately 65 per cent. complete. The total excavation since the work was recommenced on the deviation is 197,000 cubic yards, the quantity excavated previously was 320,000 yards, making the total to date 517,000 cubic yards out of an estimated total of 836,000 cubic yards.

Platelaying and ballasting have been completed on the eastern track for 5 m. 44 ch. and the second lift of ballast for approximately 3½ miles. The platelaying on the western track has been completed for approximately 2½ miles, but has not been ballasted.

The Mangaone Bridge, which is 82 ft. 9 in. overall length by 68 ft. wide, is now completed with the exception of pipe hand-rails. This bridge is supported on eighty-five 16 in. concrete piles and five piers.

The Kawau Stream culvert, which is 781 ft. long and 18 ft. in width, is well advanced, 513 lineal feet having been completed. The excavation for the new stream-diversion has also been completed. All small culverts have been completed and also two 14 ft. span R.S.J. bridges on the Palmerston North – Longburn section. All main-line fencing is now completed.

The formation of the Whakaronga Deviation has been completed for 50 chains out of a total of 2 miles 15 chains. The total excavation to date is 7,000 cubic yards, leaving 9,000 cubic yards to complete. All main-line fencing, culverts, and side drains have been completed on this section.

Plimmerton–Paekakariki Railway Duplication.

The work entrusted to this Department was completed at the end of September, 1939.

South Island Main Trunk Railway: North End.

This length comprising the Clarence and Kaikoura sections, commences at 56 m. 6 ch. and ends at 104 m. 54 ch., the total distance being 48 m. 48 ch.

Clarence Section (56 m. 6 ch. to 76 m. 13 ch. = 20 m. 7 ch.).—The completion of this section has been delayed by the very heavy slipping which recurred at the Blue Slip late in 1938, and work has, in the main, been confined to the removal of this slip. With the exception of a small amount of filling at overbridge abutments, all ordinary earthwork is now completed.

Removal of the slip has been speeded up by the use of additional plant and by double-shifting. During the past summer two Diesel shovels and two bulldozers have been continuously employed on this slip, and approximately 160,000 cubic yards of material have been excavated, bringing the total to date since the reopening of the works to 305,000 cubic yards. The bulldozers have been principally employed in removing weight from the top of the slip, which has now been worked down to a 1 in 4 slope over the areas where the worst slipping has occurred in the past.

Good progress has been made with the drainage of the slip, and this portion of the work is now overtaking the excavation programme, which has been retarded by rains and generally unfavourable weather conditions.

With the exception of the 9-in.-pipe culverts now being laid at the road deviation, and railway-formation at the toe of the Blue Slip, all railway bridges and culverts on the section have been completed.

The overbridge at 64 m. 65 ch. was finished during the year, and the contractor has made a good start on the overbridge at 63 m. 5 ch., and should finish in approximately four months' time. This will complete the bridging on the section.

Stocks pens and yards, platforms, and loading-bank walls have been completed, and most of the private level-crossings and station-yard gates have been erected. Tenders are to be called shortly for the erection of cottages and station buildings.

Platelaying has been confined to the completion of sidings in station-yards, and all this work is now completed with the exception of about half a mile at the Blue Slip, which cannot be laid until excavation and drainage is completed there.

Ballasting and metalling of station-yards is partly completed, but this work, together with the boxing-up of the main line, has been deferred until labour and plant is available from the Blue Slip.

A commencement has been made on an extensive forestry scheme, involving the planting in *Pinus insignus* of approximately 1,800 acres of sandhills and waste land adjacent to the railway from Wharanui southwards to the 80 m. peg near Waipapa Bay. A nursery has been established at Clarence Bridge, and workmen are now engaged in sand-stabilization work preparatory to planting out.

Kaikoura Section (76 m. 13 ch. to 104 m. 54 ch. = 28 m. 41 ch.).—Between 76 m. 13 ch. and 101 m. formation work is almost complete, and, with the exception of the approach banks to the Hapuku River Bridge, only small gaps, which have been held up by other construction, remain to be done. Work beyond 101 m. is in hand. During the year 175,000 cubic yards of material were excavated on railway-formation and road-deviation works, bringing the total to date to 672,500 cubic yards, of which a good proportion was rock. Sea-protection work has been proceeded with, and approximately 13,500 cubic yards of heavy rock from railway and road excavations have been tipped for this purpose.

Tunnelling has proceeded satisfactorily. Five out of the six tunnels have been completed, and only 2 chains of work remain to be done. Tunnel parties have been gradually shifted to the south end.

Under full mechanization all tunnelling operations have been pushed forward, but progress has been reduced owing to frequent changes of country necessitating special methods of working. Many chains of loose broken rock and heavy boulders have been encountered, and in one place a tunnel passed through a cave. A total of 674 lineal feet of tunnelling was completed during the year, making a total to date of 4,484 lineal feet.

The erection of the superstructure of the Clarence River Bridge is now well in hand, and seven of the twelve 122 ft. steel-truss spans are on the site. This bridge has an overall length of 1,524 ft. At the end of the year practically all temporary bridging and erection staging had been completed, and the two spans over the North Channel were assembled in place. Gabion-protection works at the bridge abutments and the large groynes on the south bank of the river have been completed. This work included the placing of 6,500 cubic yards of stone in gabions and 760 cubic yards of concrete in the 30-ton blocks placed at the north abutment and at the groyne heads.

Owing to delay in the delivery of reinforcing-steel, the continuity of the bridging programme was interrupted, and several months lapsed before work was recommenced. However, work is now proceeding satisfactorily, and, in addition to the Hapuku River Bridge, which is well in hand, the following bridges have been built by co-operative contract parties: Ohau Bridge at 84 m. 28 ch. (60 lineal feet); Aniseed Stream Bridge at 86 m. 42 ch. (95 lineal feet); and the Iron Gate Stream Bridge at 88 m. 33 ch. (85 lineal feet). The bridge over the Blue Duck Stream at 88 m. 55 ch. is well advanced, and those over the Hapuku No. 2 Stream at 93 m. 4 ch. and over the Waimangarara Stream at 96 m. are in hand.

The contractor for the Hapuku River Bridge has completed the foundation work, all of the twenty-three 67 ft. arch barrels and half of the spandrel walls and footway.

Nearly all culverts have been completed as far as 101 m. One twin 10 ft. flat-top culvert, 44 ft. long, and a total of 714 lineal feet of pipe and arch culverts, varying from 12 in. diameter to 5 ft. arch type, have been built.

A contract has been let for the supply of concrete fencing-posts, and the contractor has established a yard in Kaikoura. Good progress cannot be made with the fencing programme until posts and wire are available. Telephone-lines have been extended southwards to 98 m.

As rails are not yet available, no platelaying or ballasting has been done on this section. Sleepers and all permanent-way fittings are on the works.

During the year bins for a large crushing and screening plant for ballast have been erected at the Hapuku River, but completion of the assembly of machinery and the erection of the slack-line cableway has been deferred until there is some prospect of the platelaying programme being commenced.

A large amount of camp shifting has been necessary during the year. Buildings have been transferred from the Aniseed Camp to Clarence Bridge Camp, which has been considerably extended, and also to Kaikoura, where a large new camp with office and stores accommodation has been built.

At the end of April the north and south end construction organizations were amalgamated, and headquarters are now established in Kaikoura.

An average number of 350 men have been employed on the works during the past year.

South Island Main Trunk Railway: South End.

(44 m. to 73 m. 40 ch. = 29 m. 40 ch.)

During the period under review further consolidation of the track and trimming of slips enabled goods-trains to be run over the Parnassus–Hundalee section (11½ miles), and the Railways Department commenced a regular goods service on 27th November, 1939, and a passenger service on 11th December, 1939.

The remainder of the sidings have been laid at the Hundalee Station Yard (55 m. 60 ch.), and ballasting has been completed by obtaining 8,932 cubic yards of ballast from Ferniehurst for the main line and sidings. A temporary station building was erected at Hundalee, and the goods and engine sheds and stock-yards were completed. The two permanent dwellings at Ferniehurst (50 m. 20 ch.) are almost completed, and the three at Hundalee are well in hand.

Fencing on the Parnassus–Hundalee section is now practically completed, 193 chains having been erected during the period. All private crossings but one have been installed.

The permanent telephone-line has been completed to Hundalee.

The works-train, which was operating before the Railways Department started its service, is still being used for the removal of slips and trimming of batters in cuttings.

From Hundalee to Claverley Station Yard at 59 m. 20 ch. the formation has been completed. Limestone Creek Bridge, of three 30 ft. reinforced-concrete spans, has also been completed, while the necessary culverting has received attention. Fencing over this length is about two-thirds completed. Permanent-way has been laid and ballasted on this section, and temporary sidings have been laid in the Claverley Yard. The two permanent dwellings at Claverley are well in hand. As the Railways Department is now using the Parnassus–Hundalee section all rails, fastenings, and sleepers have been transferred from Parnassus to Claverley.

From Claverley to the Okarahia Stream at 61 m. 60 ch. the bulk of the work has consisted of excavation of the heavy sidling between 61 m. 30 ch. and 61 m. 60 ch., where 88,300 cublic yards have been excavated. Work was resumed on Stockyard Creek Bridge at 60 m. 65 ch., and this structure is now completed.

Owing to the non-arrival of reinforcing-steel, progress on the Okarahia Stream Bridge has been slow, but steel is now to hand and the bulk of the substructure of this bridge, 376 ft. long and 70 ft. high, has been completed.

Work on the Amuri Bluff Tunnel—the longest on the railway—has progressed satisfactorily at both ends. The headings are expected to meet at an early date, and of the total length of the tunnel (2,967 ft.) 2,604 ft. have been lined. Constructional difficulties, more particularly at the north end, arising from heavy stresses in the lining due to the swelling of the material through which the tunnel was driven, have been successfully overcome by the adoption of a stronger type of lining.

The broken nature of the country encountered in tunnel No. 5 at 64 m. 7 ch. has impeded progress, but 300 ft. of concrete lining has been completed.

Test piles have been driven for the Oaro Stream Bridge at 65 m. 34 ch., and most of the other piles have been cast. This bridge will be 375 ft. long.

From Oaro to Puketa at 73 m. 30 ch. the bulk of the progress has been on the tunnels, and with the increase in the number of tunnel-faces being worked, Puketa Camp has been considerably extended by the transfer of workmen from Hundalee and Claverley.

No. 6 tunnel at 67 m. 64 ch. was completed over the full length of 682 ft., of which 66 ft. were built of reinforced section by cut and cover through the clay at the northern end.

No. 7 tunnel, 375 ft. long, at 70 m. 2 ch. was also completed, as was No. 8 at 70 m. 31 ch. with a length of 512 ft.

A start has been made on the building of a short length of tunnel barrel in the open at the south end of No. 9 tunnel at 70 m. 76 ch., and from the north end 200 ft. have been driven and 157 ft. lined. No. 10 tunnel at 71 m. 11 ch. is now completed throughout the length of 323 ft., and there remains only the northern portal to erect.

Nos. 11 and 12 tunnels working south from 71 m. 55 ch. and north from 71 m. 65 ch. respectively have been fully mechanized, and from the central mixing plant at 71 m. 60 ch., 580 ft. of lining have been placed in No. 11 and 584 ft. in No. 12, despite about 100 ft. of loose and wet country encountered in the latter.

Both ends of No. 13 tunnel are being worked. From the south end at 72 m. 15 ch., 56 ft. have been completed, and from the north end, which is fully mechanized, 550 ft. have been excavated and 411 ft. lined. The remaining short No. 14 tunnel at 72 m. 40 ch. was completed for its total length of 381 ft.

A bottom heading was driven through soft country at the north end of No. 15 tunnel and has broken through to the excavation from the south end (72 m. 52 ch.). With a full set of machines in use 1,207 ft. have been lined and a further 130 ft. excavated ahead.

The progress of tunnelling, which is the biggest obstacle on this section, has been satisfactory, and with 8,561 ft. of lining now completed out of a total of about 11,500 ft. the tunnelling should be finished during the current year.

Quarrying operations at Goose Bay have been continued, and the output of rock has averaged about 2,300 cubic yards per month for the lighter sea-protection works and for stonework behind the heavier concrete blocks. Nearly as much rubble as stone was removed from the quarry, but the bulk of this has been profitably utilized where required in the vicinity.

Owing to the cost and difficulties now associated with the quarrying operations some of the remaining sea-protection work will have to be carried out in concrete.

A start has been made at 66 m. 30 ch. with the placing of 20-ton concrete blocks at the toe of the road batters to provide sea protection in this exposed locality. This work can be carried out only when the sea is reasonably calm, but some 3½ chains have been placed, requiring the construction of forty blocks.

A Railway Bridge 120 ft. long in reinforced concrete has been completed at Goose Bay (68 m. 9 ch.), and also alongside a new 24-ft.-wide concrete road-bridge with similar spans. A contract has been let for the construction of the Kahautara River Bridge, 750 ft. long, at 73 m.

Apart from cuttings at 68 m. 40 ch., 69 m. 60 ch., and 69 m. 70 ch., the bulk of the earthwork over the portion from Oaro to the Kahautara River has been finished, but battering, particularly between 70 m., and 71 m., has not yet been completed.

A number of reinforced-concrete culverts ranging in size from 3 ft. to 8 ft. spans have been built between 66 m. and 73 m. This culverting-work is about 30 per cent. completed.

Practically no fencing has been done over this section of the line during the year.

Temporary telephone-lines have been in use from Claverley (60 m.) to Puketa (73 m.) and although some of the poles are in their final position no permanent line has yet been built between these places.

Except for a number of sleepers, sufficient permanent-way material is on hand to complete to the Kahautara River, and it is not likely that there will be any delay in extending the line northwards as far as this point.

During the twelve months under review the average number of men employed on this section was approximately 560.

Westport–Inangahua Railway.

Cascade Section (5 m. 70 ch. to 8 m. 78 ch.; length, 3 m. 8 ch.).—This section has been maintained during the year. The Department's work train carried men daily from Westport to Cascade Creek and beyond, and 15,906 tons of coal were transported from the Cascade-Westport Coal Co.'s bin at Cascade Creek to Westport. In addition, much ballast for the Railways Department was conveyed to Westport from the pit at 1 m. 60 ch.

Cascade – Inangahua Junction Section (8 m. 78 ch. to 23 m. 62 ch. (Westport chainage) and 62 m. to 58 m. 30 ch. (Stillwater chainage); length, 18 m. 34 ch.).—The average number of men employed throughout the year has been 251, with a maximum of 277. At present 232 men are employed, the reduction being due to the splendid response by both staff and men for military service overseas.

Rainfall at Tiroroa for the year ended 31st December, 1939, was noticeably less than that of 1938, being 158·81 in. spread over 192 days.

Although formation work had reached an advanced stage in the preceding year, several major earthworks remained to be completed. During the year under review much has been done with the aid of plant towards the finishing-off of the large banks between 20 m. and 20 m. 22 ch., and between 21 m. 61 ch. and 22 m. Formation through the heavy clay country between 22 m. and 23 m. was opened up during the year, and is now practically completed.

In the vicinity of Tiroroa and Inangahua Junction much has been done with bulldozers towards the flattening of unstable batters. This work has been particularly effective and will have a noticeable result in reducing to an absolute minimum the number of slips likely to occur on the line.

Bridge-construction has progressed very satisfactorily. The previous shortage of tradesmen was largely overcome, and in the building of reinforced-concrete structures the co-operative contract system has yielded excellent results.

The piers of the bridge at 10 m. 24 ch. were completed previously and are awaiting the steel-plate girders.

Bridges that have been finished during the past year were Stable Creek Bridge (15 m. 51 ch.), Newman Creek Bridge (15 m. 60 ch.), Welshman Creek Bridge (61 m. 70 ch.), and bridge at 61 m. 13 ch.

All the remaining bridges on the railway are in course of erection—namely, Slaty Creek Bridge (16 m. 55 ch.), Tracy Creek Bridge (19 m. 32 ch.), and Orikaka River Bridge (21 m. 58 ch.).

Of the total length of 3,581 ft. of bridging between Cascade Creek and Inangahua Station, 2,815 ft. have been completed, 478 ft. of substructure have been completed in readiness for the steel superstructure, and the balance is under construction.

Culvert-construction for the line has been almost completed. A large number of reinforced-concrete box culverts of a type designed to suit local conditions have been built by ordinary contract and under the co-operative contract system. In addition, many pipe culverts with diameters varying from 9 in. to 3 ft. have been built. On some sections of the railway there are as many as seventeen culverts per mile. The 9 in. and 12 in. pipes were placed mainly to lead concentrations of seepage water under the line, and they have proved markedly successful in drying out the formation.

A contract was let for plate-laying, and the contractor had completed 5 m. 19 ch. to the end of May—namely, from 8 m. 78 ch. to 12 m. 31 ch., and from 58 m. 40 ch. to 60 m. 16 ch.

The first lift of ballast has been placed between 9 m. 5 ch. and 10 m. 22 ch., and two lifts have been placed between 58 m. 40 ch. and 60 m. 12 ch.

Fencing at the Inangahua end of the line has been continued as far as the restricted supplies of wire have permitted.

TABLE OF LENGTHS OF GOVERNMENT LINES CONSTRUCTED AND UNDER CONSTRUCTION BETWEEN 31ST MARCH, 1931, AND 31ST MARCH, 1940.

(NOTE.—For railways constructed and opened prior to 1931 see Public Works Statement, 1931.)

Railway.	Mileage.	Section.	Lengths under Construction.	Lengths of Line open for Traffic.		
				Date.	Length.	Total.
	M. ch.		M. ch.		M. ch.	M. ch.
Number of miles of railway opened prior to 1931 (see 1931 Public Works Statement, 1931)				..	..	3,339 46
North Island.						
North Auckland Main Trunk Railway	..	Rangiahua	13 65	Construction abandoned 8/12/36.		
Dargaville Branch Railway ..	19 70	..	19 70	Open for goods traffic.		
Napier–Gisborne Railway ..	..	Putorino–Raupunga ..	13 10	27/2/39	13 10	..
		Raupunga–Wairoa–Waikokopu	44 33	1/7/39	44 33	57 43
		Waikokopu–Gisborne ..	34 10	..	..	..
Stratford Main Trunk Railway ..	41 40	Tahora–Raekohua	3 20	3/9/33		
		Raekohua–Heao	4 63	3/9/33		
		Haeo–Tokirima	3 47	3/9/33		
		Tokirima–Ohura	10 60	3/9/33	41 40	41 40
		Ohura–Matiere	8 67	3/9/33		
		Matiere–Okahukura ..	10 23	3/9/33		
Paeroa–Pokeno Railway	40 5	..	40 5	Construction suspended for duration of war.		
Turakina–Okoia Deviation ..	10 20	..	10 20	..	..	..
Palmerston North Deviation ..	8 75	..	8 75	..	..	..
Wellington – Tawa Flat Deviation ..	7 40	(Double line)	7 40	19/6/37	7 40	7 40
South Island.						
South Island Main Trunk Railway..	..	Clarence (North End) ..	19 25	..	..	..
		Kaikoura (North End) ..	28 44	..	..	..
		Conway (South End) ..	29 20	..	..	..
Westport–Inangahua Railway ..	21 38	Te Kuha – Cascade ..	3 4	..	..	..
		Cascade–Inangahua ..	18 34	..	..	..
Total	..	..	..	..	..	3,446 9

IRRIGATION.

CENTRAL OTAGO.

During the past irrigation season rainfall throughout Central Otago was appreciably above the average, the rains being well distributed, and particularly good during the months that are normally subject to most irrigation activity.

In addition, temperatures throughout the summer were moderate, and no difficulty was experienced in maintaining supplies to all schemes.

No construction work was undertaken during the year. Extraordinary maintenance-work was necessitated through thunderstorm damage on the Manuherikia main race and through a slip near the Arrow River intake. The latter carried away portion of the concrete headrace, and the installation of a temporary pipe-line was necessary to maintain supplies. At Chatto Creek the 36-in.-diameter pipe-line, 1,780 ft. long, was dismantled, cleaned, and recoated during the off season. Further pipe-line-renovation work on other schemes will be carried out before the beginning of next irrigation season. Special maintenance-work was also carried out at the Falls Dam.

The number of irrigators showed a decrease of seven on last year's figures, this being due partly to the amalgamation of properties and partly to the fact that, owing to the wet season, certain irrigators on the Omakau Scheme elected not to use water. In addition, twenty-two irrigators on schemes other than Omakau received no supplies on account of non-payment of rates, as against seventeen for the preceding year.

The following figures show details of completed schemes in operation, and also the area which should have been irrigated had all rates been forthcoming :—

Scheme.	Area actually irrigated.	Area that should have been irrigated.	Number of Irrigators actually supplied.
	Acres.	Acres.	
Arrow River	2,750	2,980	46
Ardgour	1,364	1,364	11
Bengerburn	114	144	13
Earnscleugh	1,987	2,190	48
Galloway	2,391	2,391	20
Hawkdun	8,255	8,977	66
Idaburn	565	565	8
Ida Valley	11,958	11,981	57
Last Chance	2,760	2,760	31
Manuherikia	4,818	4,862	75
Tarras	2,675	2,675	18
Teviot River	3,508	3,942	44
	43,145	44,841	437
Omakau including Dunstan ..	8,150	..	56
Totals	51,295	..	493

The total area actually irrigated shows an increase of 264 acres over last year's figures. On the Manuherikia Scheme and Last Chance Scheme areas of 81 acres previously charged for were classed this season as non-irrigable.

The total irrigable area commanded on all schemes is approximately 63,000 acres.

The financial results of the year's working were: Revenue, £25,896; working-expenses, £23,290; profit on working, £2,606.

The revenue exceeded the preceding year's by £244, but, owing to the extraordinary maintenance items mentioned before, the working-expenses were also greater to the extent of £757, the profit on working thus showing a reduction of £513.

On the Omakau Scheme, where no irrigation agreements are in force, but where water is purchased as required, the total quantity sold was 5,844 acre-feet, as against 5,915 acre-feet for the previous season. When it is considered that the irrigable area commanded is 15,000 acres, the sales for the past two seasons have been very disappointing.

The total amount of rates collected amounted to £24,597, as against £25,980 for the previous year. During that year sales of water for mining were some £320 greater, and some substantial sums were paid in settlement of arrears.

The usual work of recording stream-flows, lake-levels, and meteorogical data was carried out.

CANTERBURY.

Operation and Maintenance of Irrigation Schemes.

Redcliffs Scheme.—The demand for water greatly increased during the past season, the return for sales being £334, a little more than twice the return of the previous season. The area watered increased from 1,080 acres to approximately 1,400 acres, while a more intensive programme of irrigation was carried out on the areas brought in earlier. The response from irrigation was entirely satisfactory, as is evidenced by the fact that during a year of a disastrous shortage of winter feed, Redcliffs was the only area in South and Mid-Canterbury where there was an abundance of winter feed. The Redcliffs farmers are becoming strongly irrigation-minded, and a steady development of the areas within the scheme can be confidently anticipated.

Levels Scheme.—On the Levels Scheme the returns from the sales of water were also doubled, the revenue being £353. The number of farmers who availed themselves of irrigation increased from thirty-seven in the previous year to fifty-one for the season just past. The area watered was approximately 1,600 acres. At this early stage in development much of the land irrigated is in poor type, run-out pasture, the water being applied to give temporary relief. Considerable increase in resowing in good-type pasture, so essential to give maximum results from irrigation, is a pleasing feature. More paddocks have also been border-dyked and sown in lucerne. On farms which have followed a consistent programme of development and irrigation the responses have been similar to results obtained at Redcliffs.

The completed schemes in operation are shown in the following table:—

Scheme.	Area actually irrigated.	Area for which Water is available.	Number of Irrigators.
	Acres.	Acres.	
Redcliffs	1,400	4,603	12
Levels	1,600	12,800	51
Totals	3,000	17,403	63

The financial result of the year's operations was as follows: Revenue, £678; working-expenses, £2,472.

Schemes under Construction.

Ashburton-Lyndhurst Scheme.—Race formation completed: For the year, 17 m. 70 ch.; 47,591 cubic yards. To date, 94 m. 47 ch.; 442,273 cubic yards. Proportion completed, 83 per cent.

Fencing: For year, 76 ch.; to date, 35 m. 63 ch.; proportion completed, 77 per cent.

Structures:—

	Number.	Percentage completed.
For year—		
Drops	103	75
Bridges	26	61
Bridges and drops combined	5	100
Siphons	72	78
Special structures	10	52
Turnouts	49	50
Fence crossings	51	42
Total structures completed during year	316	
Total completed to date	1,088	72

Survey: Pegging race-lines—for year, 9 m. 61 ch.; to date, 125 m. 48 ch. Plotting race-lines—for year, 14 m. 55 ch.; to date, 114 m. 3 ch. Total length of system to be surveyed, 133 m.

With the outbreak of war, resulting in the greater part of the excavating-plant being diverted to defence work for three months, coupled with bad weather conditions, earthwork output has been greatly retarded in the period under review.

The demonstration area has been extended and the original 36 acres has continued to yield excellent results, the average carrying-capacity for the year being nine sheep per acre.

The irrigation of this area has practically eliminated the grass-grub, the adjoining areas being badly infested.

With the majority of the large structures and heavy excavation work completed, there remains the cutting of approximately 39 miles of small-capacity race and the construction of the necessary bridges, &c., over this length, which work is estimated to be complete during the current year.

Mayfield-Hinds Scheme.—This scheme embraces an area of 110,000 acres between the Rangitata and Hinds Rivers, of which 50 per cent. is estimated to be irrigable.

Good progress has been recorded during the year on the mechanical excavation, nine large Diesel excavating-units being employed, though delay has been caused to a certain extent due to the temporary transfer of some of this plant to urgent defence works.

The work completed to date is as follows: Race-excavation, 273,000 cubic yards; reinforced-concrete structures, 221; erection of new fences, 29 miles; race-lines surveyed, 140 miles; mile sheets plotted, 129.

The work is estimated to be 30 per cent. complete.

Rangitata Diverson Race.—The position in regard to this excavation is as follows:—

Previously excavated	1,265,000 cubic yards.
Excavation for year	998,000 cubic yards.
Total excavation to date	2,263,000 cubic yards.

The work is fully mechanized, and good progress is being made.

Structures: During the year the following further structures have been completed—One road bridge, two access bridges, seven large drainage siphons, three stock-race siphons. Work in hand comprises seven access and road bridges, and four drainage siphons.

Accommodation: New accommodation erected during the year comprises six staff cottages, seventeen married quarters, one hundred and ninety-eight single quarters.

Intake: Work at the intake was subjected to an abnormally high flood during the year, and although very little damage was done it was found necessary to modify the existing plans to cope with a similar flood.

Surrey Hills Siphon: A pipe-factory has been set up to fabricate the 12-ft.-diameter concrete pipes.

Pumping-station: Owing to the advanced state of the excavation it has now been possible to supply the Council stock race with water.

Fencing: Eight miles of permanent fencing have been erected.

Highbank Power Scheme: The utilization of surplus water for a power scheme at Highbank has necessitated an additional excavation of 600,000 cubic yards, and work on this portion will be commenced shortly.

Downs Water-supply Scheme.—Good progress has been maintained on this scheme, which is designed to supply water for stock and domestic purposes to a gross area of 167,500 acres near Timaru.

The scheme includes the manufacture and placing of reinforced-concrete drinking-troughs, of which about three thousand will be required.

The present position of the work is as follows:—

Survey: Plans completed, 160,000 acres; work located, 100,000 acres; reticulations detailed, 70,000 acres.

Pipe-supplies: 90 per cent. of galvanized pipe requirements have been received, and the balance is expected shortly. Locally-manufactured pipes are being delivered as required.

Pipe-laying: A total length of 1,510,000 ft. of galvanized pipe, sizes $\frac{3}{4}$ in. to $3\frac{1}{2}$ in. diameter, has been laid in an area of 70,000 acres, and in the main and sub-mains 120,000 ft., of pipes, sizes 4 in. to 13 in. diameter, has been laid. The average monthly total footage laid has since reached 160,000 ft.

Reservoirs: Two storage reservoirs are complete and in use, and three others are in various stages of completion.

Troughs: Total number manufactured is nine hundred and fifty, and five hundred have been placed.

Water was turned on in January, and some 20,000 acres are now being supplied.

It is expected that the scheme will be nearing completion next year.

Canterbury Irrigation Investigations.

Topographical Surveys.—Owing to the shortage of staff no further surveys have been made during the year.

Stream-gauging.—Continuous records were obtained from all eight river gauges during the year. Discharge records at high and low flows from these rivers were also obtained.

Ground-water observations in Levels and Geraldine Counties were also regularly carried out during the year.

Soil Moisture and Rainfall.—Observations and records of soil moisture have been continued during the period from each of sixteen stations in Ashburton County, four stations in Levels County, nine stations on the Redcliffs Irrigation Scheme, and fifteen in the Wairau Valley, Marlborough.

Evaporation.—Continuous records of evaporation, wind-mileage, humidity, and temperatures were taken at these stations with the following results :—

Station.	Evaporation Year 1st May, 1939, to 30th April, 1940.	Wind Mileage.
	In.	Miles.
Ealing	44·95	21,632
Methven	49·98	35,773
Blenheim	44·01	13,608
Pendarves	42·78	16,581
Levels	40·28	10,317
Kirwee	46·66	31,970

Rainfall Run-off.—Good records were also obtained during the past year from six high-level automatic rain-gauges in the North Ashburton catchment area. Outflow from the catchment was measured at the Gorge weir.

Soil Survey.—A soil-acidity and soil-fertility survey of the Ashburton County has been commenced and information of a most useful nature is being compiled.

Marlborough Irrigation Scheme.

Soil samples have been taken during the period, and a continuous record has been obtained from the level-recorder at the Ferry Bridge, Wairau River.

HYDRO-ELECTRIC DEVELOPMENT.

Arapuni Power Scheme.

Penstock Tunnels, Nos. 5 and 6 Units.—These tunnels have been excavated to a point 350 ft. from the lower end, the total excavation being 4,470 cubic yards.

The excavation of the gate-shafts is also proceeding, No. 5 shaft being excavated to a depth of 8 ft. and No. 6 to a depth of 5 ft.

A contract has been let for the steel-lining of the penstocks.

Tail-race.—During the year efforts were made to reduce the tail-water level to obtain additional power. The work consisted of dragging operations on the sand-bar and cutting off a corner of the river-bank 5 chains below the sand-bar. This reduced the level below the sand-bar by 3 ft. 6 in. and 1 ft. at the sand-bar. Further dragging of the sand-bar is in hand, and it is hoped to obtain between 2 ft. and 3 ft. of additional head by this means.

Arapuni Dam.—Boring operations were put in hand at the eastern abutment of the dam in an endeavour to trace a persistent leak through the eastern abutment. A total of fifteen bores of various depths were put down, totalling 3,029 ft. of boring. A rock fissure was located in three bores giving the direction of the fissure, and after further boring along the line of the fissure it is intended to cement grout the whole area.

Karapiro Power Scheme : Investigations.

Prospecting the foundations by boring was continued during the year. Twenty-eight bores were put down, totalling 2,194 ft. of boring, this making a total of eighty-one bores since the investigations were commenced.

Waikaremoana Power Scheme.

No. 3 Penstock.—The pipe-line was tested under a static load 100 lb. per square inch in excess of the ordinary working-pressure. A few small weeps were repaired by welding, and after retesting no leakage occurred. The pipe-line was then cleaned by sand-blasting and painted with two coats of No. 2 Formula paint and a finishing coat of several selected paints.

No. 3 Unit.—The necessary concrete work for the installation of this unit was completed, the temporary concrete bulkhead in the draft tube was cut out, and the tail-race in front of the draft tube was dredged to the necessary level in readiness for the arrival of the machine.

Waikaremoana Lower Development.

Service Roads.—Several short sections of service road were completed and the six miles of roading system were maintained to a good standard.

Quarry.—The quarry at Tuai produced 9,870 cubic yards of crushed metal and a large quantity of spalls for inlet canal and river-bank protection.

Whakamarino Canal.—The excavation of this canal was completed, and 7,800 cubic yards of rock and earth were removed. The intake structure and cut-off wall were completed, and 200 lineal feet of canal section were lined.

Whakamarino Dam.—Boring and grouting the foundation of this dam was continued, 1,970 lineal feet of boring being completed to date. The grouting consumed 139 tons of cement. The iron-gate

frames and gates were installed in the Kohutangaroa Culvert, and the excavation for the automatic spillway is in hand, 2,500 cubic yards being excavated to date. The excavation from the canal and spillway was used to reclaim a useful recreation area in front of the existing hostels.

Tunnel and Intake.—The excavation of the 16-ft.-diameter water-tunnel was put in hand at five faces, the total length completed being 2,674 lineal feet. A drainage adit 6 ft. by 3 ft. has been driven for a length of 1,086 ft. to drain the siphon, and has been connected with a 6 ft. by 5 ft. control shaft. Preparations for concreting the tunnel are well in hand, three sets of mixers, bins, and cement sheds are completed, and three sets of collapsible steel form work have been received on the job.

Surge-chamber.—The excavation of the surge-chamber is well in hand, and 7,600 cubic yards of material have been removed to date.

Penstocks.—The excavations for the penstocks have been completed, including the driving of the west penstock tunnel to the surge chamber. The total excavation was 4,500 cubic yards. In the raft section of the penstocks near the powerhouse 9,000 cubic yards of heavy excavation in wet material was removed by a drag-line excavator and a carry-all scoop. The steel penstock pipes have been constructed on the site and have been sand-blasted and painted. These pipes are 7 ft. 6 in. in diameter, and have a total length of 1,820 lineal feet; they are now ready for installing in their permanent position.

Powerhouse.—The excavation of the power-house site was completed, 7,300 cubic yards of spoil being removed, and the excavation of the tail-race is proceeding. Good foundation papa was revealed over the whole of the site. A contract has been let for the powerhouse building, and the contractor arrived on the site on 26th March, and is proceeding actively with the erection of the necessary barracks for his employees.

Piripaua By-pass.—The excavation of this by-pass was completed in July, 1939, and the river was diverted into the new channel the same day. The total excavation was 18,170 cubic yards, and this material was used to fill the old river-channel. A 60-ft.-span bridge was constructed over the by-pass, and a concrete drop-weir was constructed to prevent future scour. The sides of the canal were protected with stone-pitched walls 8 ft. high and having a total length of 1,030 lineal feet.

Buildings.—All the accommodation buildings, service buildings, workshop, cement sheds, &c., have been completed except for more single-men's quarters that may prove necessary. A school was also erected at Piripaua Camp, and seventy-one children now attend.

Electrical Work.—Light and power leads have been run to all the construction works to light tunnels and tips, and serve power to the construction plant. The connected load consists of twenty-nine motors, with a total of 720 horse-power. All accommodation has been provided with electric lighting, and street lights have been provided where necessary.

Plant.—The excavation plant consists of three large tractors and bull-dozers, and two Diesel shovels. The four tunnel headings are equipped with Diesel tunnel locomotives, scrapers, concrete mixers, and tunnel-ventilating fans. A workshop has been built and fitted with modern plant for carrying out maintenance and construction work, and has mechanical, woodworking, and plumbing sections. The total number of employees has now reached 361.

Lake Tekapo Power Scheme.

The preliminary survey and investigations of the site of this scheme have been completed, and work has commenced in forming access roads and erecting service buildings and accommodation preparatory to putting the construction work in hand.

Highbank Power Scheme.

The preliminary engineering plans of this development have been completed, and the access road to the site has been constructed. Specifications have been prepared for the contract for the power-house foundation and tail-race excavation, and it is expected to proceed vigorously with this scheme during the current year.

CONSTRUCTION AND IMPROVEMENT OF ROADS AND BRIDGES.

The construction and improvement of settlement and other roads resulted in the completion during the year of formation totalling 402 miles, and of metalling aggregating 699 miles. The policy of erecting reinforced-concrete bridges wherever possible was maintained, and structures totalling 6,563 lineal feet were completed. A small proportion of this length comprised timber and R.S.J. bridges, but structures of this type were erected only when it was not considered advisable to build in reinforced concrete.

The principal major works completed were: The Paihia Black Bridge Road, which was reconstructed prior to the Centennial celebrations at Waitangi in February, 1940; the Haywards–Pahautanui Road; and the Plimmerton–Paekakariki coastal deviation, which was opened to traffic on 4th November, 1939. All of these roads have been declared main highways, the last named also being classified as a State highway.

Construction is proceeding on the Rotorua–Waikaremoana, Taumarunui–Tokaanu, Waiouru–Tokaanu, Western Hutt, Matakitaki–Springs Junction, the Makarora–Haast and the Main South Westland Roads. On the latter road, 108 miles in length, 56 miles have been constructed to date, of which 31 miles were metalled during the past year. The bridging programme is well advanced, five reinforced-concrete structures having been erected during the year, whilst five others are in course of construction.

The following schedule shows details of formation, metalling, bridging, culverting, &c., completed during the year ended 31st March, 1940 :—

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939-40.

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans. Number.	Spans. Length.	Total Length.	Reinforced Concrete or Timber.
WHANGAREI DISTRICT.										
Bay of Islands County.	M. ch.	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Access to Block XV, Kawakawa Survey District	..	..	0 40	..	..	..	..	..	..	..
Access to O.L.C. Block X, Kawakawa Survey District	..	..	0 52	..	..	..	..	..	..	..
Access to Section 40, Block III, Punakitere Survey District	0 20	0 20	0 20	..	..	..	..	..	..	..
Cumber's Access	0 28	0 28	0 28	..	..	..	..	..	..	..
Davis' Access	0 45	0 45	0 45	13	240	..	..	..	..	..
Kawakawa Settlement	1 4	1 4	1 4	11	262	..	..	..	..	..
Motatau–Kaikou	2 40	2 40	3 97	25	446	..	..	..	..	..
Opua Settlement Roads	..	..	0 57	..	..	..	..	..	..	..
Oramahoe Native-school Access	0 25	0 25	0 25	1	40	..	..	..	..	..
Paiaka–Hukerenui	1 70	1 70	1 70	5	76	..	..	..	..	..
Paihia – Black Bridge	7 62	7 62	7 62	54	3,135	24	2	30	60	R.C. and timb.
						24	1	45	45	R.C.
						24	1	20	20	R.C.
						24	1	20	20	R.C.
Pakaru Settlement	2 0	2 0	2 0	6	108	..	..	..	..	..
Punakitere Valley	0 18	0 18	0 18	6	90	..	..	..	..	..
Ramarama	0 70	0 70	1 27	10	230	..	..	..	..	..
Tapuhi–Ruapekapeka	1 50	1 50	1 50	19	368	..	..	..	..	..
Tarahi – Te Pua	0 68	0 68	0 68	8	153	..	..	..	..	..
Tokowhero Stream Bridge	..	..	..	..	..	12	1	30	30	R.C.
Tutaematai–Rawhiti	..	0 68	5 48	24	479	..	..	..	..	..
Waikare–Russell	3 46	..	..	..	..	..	..	..	..	..
Waipapa–Pureura	4 20	4 20	..	..	..	10½	1	18	18	Timb.
Whangae Settlement Extension	0 70	0 70	0 70	6	114	..	..	..	..	..
Hobson County.										
Aranga to Coast	..	..	1 48	..	..	..	..	..	..	..
Aratapu to Redhill	..	3 40	2 0	24	537	..	..	..	..	..
Brown's Bridge	..	..	..	..	..	8½	1	20	20	Timb.
Girls' High School Road	..	..	2 40	..	..	..	..	..	..	..
Hoyle's to Brown's	0 32	0 32	..	8	198	..	..	..	..	..
Johnson's	0 50	0 50	..	5	111	..	..	..	..	..
Maropiu to Mamaranui	0 36	0 36	..	..	..	10½	1	30	30	R.C.
Pouto	5 57	3 40	..	36	1,013	..	..	..	..	..
Shine's Bridge	..	..	..	..	..	10½	1	25	25	R.C.
Trounson Park	..	..	4 70	..	..	..	..	..	..	..
Hokianga County.										
Access Paihia Block	3 68	..	..	..	..	..	..	..	..	..
Auckland Block	1 50	1 50	1 50	21	390	..	..	..	..	..
Awaroa River	0 60	0 60	0 60	1	32	..	..	..	..	..
Baker's Access	0 20	0 20	0 20	4	87	..	..	..	..	..
Claasen's	..	..	1 60	..	..	..	..	..	..	..
De Thierry's	0 32	0 32	0 32	9	210	..	..	..	..	..
Giles	..	0 13	2 0	..	..	..	..	..	..	..
Herbert's Access	0 38	..	0 38	..	..	..	..	..	..	..
Humphrie's	0 60	0 60	0 60	10	184	..	..	..	..	..
Irving's	..	..	0 20	7	132	..	..	..	..	..
Humanga	1 0	1 0	1 0	2	84	..	..	..	..	..
Iwitaua Road, Branch No. 2	0 7	0 7	0 7	..	..	10½	1	40	40	R.C.
Kohukohu–Rakatapu	5 76	5 76	5 76	25	528	..	..	..	..	..
Mangakino Valley	0 60	0 60	0 60	16	289	..	..	..	..	..
Mangamuka Stream Bridge	..	0 10	0 10	..	..	..	..	..	..	..
Mangatipa Road Bridge	0 11	..	..	..	..	10½	1	25	25	Timb.
Mangatairairi Road Bridge	0 11	..	..	..	..	12	1	30	30	Timb.
Motataua Bridge	..	..	..	1	56	..	..	..	..	..
Moturuna	0 37	0 37	..	..	..	12	1	21	21	Timb.
Ohuri	0 21	0 21	0 21	6	111	..	..	..	..	..
Pearson's	..	..	0 46	..	..	..	..	..	..	..
Rahiri Settlement	1 76	..	..	..	..	..	..	..	..	..
Taita	..	0 40	0 40	8	144	..	..	..	..	..
Survey Creek	0 10	..	..	..	..	10½	1	25	25	Timb.
Waima Valley	..	0 12	0 34	..	..	10	1	40	40	Timb.
						10	1	40	90	Timb.
							2	25		
Whirinaki–Kouto	1 50	..	..	..	..	..	..	..	..	..
Mangonui County.										
Apeturewa	..	0 44	0 44	7	144	..	..	..	..	..
Awanui–Mangonui	1 40	..	..	1	24	..	..	..	..	..
Church	..	..	0 40	..	..	..	..	..	..	..
Garton's	..	0 56	0 56	2	54	..	..	..	..	..
Honeymoon Valley	..	0 38	0 38	7	142	..	..	..	..	..
Kaingaroa–Mangatete	..	4 48	1 70	3	72	..	..	..	..	..
Kaitaia Block Access	..	..	0 60	..	..	..	..	..	..	..
Kitchen's	..	0 36	0 36	5	91	..	..	..	..	..
Larmer's	..	0 17	..	3	81	..	..	..	..	..
Okahu Block	..	0 32	0 16	2	48	..	..	..	..	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939–40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans.		Total Length.	Reinforced Concrete or Timber.
							Number.	Length.		
WHANGAREI DISTRICT—*continued.*										
Mangonui County—continued.	M. ch.	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Oturu Native Development Roading ..	0 40	2 50	4 40	16	303	10½ 10½	1 1	20 20	20 20	Timb.
Parapara–Taumata	..	0 3	0 3	..	..	12	1	40	40	Timb.
Parapara–Toatoa	1 69	1 35	0 15	26	547	..	..	..	..	..
Parker's Bridge	..	..	..	..	..	10½	1	30	30	Timb.
Pirikaha Road	..	0 55	0 55	8	171	..	..	..	..	..
Simpson's	..	0 32	0 32	3	66	..	..	..	..	..
Takahue–Herekino	0 40	4 0	4 0	19	403	..	..	..	..	..
Te Koroa Bridge	..	..	..	..	..	9	2	30	60	Timb.
Te Paki – Cape Reinga	10 20	10 0	3 55	56	1,030	..	..	..	..	..
Te Paki – Ninety-mile Beach	0 30	2 34	2 34	18	340	12	1	25	25	Timb.
Waiharara Road	..	0 25	0 25	2	48	..	..	..	..	..
Wainui – Lake Tangonge	..	0 30	0 30	1	24	..	..	..	..	..
Waipapakauri – Te Kao	..	..	..	3	60	..	..	..	..	..
Wallace's	..	0 32	0 32	3	62	..	..	..	..	..
Wells'	..	0 20	0 20	3	72	..	..	..	..	..
Werner's	..	..	0 42	..	..	..	..	..	..	..
Whangape	0 10	0 34	0 40	12	230	..	..	..	..	..
Otamatea County.										
Bradley's	0 66	..	..	5	153	..	..	..	..	..
Courtenay's	0 35	..	..	3	83	..	..	..	..	..
Chadwick's	2 4	..	..	..	..	..	..	..	..	..
Dunn's Road Extension, Kaiwaka ..	..	2 10	..	..	..	..	..	..	..	..
Greenhill	0 34	..	..	..	..	..	..	..	..	..
Griffin's	..	0 60	0 60	..	..	..	..	..	..	..
Hukatere–Tinopai	..	..	3 18	..	..	..	..	..	..	..
Heatley's Access	0 72	..	..	..	..	..	..	..	..	..
Hastie's	..	0 31	0 31	..	..	..	..	..	..	..
Kaiwaka–Oneriri	..	1 43	1 43	12	244	..	..	..	..	..
Mangawai–Waipu	0 74	..	..	..	..	..	..	..	..	..
Oven's	..	..	1 2	..	..	..	..	..	..	..
Porter's Junction to Ararua	1 56	1 12	..	8	221	..	..	..	..	..
Simpkin–Ringrose	..	..	0 50	..	..	..	..	..	..	..
Taipuha–Maungaturoto	..	2 40	..	21	456	..	..	..	..	..
Tokatoka–Matakohe	..	..	5 40	..	..	..	..	..	..	..
Waihaua	..	2 4	..	14	366	..	..	..	..	..
Waiotira–Ararua	0 58	0 58	..	2	34	..	..	..	..	..
Wearmouth	0 24	1 13	0 24	..	..	..	..	..	..	..
Whangaroa County.										
Connolly's Access	..	0 52	..	5	105	..	..	..	..	..
Mangapa	..	..	1 20	..	..	..	..	..	..	..
Matauri Bay to Te Ngaere	..	..	0 55	..	..	..	..	..	..	..
Pupuke Settlement	..	0 38	..	6	217	..	..	..	..	..
Waikare Road, Kaeo	0 3	0 3	0 3	1	40	..	..	..	..	..
Wainui – Te Ngaere – Matauri Bay ..	..	0 35	0 35	4	72	..	..	..	..	..
Whangaroa Coast	..	..	3 24	..	..	..	..	..	..	..
Whangarei County.										
Addison's	..	..	0 69	2	36	..	..	..	..	..
Campbell's	..	..	1 46	5	90	..	..	..	..	..
Carruth's	..	..	0 43	4	72	..	..	..	..	..
Carter's	..	..	0 70	1	18	..	..	..	..	..
Chamber's	..	..	0 16	3	45	..	..	..	..	..
Corbett's	..	..	1 58	6	108	..	..	..	..	..
Crane's	..	..	0 36	2	36	..	..	..	..	..
Edginton's	..	..	0 33	2	36	..	..	..	..	..
Gumtown – Kaitara	..	..	0 35	3	65	..	..	..	..	..
Haha	0 72	0 72	0 72	7	126	..	..	..	..	..
Hewlett's	..	..	1 40	2	39	..	..	..	..	..
Hikurangi Town Boundary	..	..	0 31	2	38	..	..	..	..	..
Hilford's	..	..	0 16	3	45	..	..	..	..	..
Hutchinson's	0 3	0 3	..	1	24	..	..	..	..	..
Jack's	..	..	0 25	1	18	..	..	..	..	..
Knight's	..	..	2 0	10	160	..	..	..	..	..
Maddren's Bridge	..	..	..	..	..	9	1	25	25	Timb.
Massey's	..	..	1 0	5	90	..	..	..	..	..
McBeth's Bridge	..	..	..	..	..	8½	3	20	60	Conc. and timb.
McLennan's	..	..	0 60	4	84	..	..	..	..	..
Ngararatunua Swamp	0 60	0 60	..	..	..	..	..	..	..	..
Neill's	..	..	0 55	5	87	..	..	..	..	..
Otaika–Kaigoose	..	..	0 34	3	60	..	..	..	..	..
Parakao–Karaka	..	..	1 10	4	80	..	..	..	..	..
Parke's Bridge	0 36	0 36	0 36	3	63	..	..	..	..	..
Puhipuhi Back	..	..	1 2	5	120	..	..	..	..	..
Wilson's, Ruakaka	..	..	0 38	1	15	..	..	..	..	..
Wrack's	..	..	0 43	..	..	..	..	..	..	..
District totals	82 24	94 65	121 29	736	17,405	..	..	..	819	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939–40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans.		Total Length.	Reinforced Concrete or Timber.
							Number.	Length.		
AUCKLAND DISTRICT.										
Coromandel County.	M. ch.	M. ch.	M. ch.		Ft.	Ft.	..	Ft.	Ft.	
Blackmore's	..	0 60	0 60	3	63	..	..	..	..	..
Boat Harbour	..	..	0 52	..	..	..	..	..	..	..
Coromandel – Kennedy Bay	..	0 63	0 15	4	108	..	..	..	..	..
Kapowai	1 36	1 36	1 36	11	176	..	..	..	..	..
Kuaotunu – Mercury Bay	..	..	8 0	26	510	..	..	..	..	..
Kuaotunu–Opito	1 65	0 25	0 25	3	48	..	..	..	..	..
Otakeao	0 29	0 29	..	10	160	..	..	..	..	..
Owera–Kuaotunu	1 28	1 28	0 40	16	282	..	..	..	..	..
Purangi	2 5	2 22	2 52	8	158	..	..	..	..	..
Tuateawa	..	..	0 42	2	36	..	..	..	..	..
Waikawau Beach	2 5	1 32	1 0	7	142	12	1	12	12	Timb.
Whenuakite School	2 5	..	0 32	..	..	..	..	..	..	..
Franklin County.										
Awhitu Central to C. N. Hamilton's	..	1 22	1 22	..	..	..	..	..	..	..
Awhitu – Orua Bay	..	..	0 24½	2	40	..	..	..	..	..
Bluff Road, Mercer	..	..	0 25	..	..	..	..	..	..	..
Cameron's	..	0 55	0 55	2	40	..	..	..	..	..
Donnelly's Bridge	..	..	..	..	..	24	1	50½	50½	R.C.
Graham's Beach	..	..	1 55	..	..	..	..	..	..	..
Graham's Beach to Big Bay Wharf	..	..	0 62	..	..	..	..	..	..	..
Hayward's Trig	..	0 46½	0 46½	5	110	..	..	..	..	..
Kahawai	..	0 21	0 21	..	..	..	..	..	..	..
Kariotahi–Taurangaruru	..	..	0 50	..	..	..	..	..	..	..
Maxted's	..	1 10	..	..	..	..	..	..	..	..
McRobbie's	..	0 18½	0 18½	..	..	..	..	..	..	..
Orua Bay – Awhitu Gully	..	0 23	0 23	..	..	..	..	..	..	..
Otto's	..	..	0 29	..	..	..	..	..	..	..
Pollok Wharf	..	0 75	1 0	..	..	..	..	..	..	..
Ponsford's	..	1 6	1 6	..	..	..	..	..	..	..
Robert's	..	0 25	0 25	3	48	..	..	..	..	..
Steel's Access	..	..	0 46½	2	64	..	..	..	..	..
Taylor's	..	0 24	0 24	..	..	..	..	..	..	..
Trig	..	..	0 43	1	10	..	..	..	..	..
Waipipi–Kohekohe	..	..	1 40	..	..	..	..	..	..	..
Whatapaka Block Access	..	0 38½	..	4	96	..	..	..	..	..
Wilcox Bridge	..	..	..	..	..	24	1	24	24	R.C.
Wright's	..	1 8½	1 8½	..	..	..	..	..	..	..
Great Barrier Island County.										
Blind Bay–Haratonga (Black Bridge)	..	..	..	1	60	..	..	..	..	..
Tryphena–Kaitoke	..	5 37	5 5	..	..	..	..	..	..	..
Hauraki Plains County.										
Awaiti South	0 44	0 44	0 44	..	..	..	..	..	..	..
Baigent's	0 50	0 50	0 50	..	..	..	..	..	..	..
Hamilton's	1 36	1 36	0 45	11	264	..	..	..	..	..
Mangawhero	0 28	0 28	0 28	..	..	..	..	..	..	..
Miranda Bridge	..	..	..	..	..	24	1	20	20	R.C.
Torehapa West	..	..	0 40	..	..	..	..	..	..	..
Manakau County.										
Access to Musick Memorial Aeradio Station	0 26	0 26	0 26	4	162	..	..	..	..	..
Bush Bridge	..	..	..	..	..	26	1	12	12	R.C.
Cascade	..	0 7½	0 7½	1	15	..	..	..	..	..
Cashmore's Bridge	..	..	..	..	..	24	1	26½	26½	R.C.
Kimpton's	..	0 48	0 48	..	..	..	..	..	..	..
Mill	..	0 53	0 53	..	..	..	..	..	..	..
Potts	..	0 64½	0 64½	..	..	..	..	..	..	..
Matamata County.										
Banks	..	..	1 0	..	..	..	..	..	..	..
Harris	..	..	2 23	..	..	..	..	..	..	..
Livingstone's	..	..	1 22	..	..	..	..	..	..	..
Luck at Last	..	0 23	0 23	..	..	12	1	12	14	Timb.
						12	1	12	14	Timb.
Morgan's Road Bridge	..	..	..	..	..	20	1	15	16½	R.C.
Okauia Native School	..	1 22	0 45	13	267	..	..	..	..	..
Puketurua Group	..	6 36	6 70	19	429	..	..	..	..	..
Taotaoroa	..	1 40	0 45	..	..	..	..	..	..	..
Waipa Bridges	..	0 14	0 14	..	..	12	1	30	31½	R.C.
						12	1	20	21	R.C.
Ohinemuri County.										
Hungahunga	..	..	0 34	..	..	..	..	..	..	..
Morrison's	0 22	..	0 22	..	..	..	..	..	..	..
Peel's Bridge, Maratoto	..	..	..	..	..	..	1	40	40	R.S.J. and timb.
Piakoiti Loop	..	..	1 64	..	..	..	..	..	..	..
Waihi–Whangamata	..	..	6 29	46	1,114	..	..	..	..	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939-40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans.		Total Length.	Reinforced Concrete or Timber.
							Number.	Length.		
AUCKLAND DISTRICT—*continued.*										
Otorohanga County.	M. ch.	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Awatane Extension	3 3	..	..	..	..	..	..	..	..	..
Addison's	0 16	0 16	0 16	1	32	..	..	..	..	..
Barber's	..	..	0 57½	3	63	..	..	..	..	..
Carlin's	..	..	0 27	1	24	..	..	..	..	..
Ellis	..	..	0 35½	..	..	..	..	..	..	..
Haurua	..	0 38	1 58	12	276	..	..	..	..	..
Maihihi–Hingaia	..	0 2½	0 2½	..	..	..	..	..	..	..
Ngahape–Korokonui	..	..	0 50	..	..	..	..	..	..	..
Owaikura	..	..	1 72	7	147	..	..	..	..	..
Pinney's	..	0 14	0 14	1	21	..	..	..	..	..
Tahaia Bush	..	..	1 60	11	219	..	..	..	..	..
Waitomo Valley	..	0 9	..	..	..	..	..	..	..	..
Waverley	..	..	0 40	1	12	..	..	..	..	..
Raglan County.										
Allan and Eyre's	..	..	0 30	..	..	..	..	..	..	..
Bain's	..	..	0 75	5	100	..	..	..	..	..
Campbell	..	..	1 40	10	240	..	..	..	..	..
Halliday's	..	..	0 16	..	..	..	..	..	..	..
Heddon	..	..	0 70	..	..	..	..	..	..	..
Kaniwhaniwha	..	1 0	..	..	..	..	..	..	..	..
Klondyke	..	..	10 44	..	..	..	..	..	..	..
Kohanga	..	..	0 65	..	..	..	..	..	..	..
Lee's	..	..	0 40	..	..	..	..	..	..	..
Mangapiko Estate	..	..	0 20	..	..	..	..	..	..	..
Mangati – Te Akau Wharf	..	..	4 44	..	..	..	..	..	..	..
Phillips	..	..	1 35	2	42	..	..	..	..	..
Ruakiwi Hill	..	0 20	0 20	4	102	..	..	..	..	..
Slater's	..	..	0 30	..	..	..	..	..	..	..
Smith's Access, Karamu	..	0 26½	..	1	24	..	..	..	..	..
Te Mata – Te Papatapu	..	..	0 49	19	361	..	..	..	..	..
Waikorea Naike via Speedy's	..	0 41	2 18	..	..	..	..	..	..	..
Wairamarama–Kaawa	..	..	6 50	..	..	..	..	..	..	..
Waimaori	..	0 6	1 65	..	..	..	..	..	..	..
Wilson's	..	..	0 32	..	..	..	..	..	..	..
Rodney County.										
Dyer's Swamp	..	1 40	1 40	8	170	..	..	..	..	..
Hall Bridge (Puhoi–Ahuroa)	..	..	..	..	..	26	1	22	22	R.C.
Hamilton's	..	..	0 15	..	..	..	..	..	..	..
Levett's Bridge (Te Hana – Wellsford Valley)	..	..	..	..	..	12	2 1	22½ 60	105	R.C.
Linton's Quarry	..	..	0 20	..	..	..	..	..	..	..
Mahurangi Heads and Mullet Point	..	0 10	..	4	80	..	..	..	..	..
Omaha Valley	..	..	0 20	..	..	..	..	..	..	..
Pakiri Block Roads	..	..	0 15	..	..	..	..	..	..	..
Prictor's Access	..	..	0 15	4	110	..	..	..	..	..
Pukapuka–Opahi	..	..	1 0	..	..	..	..	..	..	..
Rodney's	..	0 30	..	2	40	..	..	..	..	..
Run	..	2 0	1 0	18	366	..	..	..	..	..
Ryan's–Hakaru	..	..	0 23	..	..	..	..	..	..	..
Schischka's	..	0 14	0 14	..	..	..	..	..	..	..
Silver Hills	..	..	0 40	..	..	..	..	..	..	..
Tapu Bush	..	0 70	0 45	5	125	12	1	15	15	Timb.
Te Hana – Wellsford Valley	..	..	1 11	..	..	..	..	..	..	..
Town Bridge (Puhoi–Ahuroa)	..	..	..	..	..	24	1	23	23	R.C.
Ward's	..	..	0 27	..	..	..	..	..	..	..
Waimanu	..	0 23	0 23	..	..	..	..	..	..	..
Thames County.										
Ahuamuri	0 26	0 26	0 26	2	38	..	..	..	..	..
Hikutaia–Whangamata	..	1 10	1 45	..	..	..	..	..	..	..
Kapakapa Bridge and Approaches	..	0 17	..	..	..	12	2	20	40	Timb.
Kirikiri	1 56	0 70	..	..	..	..	..	..	..	..
Puriri–Neavesville	..	1 69	..	6	118	..	..	..	..	..
Te Morete	0 18	0 48	..	6	91	..	..	..	..	..
Wainui	1 0	1 0	..	7	243	..	..	..	..	..
Waikato County.										
Davies	..	0 79	0 79	2	39	..	..	..	..	..
Frost's	..	1 57½	..	..	..	..	..	..	..	..
Gordonton–Motumaoho	..	..	1 40	..	..	..	..	..	..	..
Hampton Downs	..	0 42	1 12	..	..	..	..	..	..	..
Jefferies	..	..	1 6	..	..	..	..	..	..	..
Kopuku Soldiers' Settlement	..	0 13	0 13	..	..	..	..	..	..	..
Lake "B"	..	2 0	2 0	16	358	..	..	..	..	..
Manuel's	..	0 68	..	15	342	..	..	..	..	..
Pizzini's	..	0 25	..	3	53	..	..	..	..	..
Te Miro – Kiwitahi	..	0 32	1 40	..	..	..	..	..	..	..
Waikato Bridge Narrows	..	0 18	0 18	2	60	20	1	160	162	R.C.

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939–40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans. Number.	Spans. Length.	Total Length.	Reinforced Concrete or Timber.
AUCKLAND DISTRICT—*continued.*										
Waipa County.	M. ch.	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Day's	..	0 39	..	3	60	..	..	..	..	..
Johnson's	..	0 41	..	2	51	..	..	..	..	..
Kairangi Settlement	..	0 32	0 32	..	..	..	..	..	..	..
Mellsop	..	0 79	0 79	..	..	..	..	..	..	..
Montefiore	..	..	0 36	..	..	..	..	..	..	..
Newcastle Riding Boundary	..	0 39½	..	5	134	..	..	..	..	..
Ngahinepouri Old School	..	1 2	1 2	..	..	..	..	..	..	..
Rukuhia Station	..	0 50	..	..	..	..	..	..	..	..
Thompson	..	..	0 51	..	..	..	..	..	..	..
Tika	..	0 42½	0 30	7	204	..	..	..	..	..
Tokanui	..	0 20	0 20	..	..	..	..	..	..	..
Waikeria	..	1 20	..	6	167	..	..	..	..	..
Wharepapa	..	0 2	0 74	18	400	12	2	23½	90	R.S.J. timb.;
							1	40		R.C. (piers).
Wharepapa Settlement Roading	..	1 59	2 40	40	939	..	..	..	..	..
Waitemata County.										
Anzac Valley	..	0 77	0 35	7	177	..	..	..	..	..
Black Bridge	..	..	..	..	..	12	2	11	66	R.C.
							1	44		
East Coast – Cuthill	..	..	2 0	3	70	..	..	..	..	..
Glen Var	..	1 0	1 0	1	30	..	..	..	..	..
Joblin's	..	0 17	0 17	2	68	..	..	..	..	..
Kiwitahi	..	..	0 58	..	..	..	..	..	..	..
Lone Kauri (Karekare)	..	..	0 25	..	..	..	..	..	..	..
Museum Endowment	..	..	0 10	..	..	..	..	..	..	..
Pilcher's	..	0 19	0 76	5	126	..	..	..	..	..
Pilcher's Bridge	..	..	..	..	..	12	1	55	55	R.C.
Taiapa and Oaia	..	..	4 0	..	..	..	..	..	..	..
Waimunu	..	..	1 0	..	..	..	..	..	..	..
Whangaparaoa–Tiri	..	..	2 40	19	396	..	..	..	..	..
Waitakere Scenic Drive	..	0 50	1 0	..	..	12	1	42	42	Timb.
Wairau	..	0 45	0 42	3	170	30½	1	28	45	R.C.
District totals	21 70½	71 45½	145 50	503	11,290	..	..	..	947	..
TAURANGA DISTRICT.										
Opotiki County.										
Copenhagen	0 8½	0 8½	0 8½	1	33	..	..	..	..	..
Dickenson's	0 23½	0 23½	0 23½	1	18	..	..	..	..	..
Keen's	..	..	0 33½	2	36	..	..	..	..	..
Omaramutu	..	..	1 55	..	..	..	..	..	..	..
Pakihi Bridge	..	..	..	..	..	4	2	40	80	Timb. susp.
Pile's	0 39½	0 39½	0 39½	2	36	..	..	..	..	..
Ruatuna	0 16	0 16	0 16	1	16	..	..	..	..	..
Woodland's Dip	..	0 65	0 65	2	36	..	..	..	..	..
Rotorua County.										
Basley's	..	..	0 70	..	..	..	..	..	..	..
Bryce's	..	5 40	5 40	3	90	..	..	..	..	..
Clinkard's	..	..	0 21	..	..	..	..	..	..	..
Ford's Access	..	0 57	0 57	5	105	..	..	..	..	..
Gunson's	..	0 22	0 22	4	76	..	..	..	..	..
Iles	..	0 35	0 35	2	36	..	..	..	..	..
Kapukapu	..	..	1 9	..	..	..	..	..	..	..
Millar's Access	1 40	1 40	..	..	..	..	1	20	20	Timb.
Oturoa	..	..	0 27	..	..	..	..	..	..	..
South	..	1 0	1 0	..	..	..	..	..	..	..
Waiotapu – Waikite Valley	1 0	3 20	3 20	24	740	..	..	..	..	..
Whirinaki Block Access	..	3 65	2 25	31	780	..	..	..	..	..
Waikaukau	..	1 0	1 0	..	..	..	..	..	..	..
Ngongotaha Mountain	..	..	1 40	10	20	..	..	..	..	..
Taupo County.										
Taupo – Western Bay	..	1 34	1 12	8	162	..	..	..	..	..
Tauranga County.										
Burd	..	1 0	1 0	4	96	..	..	..	..	..
Joyce's	..	0 50	0 34	3	54	..	..	..	..	..
Kauri Point	..	0 30	0 30	..	..	..	..	..	..	..
Mangatoetoe Bridge	..	0 10	..	..	..	20	2	8	16	R.C.
Manoeka Bridge	..	..	..	..	..	10	1	15	15	R.C.
Marshall	..	0 40	0 40	..	..	..	..	..	..	..
No. 1 Road, Te Puke	..	1 40	1 40	..	..	..	..	..	..	..
No. 2 Road, Te Puke	..	0 64	0 64	3	72	..	..	..	..	..
Ohauti–Waimapu	..	2 44	2 44	20	420	..	..	..	..	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939–40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans. Number.	Spans. Length.	Total Length.	Reinforced Concrete or Timber.
TAURANGA DISTRICT—*continued.*										
Tauranga County—continued.	M. ch.	M. ch.	M. ch.		Ft.	Ft.			Ft.	
Ohinepanea	..	1 5	1 5	..	..	..	..	..	..	..
Peer's	..	0 42	0 42	..	..	..	..	..	..	..
Rangiuru Pah	..	0 40	0 40	4	96	..	..	..	..	..
Rangiuru	..	0 60	0 60	..	..	..	..	..	..	..
Rea's	..	0 36	0 36	..	..	..	..	..	..	..
Rocky Cutting	..	0 48	0 48	3	45	..	..	..	..	..
Soldiers' (Kaimai)	..	1 10	1 10	4	60	..	..	..	..	..
Te Tumu	..	0 32	0 32	..	..	..	..	..	..	..
Tomsett	..	0 27	0 20	4	72	..	..	..	..	..
Tuapiro River Bridge	..	..	..	..	..	2½	1	100	100	Timb. susp.
Wainui South	..	..	0 20	..	..	..	..	..	..	..
Wharawara	..	0 36	0 36	..	..	..	..	..	..	..
Wharere Bridge	..	..	..	..	..	24	1	21	21	R.C.
Whakatane County.										
Awaiti Bridge	..	..	..	..	..	18	1	20	20	Timb.
Bank	..	0 80	..	3	54	..	..	..	..	..
Bell's Road Bridge	..	..	..	..	..	12	2	20	40	Timb.
Bright's	..	..	2 70	..	..	..	..	..	..	..
Hodge's Bridge	..	..	..	1	22	..	..	..	..	..
Johnston's Road Bridge	..	..	..	..	..	12	1	26	26	Timb.
Pokaitoa Bridge	..	..	..	..	..	12	1	26	26	Timb.
Reid's Drain Bridge	..	..	..	..	..	18	1 2	30 14	58	Timb.
Rotorua–Waikaremoana	0 40	1 15	1 38	9	301	20	2 2	35 30	70 60	R.C. R.C.
Sutherland's Access	..	0 76	0 76	2	36	..	..	..	..	..
Thornton	..	..	0 50	..	..	..	..	..	..	..
Whakatane River Bridge and Approaches (Ruatoki)	0 42	0 32	0 32	1	24	..	15	44	660	R.C.
District totals	4 49½	38 2½	43 46	157	3,536	..	..	..	1,212	..
GISBORNE DISTRICT.										
Cook County.										
Bellerby's	..	..	0 2	..	..	..	..	..	..	..
Brunton's	..	..	0 33	..	..	..	..	..	..	..
Gaddum's	..	0 64	0 75	13	258	..	..	..	..	..
Gordon's	..	0 45	0 55	3	113	..	..	..	..	..
Hangaroa–Waikaremoana	1 8	..	1 38	34	651	..	..	..	..	..
Hangaroa–Tahora	0 32	0 30	0 30	12	296	..	..	..	..	..
Marshall's	1 0	0 20	..	..	..	..	..	..	..	..
Nelson	..	..	0 10	..	..	..	..	..	..	..
Ngatapa–Pouarua	..	..	0 40	4	90	..	..	..	..	..
Noble Campbell's	0 34	0 20	..	7	132	..	..	..	..	..
O'Grady's	..	..	0 34	..	..	..	..	..	..	..
Pakarae River Suspension Bridge	..	..	..	..	..	3½	1	200	200	Timb. susp.
Panikau–Waiomoku	0 46	0 46	..	8	144	..	..	..	..	..
Parakanapa	..	..	1 49	16	282	..	..	..	..	..
Pipiwhakoa	..	..	0 20	..	..	..	..	..	..	..
Puatai	1 32	1 32	..	17	346	..	..	..	..	..
S.G.R. 59, Hamilton's Access	..	0 40	..	..	..	..	..	..	..	..
Stafford's	..	..	..	..	..	9	1	60	60	R.C.
Taurau Valley	..	..	0 22	1	18	..	..	..	..	..
Tokonui–Tarewa	..	..	0 73	12	220	..	..	..	..	..
Utting's	..	..	0 20	3	46	..	..	..	..	..
Waimata Riverside	0 26	0 33	0 66	7	210	..	..	..	..	..
Waimata Riverside (Donners)	..	..	0 14	..	..	..	..	..	..	..
Waimata Valley	..	..	..	1	57	..	..	..	..	..
Waimata–Arakihi	..	..	3 48	25	450	..	..	..	..	..
Waiomoku (Newman's)	..	..	..	2	36	..	..	..	..	..
Matakaoa County.										
McClutchie's	..	2 0	1 40	6	120	..	..	..	..	..
Potaka Junction – Waikura	..	..	0 42	..	..	..	..	..	..	..
Te Araroa – East Cape	1 60	0 40	..	5	108	..	..	..	..	..
Uawa County.										
Huanui (Waiapu Inland)	0 20	0 20	0 80	2	48	..	..	..	..	..
Kaiau	..	..	0 37	..	..	..	..	..	..	..
Kaiau Road Bridge	..	..	..	..	..	24	1	17	17	Timb.; R.S.J.
Mangaheia Bridge	..	..	..	..	..	12	1	25	25	Timb.; R.S.J.
Mangatokerau	0 38	0 20	0 38	..	..	..	..	..	..	..
Tauwhareparae (Huanui–Hutchinson's)	0 11	0 11	1 25	..	..	..	..	..	..	..
Tolaga–Arakihi	..	..	1 20	..	..	..	..	..	..	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939–40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans.		Total Length.	Reinforced Concrete or Timber.
							Number.	Length.		
GISBORNE DISTRICT—*continued.*										
Waiapu County.	M. ch.	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Ihungia–Waitahaia	1 0	1 0	1 0	20	408	..	..	..	..	..
Jerusalem–Whareponga	..	..	1 20	..	..	..	..	..	..	..
Kie Kie	..	..	0 50	..	..	..	..	..	..	..
Mahora–Reporua	..	..	0 40	..	..	..	..	..	..	..
Por poro Stream Bridge (Poroporo)	..	..	..	..	..	8	2	60	120	R.C. and steel.
Poroporo Valley	..	..	1 17	..	..	..	..	..	..	..
Te Horo – Te Kapa	0 12	0 12	1 0	11	265	..	..	..	..	..
Tokomaru–Mata	..	..	1 40	..	..	..	..	..	..	..
Waiau	..	..	0 16	..	..	..	..	..	..	..
Waikohu County.										
Armstrong	0 68	0 30	0 30	..	..	..	..	..	..	..
Gisborne–Motu via Whakarau	..	..	1 40	..	..	..	..	..	..	..
Kanakanaia	0 65	0 65	0 50	12	220	..	..	..	..	..
Makeretu	..	..	0 70	..	..	..	..	..	..	..
Mangamaia	1 0	..	1 0	10	240	..	..	..	..	..
Moanui	..	0 10	..	..	..	..	..	..	..	..
Oliver	..	..	0 44	..	..	..	..	..	..	..
Taikamite	..	..	1 28	..	..	..	..	..	..	..
Tarndale	..	..	0 78	..	..	..	..	..	..	..
Wharekopae–Tahora	..	0 18	0 62	9	210	..	..	..	..	..
District totals	11 52	10 76	34 56	240	4,968	..	..	..	422	..
TAUMARUNUI DISTRICT.										
Clifton County.										
Okau–Tongaporutu	6 16	3 0	..	..	..	..	..	..	..	..
Kaitieke County.										
Erua	..	1 20	1 20	..	..	..	..	..	..	..
Oio No. 1	0 34	0 19	..	14	342	..	..	..	..	..
Retaruke–Waimarino	1 59	1 59	..	..	..	..	..	..	..	..
Kawhia County.										
Awaroa and Vickerman's Access	6 78	0 78	0 48	..	..	..	..	..	..	..
Hauturu	1 56	1 56	1 56	..	..	..	..	..	..	..
McKenzie's	0 16	0 16	0 16	..	..	..	..	..	..	..
Makomako	..	..	0 60	..	..	..	..	..	..	..
Whakapirau Bridge	..	..	..	..	..	10	1	17	17	Timb.
Ohura County.										
Ararimu East	..	2 0	2 0	4	96	..	..	..	..	..
Gower's Access	0 60	0 60	0 60	..	..	..	..	..	..	..
Kopuha	2 18	2 18	1 61	24	652	..	..	..	..	..
Mangapapa	0 41	0 41	..	17	411	..	..	..	..	..
Opotiki	..	0 40	0 40	..	..	..	..	..	..	..
Tongaporutu–Mangaroa	..	0 40	0 40	..	..	..	..	..	..	..
Taumarunui County.										
Aramahoe Bridge	0 5	0 5	0 5	..	..	8	2 1	16 40	72	R.C. and timb.
Borck's	0 40	0 40	0 40	10	276	..	..	..	..	..
Dickie's	1 15	0 20	0 20	7	210	..	..	..	..	..
Kokakonui (Mullin's Bridge)	..	..	..	..	..	8	2 1	24 33	81	R.C. and timb.
Lairdvale	1 0	1 0	1 0	..	..	..	..	..	..	..
Mahuri	0 70	0 70	0 70	..	..	..	..	..	..	..
Ongarue Stream	0 30	0 30	0 30	8	160	..	..	..	..	..
Pongahuru (Goodsir's Bridge)	0 5	0 5	0 5	..	..	8	1 1	19 39	58	R.C. and timb.
Punga Punga Valley	2 0	1 0	..	4	120	..	..	..	..	..
Routley's Access	0 33	0 33	0 33	..	..	..	..	..	..	..
Taumarunui–Tokaanu	6 0	6 0	1 60	40	1,600	..	..	..	..	..
Whakamaro Bridge	0 11	0 11	..	1	30	8	1 1	29 39	68	R.C. and timb.
Waitomo County.										
Mokau River	1 0	1 0	1 0	..	..	..	..	..	..	..
Omaru	..	0 28	0 58	..	..	..	..	..	..	..
Paraheka–Waitewhena	2 0	2 0	2 0	..	..	..	..	..	..	..
Paratikona	0 60	0 60	0 60	..	..	..	..	..	..	..
Ramaroa	..	..	..	4	84	..	..	..	..	..
Tapuwae	..	..	1 0	..	..	..	..	..	..	..
Te Kuiti – Hangatiki	..	0 40	0 40	..	..	..	..	..	..	..
Totoro	..	..	1 20	..	..	..	..	..	..	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939-40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans.		Total Length.	Reinforced Concrete or Timber.
							Number.	Length.		
TAUMARUNUI DISTRICT—*continued.*										
Taupo County.	M. ch	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Pohunga School Access	..	0 30	0 30	..	..	..	..	..	..	..
Korohe–Lake	1 7	0 10	..	..	..	..	..	..	..	..
Taupo County (East).										
Waiouru–Tokaanu	4 40	4 40	..	30	1,000	..	..	..	..	..
District totals	42 54	35 69	22 72	163	4,981	..	..	..	296	..
STRATFORD DISTRICT.										
Clifton County.										
Hutiwai	..	0 60	2 20	..	..	..	..	..	..	..
Kaipikari	..	1 56	..	50	180	..	..	..	..	..
Okoke Road Bridge (Kenah's)	..	..	..	..	..	..	1	35	35	R.S.J.
Piko Road Bridge (Ekdall's)	..	..	..	..	..	..	1 1	20 25	45	Timb.
Tooi	..	..	0 10	..	..	..	..	..	..	..
Uruti–Ngatoto	..	..	1 78	..	..	..	..	..	..	..
Egmont County.										
Mangahoe Stream Bridge (Okahu)	..	..	..	1	28	..	..	..	..	..
Hawera County.										
Inaha	..	..	0 40	..	..	..	..	..	..	..
Katene	..	..	0 52	..	..	..	..	..	..	..
Makino	..	..	0 72	..	..	..	..	..	..	..
Makowhai	..	..	0 15	..	..	..	..	..	..	..
Mataimaroke	..	..	1 45	..	..	..	..	..	..	..
Inglewood County.										
Hursthouse	..	..	0 15	..	..	..	..	..	..	..
Mangamoeahu Stream Bridge	..	..	..	..	..	8	1	40	40	R.S.J.
Upland	..	..	0 11	..	..	..	..	..	..	..
Whirearuia Stream Bridge	..	..	..	..	..	..	1 1	40 16	56	R.S.J. and timb.
Patea County.										
Block 8	..	..	0 68	..	..	..	..	..	..	..
Hensen	..	..	0 8	..	..	..	..	..	..	..
Herengawe	..	..	0 71	..	..	..	..	..	..	..
Highfield	0 20	..	..	..	..	..	..	..	..	..
Hursthouse	..	..	0 15	..	..	..	..	..	..	..
Joll	..	..	0 46	..	..	..	..	..	..	..
Kakaramea	..	..	0 31	..	..	..	..	..	..	..
Karahaki	..	..	2 7	..	..	..	..	..	..	..
Kawaiti	..	..	0 55	..	..	..	..	..	..	..
Maben	..	0 31	0 31	..	..	..	..	..	..	..
Matthews	..	..	0 38	..	..	..	..	..	..	..
Momahaki	..	..	0 52	..	..	..	..	..	..	..
Moturoa	..	..	0 70	..	..	..	..	..	..	..
Moturoa (Lower)	..	..	0 50	..	..	..	..	..	..	..
Nicholson and Urekawa	..	..	0 51	..	..	..	..	..	..	..
Omata	..	..	0 50	..	..	..	..	..	..	..
Paru (O'Reilly's)	..	..	0 28	..	..	..	..	..	..	..
Waiau, Ihupuku, and Bradleys	..	..	1 54	..	..	..	..	..	..	..
Waikare	..	..	1 20	..	..	..	..	..	..	..
Rangitikei County.										
Mangahoe	..	0 30	1 0	..	..	..	..	..	..	..
Mangamahoe	..	..	0 10	..	..	..	..	..	..	..
Namunui, Kaweka, and Mataroa Ridge	..	..	5 40	..	..	..	..	..	..	..
Ngawhaka	..	..	0 32	..	..	..	..	..	..	..
Ratana Extension	..	..	0 15	..	..	..	..	..	..	..
Taurimu Stream Bridge, Turakina Valley Lower	..	0 20	0 20	..	..	..	..	..	..	..
Tricker's	..	..	0 66	..	..	..	..	..	..	..
Turakina Valley Road Upper	..	..	5 50	..	..	..	..	..	..	..
Stratford County.										
Matau Group	..	1 18	1 18	..	..	..	..	..	..	..
Taranaki County.										
Elsham	..	0 50	0 50	..	..	..	..	..	..	..
Henwood Lower	..	0 11	0 11	..	..	..	..	..	..	..
Mamaku	..	0 40	0 40	..	..	..	..	..	..	..
Weld	..	..	1 27	..	..	..	..	..	..	..
Waimarino County.										
Huikumu	..	..	2 19	..	136	..	..	..	..	..
Hukaroa	..	..	0 55	..	..	..	..	..	..	..
Matahiwi–Ohotu	..	..	0 60	..	..	..	..	..	..	..
Waitotara County.										
Ahu Ahu Valley	..	..	0 68	..	..	..	..	..	..	..
Wanganui County.										
Parihouhou and Te Komai	..	..	11 0	..	..	..	..	..	..	..
Taipo Stream Tunnel and filling	..	..	..	1	150	..	..	..	..	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939-40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans.		Total Length.	Reinforced Concrete or Timber.
							Number.	Length.		
STRATFORD DISTRICT—*continued.*										
Whangamomona County.	M. ch.	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Junction	..	1 32	1 32	..	..	..	..	..	..	..
Kirai	..	1 20	1 20	..	..	..	..	..	..	..
Makahu (Strathmore)	..	0 52	0 52	..	..	..	..	..	..	..
Moki	..	0 15	0 15	..	..	..	..	..	..	..
Whitianga Stream (Pukeko)	..	..	..	..	..	..	1	40	40	R.S.J.
District totals	0 20	9 35	58 43	52	494	..	..	..	216	..
NAPIER DISTRICT.										
Dannevirke County.										
Mangamaire	..	..	0 31	..	..	..	..	..	..	..
Mangapuaka (Hoggard's)	..	..	0 24	..	..	..	..	..	..	..
Maunga	..	..	1 10	..	..	..	..	..	..	..
Glenross	..	1 40	1 40	..	..	..	..	..	..	..
Patangata County.										
Te Uri	..	1 5	..	3	72	..	..	..	..	..
Waipawa County.										
Anderson's	..	..	0 40	1	20	..	..	..	..	..
Eastwood	..	..	0 70	1	18	..	..	..	..	..
Hinerua Hill	..	..	1 0	..	..	..	..	..	..	..
Makaretu Block (Milne's)	..	2 40	..	..	..	..	..	..	..	..
Mile's	..	1 15	..	..	..	..	..	..	..	..
Wairoa County.										
Aramawhara	..	..	0 58	..	..	..	..	..	..	..
Erepeti	..	..	0 15	..	..	..	..	..	..	..
Glenbrook and Tangoio–Mohaka	..	..	0 39	..	..	..	..	..	..	..
Haliburton's	..	..	1 75	..	..	..	..	..	..	..
Hinksman's	..	..	0 34	..	..	..	..	..	..	..
Kakariki	..	..	1 48	..	..	..	..	..	..	..
Lavendale	..	..	0 41	..	..	..	..	..	..	..
Mangaone–Mangapoike Valley (Tangiwai)	..	..	1 22	..	..	..	..	..	..	..
Mangapoike Valley (Frasertown–Tukemokihi)	..	..	1 67	..	..	..	..	..	..	..
Mangarewarewa	..	..	1 68	..	..	..	..	..	..	..
Maraetaha	..	..	0 54	..	..	..	..	..	..	..
Maraenui	..	..	0 60	..	..	..	..	..	..	..
Matakuhia	..	..	1 4	..	..	..	..	..	..	..
Ohuka Branch	..	..	1 66	..	..	..	..	..	..	..
Opoutama–Wharerata (Mahanga)	..	..	0 56	..	..	..	..	..	..	..
Ponui	..	..	2 25	..	..	..	..	..	..	..
Rangiahua	..	..	1 38	..	..	..	..	..	..	..
Rotokakarangu	..	..	7 44	..	..	..	..	..	..	..
Rotorua–Waikaremoana (Hopuruahine–Ruatahuna section)	0 60	1 60	3 0	29	822	..	..	..	..	..
Ruakituri–Waimana	..	..	0 67	..	..	..	..	..	..	..
Ruapapa–Waikaretaheke (Ruapapa section)	..	..	1 29	..	..	..	..	..	..	..
Tahaenui River	..	..	0 16	..	..	..	..	..	..	..
Tunanui–Mahia	..	..	3 39	..	..	..	..	..	..	..
Waiatai (Harrison's)	..	..	0 35	..	..	..	..	..	..	..
Waihi–Waireka (Waihi section)	..	..	0 55	..	..	..	..	..	..	..
Wai-iti	..	..	0 5	..	..	..	..	..	..	..
Waingoro	..	..	0 50	..	..	..	..	..	..	..
Willow Flat	..	..	2 53	..	..	..	..	..	..	..
Weber County.										
Birch (North)	..	..	0 63½	4	60	..	..	..	..	..
Ti-tree Point – Akitio	0 43	..	..	..	..	..	..	..	..	..
District totals	1 23	8 0	47 1½	38	992	..	..	..	..	..
WELLINGTON DISTRICT.										
Akitio County.										
Clark's Bridge	..	..	..	..	..	10	1	33	33	Timb. and R.S.J.
Waihi Valley	..	..	0 60	..	..	..	..	..	..	..
Waihoki	..	..	1 60	..	..	..	..	..	..	..
Castlepoint County.										
Tainui–Pakowai	..	..	1 0	..	..	..	..	..	..	..
Matikona	..	0 5	..	..	..	..	..	..	..	..
Eketahuna County.										
Hare's	..	..	..	2	62	24	1	30	30	R.C.
Priest	..	..	..	1	24	..	..	..	..	..
Puketoi	..	3 0	..	..	..	..	..	..	..	..
Featherston County.										
Cape Palliser	..	5 0	..	..	..	..	..	..	..	..
Tora – Te Awaite	..	0 32	0 32	..	..	..	..	..	..	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939-40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans. Number.	Spans. Length.	Total Length.	Reinforced Concrete or Timber.
WELLINGTON DISTRICT—*continued.*										
Hutt County.	M. ch.	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Haywards-Pahautanui	..	0 35	0 35	..	..	24	1	40	40	R.C.
						26	1	60	60	
						28	1	50	50	
						24	1	28	28	
						24	1	34	34	
						26½	1	19	19	
						27	1	19	19	
Plimmerton–Paekakariki	0 34	4 29	7 54	51	2,121	..	..	..	..	..
Ames Street Extension	0 8	0 8	0 8	..	..	..	..	..	..	..
Petone and Lower Hutt Boroughs.										
Western Hutt (Melling–Petone section)	2 0	1 0	1 0	8	307	..	..	..	..	..
Kairanga County.										
Lankshear's Bridge, Fitzherbert East	..	..	..	..	..	24	1	45	45	R.C.
No. 1 Line Culvert	..	..	..	..	..	24	1	8	8	R.C.
Young's Bridge, Fitzherbert West	..	..	..	..	..	24	1	17	17	R.C.
Kiwitea County.										
Conspicuous	..	..	1 7	..	..	..	..	..	..	..
Mangarere	..	..	1 68	..	..	..	..	..	..	..
Smith's Access, Upper Kawhatau	0 60	..	..	..	..	..	..	..	..	..
Waipuru	..	..	1 73	..	..	..	..	..	..	..
Manawatu County.										
Downs	0 43	0 43	..	..	..	..	..	..	..	..
Masterton County.										
Fencmor's	..	0 32	0 32	..	..	..	..	..	..	..
Waingawa Camp	..	0 15	..	..	..	24	3	20	60	R.C.
Oroua County.										
Makino Stream Bridge, Reid's Line	..	..	..	..	..	24	1	40	40	R.C.
Pahiatua County.										
Mangaramarama Bridge, Tiraumea North	..	..	..	..	..	24	1	40	40	R.C.
Octe Hill	..	0 10	..	..	..	..	..	..	..	..
Stoney Creek Bridge, Tiraumea North	..	..	..	..	..	24	1	28	28	R.C.
Pohangina County.										
Cawood's Bridge	..	..	..	..	..	15	1	20	20	R.S.J. and timb.
District totals	3 65	15 49	18 29	62	2,514	..	..	..	571	..
NELSON DISTRICT.										
Awatere County.										
Atkinson's	0 31½	0 31½	0 31½	12	272	..	..	..	..	..
Blind River Beach	0 50	0 50	0 50	5	98	..	..	..	..	..
Burtergil	..	..	0 21	1	30	..	..	..	..	..
Upper Awatere Valley–Rock Ford Deviation	0 15	0 15	0 15	..	..	..	..	..	..	..
Collingwood County.										
Aorere Valley (Upper)	0 41	0 35½	..	3	73	..	..	..	..	..
Limestone (Access to Ferguson's)	2 12	1 0	..	15	333	..	..	..	..	..
Pakawau to Puponga	0 7	0 7	0 7	1	35	..	..	..	..	..
Paturau Deviation	..	2 30	1 30	24	630	12	1	40	40	R.C.
Marlborough County.										
Avon Valley	..	..	1 25	12	128	..	..	..	..	..
Leatham Valley	..	..	0 40	..	..	..	..	..	..	..
Long Valley Bridge and Deviation (Kaituna Valley)	..	1 11	1 11	17	390	10	3	40	120	R.C.
Pukaka Valley	0 60	..	..	..	..	..	..	..	..	..
Murchison County.										
Brewery Creek	0 32	..	..	..	..	..	..	..	..	..
Glengarry (Access to Kelling and Pointon)	1 25	..	..	..	..	..	..	..	..	..
Longford to Rait's (Access to Thurlow)	..	..	1 32	..	..	..	..	..	..	..
Longford to Rait's (Access to Win)	..	..	0 79	..	..	..	..	..	..	..
Maruia River (Access to Gordon)	0 16	..	..	..	..	..	..	..	..	..
Te Peita Valley (Access to Bailey)	0 70	..	..	..	..	..	..	..	..	..
Sounds County.										
Catherine's Cove Track	..	1 15	..	..	..	..	..	..	..	..
Portage to Torea	..	..	1 10	..	..	..	..	..	..	..
Te Mehia – Onahau	..	..	1 20	..	..	..	..	..	..	..
Waikawa Bay Track	1 20	..	..	..	..	..	..	..	..	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939-40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans.		Total Length.	Reinforced Concrete or Timber.
							Number.	Length.		
NELSON DISTRICT—*continued.*										
Takaka County.	M. ch.	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Canaan	..	..	1 55	14	250	..	..	..	..	..
Page's Crossing Culvert (Access to J. D. Page)	0 3	0 3	0 3	1	19	..	..	..	..	..
Te Kukau River Bridge	..	0 3	0 3	..	..	12	2	10	20	R.C.
Waimea County.										
Beatson's Creek Culvert (Orinoco Valley)	0 8	0 8	0 8	1	25	..	..	..	..	..
Canaan	..	..	1 52	13	234	..	..	..	..	..
Chamberlain Street Bridge (Motueka)	0 14	0 14	0 14	..	..	12	1	40	40	R.C.
Chapman's No. 2 Bridge (Motueka River left bank)	0 6	0 6	0 6	..	..	12	1	20	20	R.C.
Cow Creek	0 4	..	..	..	..	..	..	..	..	..
Coleman's	..	..	0 45	1	12	..	..	..	..	..
Maconochie's Bridge (Tadmor–Glenhope)	0 18	..	..	..	..	..	..	..	..	..
Packing-shed Culvert (Ngatimoti–Orinoco)	0 9	0 9	0 9	1	26	..	..	..	..	..
Papa Creek Bridge (Sherry River)	0 8½	..	..	..	..	..	..	..	..	..
Rees Creek Bridge (Tadmor–Tapawera)	0 6½	0 6½	0 6½	..	..	24	1	15	15	R.C.
Rocky River Bridge (Motueka River left bank)	0 9	0 9	0 9	..	..	12	1	45	45	R.C.
Rosedale Creek Bridge	..	0 13½	0 13½	..	..	12	2	30	60	R.C.
Rosedale Hill Culvert (Rosedale)	0 7½	0 7½	0 7½	1	32	..	..	..	..	..
Slippery	0 70	..	..	..	..	..	..	..	..	..
Waimea West	0 46	..	..	..	..	..	..	..	..	..
District totals	11 29	8 34½	15 43	122	2,587	..	..	..	360	..
GREYMOUTH DISTRICT.										
Buller County.										
Colligan's	0 30	0 30	0 30	..	..	..	..	..	..	..
Limestone Extension	..	0 17	..	1	16	..	..	..	..	..
Mokihinui Bridge to Beach	..	..	0 55	12	130	..	..	..	..	..
Mossyburn Creek Bridge	..	0 5	0 5	..	..	10	1	40	40	R.S.J. and timb.
Sawyer's Creek Bridge (Mokihinui Bridge to Beach)	..	0 10	0 10	..	..	10	1	25	25	Timb.
Stillwater Creek Bridge (Mokihinui Bridge to Beach)	..	0 5	0 5	..	..	10	2 2	25 23½	97	Timb.
Wangapeka to Little Wanganui	..	0 30	0 20	..	..	..	..	..	..	..
Grey County.										
Becker's	1 28	..	..	..	..	..	..	..	..	..
Bray Creek Bridge (Brunner–Blackball)	..	..	..	..	..	12	1	25	25	Timb.
Brown Grey River Bridge (Second Crossing), Grey Valley – Maruia	..	0 13½	0 12½	..	..	10	2 1	25 45	105	R.S.J. and timb.
Crooked River Valley	..	0 5	0 5	..	..	..	..	..	..	..
Evan's Creek Bridge	..	..	..	..	..	10	1	23	23	Timb.
Grey to Kotuku	..	0 40	0 40	..	..	..	..	..	..	..
Homestead Creek Bridge (Mitchells–Haupiri Junction)	..	0 5	0 5	..	..	..	1	18	25	R.C.
Kumukau Bridge (Grey Valley)	..	..	..	..	..	..	1	25	25	Timb.
Manson Creek Bridge	..	..	..	..	..	..	1	25	25	Timb.
Munn's Creek Bridge (Grey Valley)	..	..	..	..	..	..	1	25	25	R.C. and timb.
Inangahua County.										
Matakitaki – Springs Junction	7 32	7 32	6 58	55	1,916	..	..	..	..	..
Springlands Junction to Hot Springs	..	..	5 0	..	..	..	1	12	12	..
Station Creek Bridge	..	0 20	0 20	..	..	10	3	40	120	R.C.
Woolley Creek Bridge (Maruia River west bank)	..	0 10	0 10	..	..	..	5	40	120	R.C.
Westland County.										
Gunn's, Wataroa	..	1 15	..	..	..	..	..	..	..	..
Milltown – Arahura Track	..	0 55	0 55	..	..	..	..	..	..	..
Main South Road—										
Bridge at 16 m. 73 ch.	..	..	..	..	..	24	1	35	35	R.C.
Jackson's Bay – Haast	10 0	12 65	12 51	27	584	..	..	..	..	..
Mai Mai Creek Bridge	..	..	..	..	..	24	1	35	35	R.C.
Makatata Stream Bridge	..	..	..	..	..	24	1	35	35	R.C.
Manakaiaua River Bridge	..	0 5	0 5	..	..	10	4	40	160	R.C.
Papakiri Stream Bridge	..	..	..	..	..	24	1	35	35	R.C.
Weheka–Haast	..	18 20	18 10	16	452	..	..	..	..	..
Mananui–Mahinapua	..	0 70	0 70	..	..	..	..	..	..	..
Upper Okuru	..	..	2 40	..	..	..	..	..	..	..
Waiho–Glacier	..	0 40	0 40	..	..	..	..	..	..	..
District totals	19 10	44 12½	49 66½	111	3,098	..	..	..	967	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939–40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans.		Total Length.	Reinforced Concrete or Timber.
							Number.	Length.		
CHRISTCHURCH DISTRICT.										
Akaroa County.	M. ch.	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Land's End	..	..	2 0	20	160	..	..	..	..	..
Maginnes's	..	..	1 0	2	32	..	..	..	..	..
Amuri County.										
Achray	..	0 40	..	..	..	..	..	..	..	..
Gardner's	..	..	1 40	..	..	..	..	..	..	..
Jollie's Pass – Clarence River	..	..	1 0	..	..	..	..	..	..	..
St. James	..	2 40	..	8	144	..	..	..	..	..
Ashburton County.										
Ashburton River	..	1 30	1 30	..	..	..	..	..	..	..
Double Hill Runs (Blackford)	..	..	3 40	..	..	..	..	..	..	..
Hepburn's	..	..	1 0	..	..	..	..	..	..	..
Johnston's	..	0 60	0 60	..	..	..	..	..	..	..
Pye's	..	1 0	1 0	..	..	..	..	..	..	..
Stanley	..	1 24	1 24	..	..	..	..	..	..	..
Surveyor's	..	0 40	0 40	..	..	..	..	..	..	..
Tank's	..	..	1 52	..	..	..	..	..	..	..
Ashley County.										
Beard's and Mountain	..	..	1 30	..	..	..	..	..	..	..
Boundary	..	..	1 20	..	..	..	..	..	..	..
Dobson's	..	..	1 40	..	..	..	..	..	..	..
Cheviot County.										
Branch and McQueen's	..	..	0 40	..	..	..	..	..	..	..
Sister's	..	..	0 50	..	..	..	..	..	..	..
Ellesmere County.										
Cooper's	..	0 70	0 70	3	56	..	..	..	..	..
Domain	..	0 72	0 50	2	108	..	..	..	..	..
Timber-yard	..	0 10	..	..	..	..	..	..	..	..
Geraldine County.										
Mount Peel Station – Forest Creek	..	3 0	3 0	..	..	..	..	..	..	..
Halswell County.										
Access to Godley Head	..	0 40	0 60	4 60	..	..	..	..	..	..
Kaikoura County.										
Dairy Farm	..	..	2 0	..	..	..	..	..	..	..
Percy's	..	..	2 0	..	..	..	..	..	..	..
Kowai County.										
Ramsay's	..	..	1 20	..	..	..	..	..	..	..
Levels County.										
Brockley	..	0 76	0 76	8	144	..	..	..	..	..
Mackenzie County.										
Ball Hutt	..	4 52	0 70	0 10	..	..	..	..	..	..
Mount Herbert County.										
Pa Road (Port Levy)	..	..	0 20	..	..	..	..	..	..	..
Pope's Road (Port Levy)	..	..	1 40	1	14	..	..	..	..	..
Purau – Port Levy	..	1 0	2 40	..	..	..	..	..	..	..
Selwyn County.										
Lake Coleridge – Lake Lyndon	..	..	0 20	..	..	..	..	..	..	..
West Boundary	..	..	0 16	..	..	..	..	..	..	..
Waimate County.										
Fraser's Road Bridge	..	0 3	0 3	..	..	8½	2	16	32	Timb.
Waipara County.										
Hurunui Bluff	..	..	7 40	..	..	..	..	..	..	..
Reece's	..	..	3 40	..	..	..	..	..	..	..
Shimmin's	..	1 25	..	2	32	..	..	..	..	..
Stonyhurst and Happy Valley	..	..	13 40	..	..	..	..	..	..	..
Virginia	..	5 48	..	5	80	..	..	..	..	..
Waitohi River Bridge (Hurunui) (Medbury)	..	0 20	0 20	..	..	..	..	..	..	..
Washpen Creek Bridge (Hoban's)	..	0 4	0 4	..	..	12	1	20	20	Timb.
Ellesmere County.										
Homebrook Settlement – Leybourne	..	0 24	0 24	..	..	..	..	..	..	..
District totals	6 12	25 36	64 59	51	770	..	..	..	52	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939-40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans.		Total Length.	Reinforced Concrete or Timber.
							Number.	Length.		
DUNEDIN DISTRICT.										
Bruce County.	M. ch.	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Blackburn to Mount Stuart	..	1 45	0 50	7	112	..	..	..	..	..
Cairn–Newton	..	..	0 36	..	..	..	..	..	..	..
Waitahuna Bridge – Hillend	..	..	1 42	..	..	..	..	..	..	..
Mount Stuart – Manuka	..	..	0 53	..	..	..	..	..	..	..
Sanson's	..	0 32½	..	3	60	..	..	..	..	..
Shaw's Hill	..	..	0 72	..	..	..	..	..	..	..
Sutherland's	..	0 42½	0 42½	..	..	..	..	..	..	..
Clutha County.										
Blaikie	..	0 20	0 60	..	..	..	..	..	..	..
Cameron's	..	0 53½	..	..	..	..	..	..	..	..
Campbell	..	..	0 12	..	..	..	..	..	..	..
Cannibal Bay	..	..	0 40	..	..	..	..	..	..	..
Carruther's	..	0 13½	0 13½	..	..	..	..	..	..	..
Clifton Settlement	..	2 17½	2 17½	..	..	..	..	..	..	..
Clive Wells	..	0 62	0 62	6	137	..	..	..	..	..
Crump	..	0 43	0 43	..	..	..	..	..	..	..
Gordon Dodd's	..	0 37½	0 37½	..	..	..	..	..	..	..
Gunn	..	0 58	0 58	..	..	..	..	..	..	..
Kaiwera (Morris)	..	0 55	0 55	..	..	..	..	..	..	..
King	..	0 55	0 55	..	..	..	..	..	..	..
Kuriwao Siding	..	..	1 23	..	..	..	..	..	..	..
Landslip	..	..	0 12½	..	..	..	..	..	..	..
Monoghan	..	0 50	0 50	..	..	..	..	..	..	..
Pullar's	..	0 28½	0 28½	..	..	..	..	..	..	..
Tahakopa–Wyndham	..	3 30	4 0	..	..	..	..	..	..	..
Mount Mistake	..	1 21½	1 21½	..	..	..	..	..	..	..
Lake County.										
Boundary	..	..	0 41	..	..	..	..	..	..	..
Kinloch–Routeburn	..	..	..	8	176	..	..	..	..	..
Maniototo County.										
Allison's and Barney's Lanes	..	..	2 0	..	..	..	..	..	..	..
Armitage's Creek Culvert	0 6	0 6	0 6	2	64	..	..	..	..	..
Horseburn Bridge (Horseburn Boundary)	..	..	..	..	..	16	1	42	44½	R.S.J. and timb.
Kyeburn River Bridge (Nobbler)	..	0 21	0 23	..	..	..	..	..	..	..
Ranfurly to Waipiata	..	..	0 70	..	..	..	..	..	..	..
Tuapeka County.										
Beaumont Station	..	..	1 52	..	..	..	..	..	..	..
Breakneck	..	..	1 41	..	..	..	..	..	..	..
Lee Flat to Black Rock Runs	..	..	0 29	..	..	..	..	..	..	..
McCoskery's	..	..	0 27½	..	..	..	..	..	..	..
Smith's	..	..	1 62	..	..	..	..	..	..	..
Waikaia Bush	..	3 0	..	..	..	..	..	..	..	..
Waitahuna to Waipori	..	..	0 70	..	..	..	..	..	..	..
Winter's (Haugh)	..	..	0 52½	..	..	..	..	..	..	..
Vincent County.										
Fraser Dam	..	..	2 0	2	32	..	..	..	..	..
Moutere – Disputed Spur	..	0 5	3 0	2	31	..	..	..	..	..
Makarora–Haast	..	2 29	3 67	26	756	20	1	22½	22½	R.C.
							1	22½	22½	„
						10	1	11	11	„
							1	10	10	„
Taieri County.										
Bald Hill to Hummock Runs	..	..	3 0	..	..	..	..	..	..	..
Outram to Hindon (via Machine Creek)	..	..	2 40	..	..	..	..	..	..	..
Waikouaiti County.										
Mount Trotter – Palmerston	..	..	1 30	7	124	..	..	..	..	..
Osborne Township	..	0 30	..	7	122	..	..	..	..	..
Waikouaiti–Nenthorn	..	..	1 26	..	..	..	..	..	..	..
Waitaki County.										
Hedley's	..	..	1 40	..	..	..	..	..	..	..
Lake Ohau	..	5 56	4 60	9	200	..	..	..	..	..
McLeod's	..	..	1 8	..	..	..	..	..	..	..
Macpherson's	..	3 60	3 60	1	30	..	..	..	..	..
Otekaike Stream Bridge	..	..	..	..	..	12	3	40	120	R.C.
Quailburn	..	1 28	8 28	2	44	..	..	..	..	..
District totals	..	0 6	32 20	67 37½	82	1,888	..	..	..	230½	..

SCHEDULE OF ROADWORKS COMPLETED DURING YEAR 1939–40—*continued.*

Name of Road.	Engr. Surveys.	Formation.	Metalling.	Culverts.		Bridges.				
				Number.	Total Length.	Width of Roadway.	Spans.		Total Length.	Reinforced Concrete or Timber.
							Number.	Length.		
INVERCARGILL DISTRICT.										
Southland County.	M. ch.	M. ch.	M. ch.		Ft.	Ft.		Ft.	Ft.	
Biggar	..	0 26½	0 26½	..	..	..	..	..	..	..
Elles (Five Rivers)	..	2 74½	..	..	..	..	..	..	..	..
Gill Road to Springhills Deviation	..	..	1 11	15	726	..	..	..	..	..
Job's Ford Bridge (Parawa–Nokomai)	..	..	..	..	..	10	4	40	160	R.C.
Kean's Road Bridge	..	..	..	..	..	16	1	12	12	R.C.
Lintley–Josephville	..	0 43	0 43	1	27	..	..	..	..	..
Lochiel Stream Bridge (Forbe's)	..	..	..	..	..	24	1	12	12	R.C.
Logan's Bridge (McBain)	..	..	..	..	..	24	1	7	7	R.C.
Miller (Waimimu)	..	..	1 17	..	..	..	..	..	..	..
Otama Creek Culvert (Otama Flat)	..	..	..	1	24	..	..	..	..	..
Otara–Haldane	..	..	0 41½	..	..	..	..	..	..	..
Oreti River Bridge (Bay)	..	..	..	..	..	10	7	40	280	R.C.
Parawa–Nokomai Deviation	..	1 22½	1 22½	24	604	..	..	..	..	..
Spar Bush School	..	0 33	0 33	1	60	..	..	..	..	..
Turnbull (Waikaka)	..	..	0 58	..	..	..	..	..	..	..
University Endowment	..	0 19	0 19	Extns.	54	..	..	..	..	..
Stewart Island County.										
Excelsior	..	0 4	0 4	1	16	..	..	..	..	..
Horseshoe Bay – Brooklands	..	0 10	0 10	1	14	..	..	..	..	..
Leask's Bay – Ringa Ringa	..	0 5	0 5	1	14	..	..	..	..	..
Leonard	..	0 3	0 3	1	18	..	..	..	..	..
Wallace County.										
Bell's	..	..	0 56½	..	..	..	..	..	..	..
Carran	..	..	0 30	..	..	..	..	..	..	..
Cockburn	..	0 70½	1 0	..	..	..	..	..	..	..
McIntosh	..	0 43½	0 43½	2	42	..	..	..	..	..
District totals	..	7 34½	9 23½	48	1,599	..	..	..	471	..
Dominion Totals	205 15	401 79½	698 76	2,365	56,122	..	..	..	6,563½	..

LANDS IMPROVEMENT.

WHANGAREI DISTRICT.

Sand-dune Reclamation.—Kaitaia Area, Mangonui County: Last season's work commenced in June and ended in August. During that period 27 acres of new marram plantations were sown on the lee of dunes from Waipapakauri Beach Road to 3 miles north. Blanking of existing marram plantations from 3 miles north to 4 miles south of Waipapakauri Beach Road was carried out.

410 acres of trees—pinus species—were planted between 1 mile north and 3 miles south of the Waipapakauri Beach Road. All planting stock was produced from the Department's own local nursery, and the "strike" of tree transplants ranged from 40 per cent. to 78 per cent. Two-year stock gave the poorest results.

The position now is that dunes between Ahipara and a point 4 miles north of the Waipapakauri Beach Road—a distance of 13½ miles—have been stabilized with marram and lupin cover, and trees are being estabilished in suitable locations between those limits.

Te Kopuru Area: Main planting operations commenced early in May and ceased at the end of September, during which period marram plantations were extended by 134 acres, including nurseries for future operations, and 35 acres were planted to protect Kaipara Heads lighthouse. Blanking existing plantations from Bayley's Beach to opposite Tikinui involved an additional 42 acres. Lupin-seed was sown broadcast where required, and kikuyu-seed was planted to form fire-breaks and to provide for future supplies. Ninety-three acres of eucalypt and pinus species trees were planted, 83 acres of which consisted of new plantations, the remainder being for blanking existing plantations.

The nursery produced 87,000 trees, of which 71,000 seedling stock were planted, the balance being lined out in the nursery for future use. Seed was sown for the production of 166,000 trees for the 1940–41 season.

The general position of sand-dune work adjacent to Te Kopuru as at the end of 1939–40 is that, commencing at Bayley's Beach to the west of Dargaville, there are now 2 miles of untouched drifts in privately-owned land, 1 mile of reclaimed drifts adjoining Wilson's Small Farm Block, and a further 6 miles to 7 miles of untouched sand adjoining semi-developed private land. There is then 11 miles of marram and lupin plantation with isolated patches of young trees, and a further 10 miles with marram nurseries at about quarter-mile intervals, while at the extreme end of the Pouto Peninsula there is a 35-acre marram plantation at the Kaipara Heads lighthouse.

Practically all moving sand threatening highly developed land has been stabilized.

Hokianga Harbour Tidal Flat Reclamations (Hokianga County).—Construction work on the Rawene area having been completed, stop-banks and flood-gates were maintained by the Department and mangroves on the 200 acres of reclaimed land were cleared.

Willow-clearing, Kirikiritoki Stream (Whangarei County).—Removal of willows over 2 miles 38 chains of this stream was completed, with beneficial results to adjoining farm land.

Swamp Drainage, Uretiti Lagoon Outlet (Whangarei County).—The cleaning and deepening of the outlet from this bird-sanctuary lagoon was carried out to lower the water-level which was affecting drainage from nearby farm land.

Auckland District.

Sand-dune Reclamation.—Pakiri – Te Arai – Mangawai Areas: The nurseries established in these areas were maintained during the year. Approximately 270 acres have been replanted, and a similar area of new ground planted in marram. One hundred acres are in lupin, and both kinds of plants are making good growth.

South Kaipara Heads: Reclamation work has progressed favourably during the period. Some 243 acres of marram were planted, which brings the total area planted to date to 2,323 acres. An area of 800 acres is under lupin. Maintenance-work was attended to, and both marram and lupin show satisfactory growth.

Woodhill–Muriwai–Helensville: Weather conditions were favourable for the continuation of reclamation work during the year, and the growth of marram, lupin, and the different species of trees which have been planted in the reclaimed area has been satisfactory. Six hundred and eighty acres of new marram were planted and 800 acres replanted. Approximately 500,000 seedling trees were lined out in the nursery and 304,600 two-year-old trees planted out in the reclaimed area. Lupin-seed collected totalled 3 tons, while 207 miles of lines were cut for tree-planting, and 1 mile of fore-dune fencing constructed. A total length of 5½ miles of fire-breaks was cleared, and to date the total area planted is—marram 9,080 acres; trees, 1,450 acres.

North Waikato Heads and Kariotahi: Although weather conditions during the year have not been altogether favourable, good progress has been made in this area. Three hundred and thirty-four acres of new marram were planted, and 310 acres replanted. Lupin has increased considerably, and the growth has been above normal. Over an area of 1,500 acres 4,000 lb. of lupin-seed was sown, and 2,000 lb. of seed is in hand for next spring sowing. Approximately 234,385 trees were planted of such varieties as *Pinus radiata, P. muricata, P. pinaster, P. ponderosa, P. murrayana,* and *P. Sylvestris.* After replacing trees lost on areas previously planted 29½ acres of new ground were covered. In nurseries 304,000 year-old trees were lined out, while 2,000 two-year-old trees were forwarded to Great Barrier Island, 10,000 to Woodhill, and 1,000 to Kaiwaka. A rabbit-proof fence, 310 chains in length, was erected, enclosing the entire area, and 40 chains of new sand-arresting fences constructed. One hundred and forty-three miles of new lines were cleared. New office accommodation and a shed to house the tractor and plant, together with an additional 2,000-gallon concrete water-tank, were provided.

A Climatological Station has been established with instruments supplied by the Meteorological Branch of the Department of Scientific and Industrial Research, and observations are made daily.

Hauraki Plains East Water-supply.—This scheme is now nearing completion, and concrete mains varying in diameter from 4 in. to 10 in. total 46 miles in length, and galvanized pipe mains below 4 in. diameter total over 39 miles in length. The headworks have been completed, and portion of the area is now being served.

Mangaorongo Stream Willow-clearing.—This work was commenced during the year, and the stream has been cleared for a length of 108 chains. The effect of this clearing is very noticeable, the water level having been lowered 3 ft. or more.

Matatoki Drainage Scheme.—Approximately 50,000 cubic yards have neen excavated from the Wainui, Matatoki, and Pipi Drains, and the spoil has been placed in stop-banks. The construction of the necessary culverts and flood-gates is in an advanced stage, making the scheme half-completed, and allowing it to function during the current winter months.

Paeroa Drainage Improvements.—The Paeroa main drain has been widened to 7 ft. over the length of 43 chains, and an overflow drain was cut to Whitmore's flood-date to assist with the discharge of flood-waters.

Strange's Culvert.—A 4 ft. concrete-pipe culvert and flood-gate, length 64 ft., was constructed under the left stop-bank of the Waihou River to provide for drainage improvement.

Taupiri Drainage Scheme.—This work has now been completed, and future maintenance will be carried out by the Taupiri Drainage Board. The final work carried out during the year covered a length of 3 m. 29 chs. of drain involving 30,180 cubic yards of excavation, and the construction of seven farm bridges. Spoil banks were levelled up by bulldozer, and the camp-sites cleaned up.

Upper Waiwera (Tahekeroa and Bayer's Roads) Clearing.—This work, commenced during the previous year, has now been completed with the exception of the burning of willows and debris removed from the beds of the streams affected. A considerable improvement is now apparent in that flooding to properties of some eighteen settlers and damage to roads alongside the streams have been reduced to a minimum.

Waihou and Ohinemuri Rivers Improvement Maintenance.—General maintenance between stop-banks was continued on these two rivers, and gorse and blackberry were cleared over a length of 8 m. 9 ch. All culvert outlets were cleared of growth, and silt and flood-gates were maintained.

Whangape Stream Clearing.—The channel of the Whangape Stream from the Waikato River to Lake Whangape was widened to 50 ft. over a length of two miles by the Raglan County Council under contract.

Waiwera Foreshore Erosion.—During 1938 considerable damage by erosion was done to the foreshore at Waiwera, and proposals were submitted by the Waitemata County Council to cover remedial measures. A masonry wall 350 ft. in length with two end walls each 16 ft. has been built with satisfactory results, and a sealed road 20 ft. wide constructed behind the wall to replace the old road destroyed by the sea.

Tauranga District.

Otara River Erosion (Opotiki).—Protection work, consisting of sheathed piling groynes, was put in hand during March, 1940.

Judea Swamp Drainage.—Widening and deepening of the Judea Stream by drag-line excavator was commenced in January, 1940, and 53 chains of widening have been completed.

Taumarunui District.

Willow-clearing, Mokau River.—During the year it was found necessary to ring-bark and poison 1 mile of the Mapara Stream, which is a tributary of the Mokau, in order to prevent the Mapara from acting as a nursery to re-establish the willows in the Mokau.

Cutting and hauling of willows previously poisoned was continued. There still remains 1 mile to complete. Maintenance-work was carried out over the length previously treated.

On a subsidy basis the Waitomo County carried out further willow removal and maintenance on the navigable portions of the lower Mokau River.

Mangapu Drainage Board.—Work has been carried on by the Mangapu Drainage Board under a subsidy from the Government. The work undertaken covers the bottom hauling of the streams, diversion cuts, and alignment of drains in the Orahiri Drainage Area, and maintenance of works completed.

Napier District.

Kumeti Drain (Flood-protective Works).—This work was put in hand during the previous year, and during the past year several groynes, varying in lengths up to 75 ft. and in heights up to 5 ft., were constructed or extended. Stop-banks were turfed and other minor repairs carried out as required.

There has been no major flooding since the foregoing works were completed, and, consequently, no appreciable damage was done to the system of protective works generally.

Kumeti Creek and Kumeti Drain Survey.—This survey, which extends 10 miles from the junction with the Manawatu River to its source in the Ruahine Range, was practically completed.

Ngaruroro River-control Scheme.—This work, which is being carried out under the supervision of the Hawke's Bay Rivers Board, is now practically completed. Levees totalling 11½ miles in length have been erected, and a half-mile deviation of the Farndon - Paki Paki Main Highway near the Ngaruroro River Bridge has been constructed, involving the handling of 396,659 cubic yards of earthwork.

During the year protective belts of trees were planted along the river-sides of levees over a length of 7 miles, and 14¾ miles of fencing were erected to protect the levees.

Approximately 100 acres of heavy willow and poplar growth have been cleared from the bed of the Ngaruroro River. Wire-netting and fascine protection work has been carried out along 280 chains of levee.

Three large floodgates, six large pipe culverts, and numerous small pipe culverts have been installed, and the Muddy Creek flood-gate was repaired and rebuilt.

The lowering of the lip of the overflow channel to offset the raising of the lip by silt deposits from the 1938 floods has now been completed.

The total estimated cost of the scheme is £257,000, and up to the present over £202,000 has been expended.

Tutaekuri River-control Scheme.—Protective work was completed during 1938, but in the following year the river was forced against the new groyne by an unusually heavy northerly drift of shingle, with consequent severe erosion of the groyne. This necessitated extensive maintenance-work and the placing of numerous additional concrete slabs for protective purposes along the sides of the groyne. The work has been satisfactorily carried out by the Hawke's Bay Rivers Board.

Stratford District.

Land-clearing by Machinery, Ohakune.—The stumping and clearing of farm lands by machinery was commenced in the Ohakune area on 12th December, 1939. The land on which operations were put in hand originally carried some of the heaviest bush in the North Island and the work was of a particularly heavy nature. During the year 489 acres of land were stumped, of which 380 acres were cleared.

Wellington District.

Hokio–Manawatu Rivers (Sand-dunes Reclamation).—Satisfactory progress has been made during the period. During the season 205,475 trees of various kinds were raised and planted out. One hundred and thirty-eight acres were planted in marram-grass.

Hutt River Estuary Reclamation.—Routine work only has been carried out during the year, such as repairs to the seawall and the filling-up of depressions in reclamation.

Land-clearing by Machinery.—At Makerua Swamp, near Shannon, 30 acres of land have been stumped and cleared.

Nelson District.

Awatere Water-supply to Seddon District.—This scheme, now under construction, provides water for stock and domestic purposes by gravity pipe-line for some 21,000 acres of grazing and cropping land on the south bank of the Awatere River, including the Township of Seddon.

The work is being carried out under a contract negotiated by the Awatere County with financial assistance by way of a Government subsidy.

During the year the difficult work of laying the 10 in. pipes across the Awatere River was successfully completed without any flood damage being sustained, and the water-main has now been laid to the outskirts of Seddon, which is nearly 11¾ miles from the intake works.

Eight and three-quarter miles of 9 in. and 10 in. pipes have been laid, together with service connections *en route*.

Motueka River Protective Works.—Protective work, consisting of a continuous lining of 4½ chains of bank affected by erosion, has been carried out by the Motueka River Board with the assistance of Government grants.

Wairoa River.—An extraordinarily high flood which inundated 11 square miles of the Waimea Plain occurred in this river in November, 1939, and opportunity was taken to measure the flood discharge. This reached the high figure of 60,000 cusecs for a catchment area of approximately 141 square miles.

Prior to the flood various small protective works were carried out by local settlers with Government assistance.

The Department has investigated and finalized proposals for a stop-banking scheme to prevent the flooding of the Brightwater Township and adjacent areas.

Further survey data in relation to a comprehensive scheme of river-control as affecting the Wairoa, Waimea, and Wai-iti Rivers has been obtained.

Waimea River.—Repairs to stop-banks in various properties fronting the river were carried out by the owners with the assistance of Government grants, the total length dealt with being approximately 12 chains.

Greymouth District.

Karamea River (Flood-control).—During the year the trestle of the Otumahana wall was extended for a distance of 1,360 ft., and stone filling was completed over that length. Further stone had to be placed in position to check erosion at Hale's and Simpson's properties.

Restoration of Quinlan's filling, commenced late in February 1940, is still in hand.

The output of Oparara Quarry for the year was 17,755 tons of mixed slingstone, boxstone and rubble, making a total to date of 61,880 tons.

Generally, these river-control works are fulfilling their function to a very satisfactory degree, and, except for minor damage, they successfully withstood the heavy flooding of February last.

Coal Creek Flat Protection Works.—A stop-bank, approximately 80 chains long and averaging 7 ft. in height, with some 34 chains of stone-bank protection, was placed on the right bank of the Grey River at Coal Creek to prevent bank-erosion and flooding of the Coal Creek area near Greymouth. This bank successfully withstood a very large flood in February last.

Raupo Protection Works.—A stop-bank 18 chains long, with a large groyne head of the "Ashley" type, with cut-off banks across old river channels extending for a further 20 chains, was constructed on the right bank of the Grey River opposite Raupo to prevent the river forming a new channel through a soldiers' settlement of approximately 600 acres of good river-flat land. The work involved placing approximately 57,000 cubic yards of stop-bank fill, with about 600 cubic yards of stone crate-work. This bank withstood a heavy flood in February last, but requires raising to provide a greater margin of safety.

Arahura River Protection Works.—A considerable amount of protection work was carried out over a length of some 4 miles in the Arahura River Valley. The main work consisted of two stop-banks designed to protect several hundred acres of farming lands, these banks being respectively 30 chains and 18 chains in length, and with an average height of 7 ft. The works successfully withstood several floods during the summer, including a major flood in February.

Land-clearing by Machinery.—During the year 641 acres of land were cleared, 583 acres disked, and 155 tandem disked in the Westport district. At Hari Hari, South Westland, 90 acres of land were cleared.

Christchurch District.

Halswell River Deviation.—A new flood-channel has been constructed, resulting in much improved drainage into Lake Ellesmere.

Little Rakaia Culverts.—A second culvert of concrete pipes has been laid through the boulder bank at Little Rakaia, and the drainage scheme is now working successfully.

New Brighton (Sand-dune Fixation).—This work was continued, and has been completed as far as intended at present.

Geraldine County River Protection.—A diversion channel has been completed on the Temuka River near Maude Street, and willow-protection provided.

Dog Kennel and Broad Gully Creeks (Flood-control).—This scheme is now completed, and as a result the run-off from 9,000 acres is now confined to a flood channel 6 miles in length, resulting in great benefit to some 1,200 acres of land.

Ashburton and Hinds Rivers (Flood-control).—The work completed to date on this scheme consists of 5½ miles of stumping and clearing over a width of 20 chains, 2½ miles of small-growth clearing 20 chains wide, and 2½ miles of small-growth clearing 7½ chains wide. Stop-banks totalling 5¾ miles in length and involving the handling of 42,000 cubic yards of earthwork have also been completed. The scheme has now been completed to the stage where all the chief danger points are safeguarded against flooding.

Opihi River Protective Works.—This work, consisting of stop-banking and rock protection, has been completed.

Washdyke Lagoon Drainage Scheme.—This scheme is designed to control the flood-flows in Washdyke Creek, near Timaru, and the flooding of farm land in the Washdyke and Seadown areas caused by surface run-off, by underground seepage, and by sea-water overtopping the sea-beach in heavy seas.

Work was commenced in November, 1939, and good progress has since been made. The state of the work at present is as follows—Main Coast Drain and Stop-bank: Excavation completed over a length of 3 miles 60 chains, the quantity of excavation involved being 51,000 cubic yards. Lateral Drains: A total length of 2 miles 21 chains of these drains have been constructed, the quantity of excavation involved being 12,000 yards. Structures: Work on main outfall culvert and on one flood-gate culvert is in hand.

It is expected that the scheme will be completed during the current year.

DUNEDIN DISTRICT.

Land-clearing by Machinery.—Three hundred and two acres of land have been cleared in Southland.

SMALL-FARMS SCHEMES.

AUCKLAND DISTRICT.

Mangawai Kauri-gum Reserve.—The development of this block has been continued during the year, and satisfactory progress has been maintained. To date, 795 acres are in pasture, while an additional 185 acres have been ploughed and are in fallow. All pasture land is in excellent condition and is carrying 208 head of cattle. The block was handed over to the control of the Department of Lands and Survey on 31st October, 1939. There is yet an area of 150 acres on which gum-holes require to be filled in, and this work will be done by this Department.

Kaipara Harbour Mangrove Reclamation (Glorit Section), (Peterson's Block).—During the period 622 acres were cleared of mangroves and double disked. Of this area, 300 acres were subsequently sown in grass, which is making satisfactory growth. Some 16 miles of fencing were erected, 103 acres grubbed of mangrove-roots, and 73 acres of mangroves stacked and burned. A considerable amount of work was carried out on the eradication of fescue, which was becoming a nuisance on the reclaimed area.

Kaipara Harbour Mangrove Reclamation (Kukutango Block), (Jordan's Block.)—An additional length of 1 m. 47 ch. of stop-banks was completed during the year, and mangroves over an area of 226 acres were collected and piled for burning. To provide internal drains 12,500 cubic yards of spoil was excavated, and three flood-gates were erected, and 84 ft. of 30 in. culverts laid.

NAPIER DISTRICT.

Ahuriri Lagoon Reclamation.—The drainage and reclamation of the Ahuriri Lagoon, a 7,500-acre block of land near Napier, has been carried out by the Public Works Department on behalf of the Small-farms Board. The Lagoon was formerly a shallow arm of the sea which was raised some 5 ft. and thus partially drained by the Hawke's Bay earthquake of 1931.

The drainage-work was commenced in 1934 and is now completed, having been considerably delayed by the disastrous Hawke's Bay floods of 1938. The Department of Lands and Survey, on behalf of the Small-farms Board, are now carrying out experimental cropping on the block as well as grazing several thousand sheep.

The main items of work carried out during the year have been the topping-up of stop-banks, involving the placing of 29,544 cubic yards, and the clearing-out of main drains, from which 117,967 cubic yards were excavated. The installation of a water-supply system, serving the whole block, has also been completed, and this has necessitated the laying of approximately 18½ miles of piping varying from ¾ in. to 4 in. diameter, as well as the building of a pumping-station and the construction of sixty-one concrete drinking-troughs, each of 400-gallons capacity. Further subdivisional fencing has also been completed, the total length erected during the year being nearly 13 miles.

The only work now in hand on the Ahuriri Lagoon is a small amount of maintenance of stop-banks and drains.

IMPROVEMENTS TO PUBLIC SCHOOL GROUNDS.

Improvements to the grounds of public schools were continued throughout the year, and as a result more and more schools now enjoy adequate areas for sport and recreation.

The work comprised excavating, draining, levelling, and grading of playing-grounds, and the metalling and sealing of assembly areas, as well as the construction of various sports-grounds. In addition, attention has been given to the improving of school amenities by the planting of ornamental trees and shrubs, the erection of fences, and the permanent surfacing of paths, &c.

Several swimming-baths have also been constructed.

School-grounds-improvement works have been carried out in practically every district in the Dominion.

HARBOUR-WORKS.

Te Kopuru Wharf.—It has been found impossible, owing to difficulties in obtaining hardwood-timber supplies, to make a start during the year with the replacement of this structure, but as the timber has now come to hand an early commencement of the work is anticipated.

Hick's Bay Wharf.—An examination of the timber portion of this wharf revealed that 67 ft. of the timber jetty was in a bad state of disrepair, with a number of the piles eaten through. Proposals for the necessary remedial measures have been approved and tenders for the work will be called as soon as material, ordered from overseas, comes to hand.

Tolaga Bay Wharf.—Serious deterioration has occurred in much of the reinforced-concrete structure of this wharf, and the best method of remedying the position is under consideration.

Waikokopu Harbour.—The control of this harbour is under the jurisdiction of the Wairoa Harbour Board on behalf of the Public Works Department. During the year sixty-nine vessels worked the port, and 5,884 tons of imports were handled. Exports included nearly 140,000 carcasses of beef, lamb, mutton, pork, &c., 949 bales of wool, and a considerable quantity of sundry goods.

Repairs to the wharf, on account of attack by teredo below the protective sheathing on the piles, were carried out, together with other minor items of maintenance.

Kawhia Harbour Lights.—Plans and proposed positions for new beacons have now been finalized, and the question of supply and installation is under consideration.

Mokau Wharf.—An inspection of the present wharf has been made, and soundings, borings, &c., taken in its vicinity. Possible alternative localities for a new wharf are under consideration.

Wharves in Sounds County.—A contract has been let for the construction of a launch jetty 80 ft. long at Ship Cove, and tenders invited for the construction of a similar type of jetty 70 ft. long at Tennyson Inlet in Pelorus Sound.

Okuru.—The erection of a new wharf shed has been completed.

Lighthouses.

Cape Reinga.—From Te Paki the access road to the new site for the Cape Reinga lighthouse and buildings was formed over its whole length of ten miles, and three miles were metalled. The construction of the lighthouse keeper's cottages, direction finding beacon, and radio telephone is in hand.

Tutukaka Heads: (Automatic Light).—Lighting equipment has been ordered, and the question of a suitable structure for housing the light is being investigated by the Whangarei Harbour Board.

Moko Hinau.—The installation of equipment necessary for the electrification of the station was completed, and maintenance-work has been carried out since the plant was placed in operation.

Stephens Island.—The lighthouse tower, office, school, store-room, engine-room at first landing, and the shed at the top landing have been painted. Roofing and spouting have been attended to on the wireless-house, signal-house, and on the three cottages occupied by the keepers. Regular maintenance has been carried out on the electrical plant. During the early part of the year the radio beacon equipment was installed.

Brothers.—The whole of the tram-line has been overhauled, the track regraded, new sleepers installed, and numerous rails and fishplates replaced. The line is now in good working-order. The winch-house has been extended and a new Diesel-driven winch installed in place of the hand-winch. A radio-telephone mast has been erected, and radio-telephone equipment installed.

Castlepoint.—A new landing-shed has been erected.

Baring Head.—Two cottages were painted and renovated, and the lighthouse has been painted. One hundred and twenty chains of fencing were erected, together with the necessary gates. Flood damage to the access road was repaired.

Akaroa Head.—Cottages have been reroofed in iron during the year. Proposals have now been approved for the erection of a Blondin cableway over the inlet, which will enable unloading operations to be carried out direct from the vessel at any point beneath the line of the cableway.

Centre Island.—In February, 1939, a contract was let for the erection of three lighthouse-keepers' cottages at the Centre Island Station, the material having been purchased earlier and conveyed to the site. The cottages were completed at the end of October, 1939, and the lighthouse-keepers are now housed in comfortable modern quarters.

Puysegur Point.—A commencement was made on the construction of $1\frac{3}{4}$ miles of access road from the landing to the lighthouse, and formation and gravelling were nearing completion at the end of the year. Proposals for the improvement of the landing and the construction of a new shed at this point were approved, and a site selected for the erection of the radio-beacon power-house.

Nugget Point and Cape Saunders.—Tenders have been accepted for replacing the present iron roofs at both these lighthouses with Fibrolite. However, owing to shortage of supplies and the import restrictions on Australian products, the contractors have been unable to commence the work. Supplies of Fibrolite have now come to hand, and a commencement will be made shortly.

Kahurangi Point.—Adjustments were carried out to the Dalen flashers to rectify faulty light characteristic.

Cape Egmont.—Adjustments were made to the Dalen flashers to rectify faulty operation, and a new sun valve was fitted.

Godley Head.—Owing to Defence requirements, it is necessary to move this light and the keeper's cottage. Proposals are under consideration and work will be put in hand as soon as possible.

Jackson's Bay.—A site has been levelled for an automatic light at this spot, and the necessary materials for its erection are coming to hand. Eleven chains of access track have been formed.

General.

A number of applications were received from local bodies and private people for approval of works involving marine interests. Among the various applications were the following:—

Foreshore Licenses.—Stoney Creek, Whenuakite River; Mercer, Waikato River; Kohukohu, Hokianga Harbour; Half-moon Bay, Stewart Island (2); Te Kopuru, Kaipara Harbour; Takamatua, Akaroa Harbour; Whangapoua Harbour; Taurikura Bay, Whangarei Harbour; Waikawa Harbour; Whangaroa Harbour; Whangaparapara Harbour, Great Barrier Island.

Wharves and Jetties.—Napier Harbour; Timaru Harbour; Kopu, Waihou River; Mechanics Bay, Auckland Harbour; Jetty, Waima River; Hobson Bay, Auckland Harbour; Oyster Wharf,

Bluff Harbour; Export Wharf, Auckland Harbour; Waipapa Landing, Bay of Islands; Waikareao Estuary, Tauranga Harbour; Whakatane; Extension to Matiatia Wharf, Waiheke Island; Otapu Creek, Matakana Island, Tauranga Harbour.

Boatsheds, Skids, Slipways, &c.—Anderson's Bay, Otago Harbour; Evans Bay, Wellington Harbour (5); Bluff; Picton; Lower Portobello Bay, Otago Harbour; Vauxhall, Otago Harbour; Boiler Point, Otago Harbour; Whakatakataka Bay, Auckland Harbour; Waikawa Harbour; Mission Point, Tauranga Harbour; Tokomaru Harbour.

Breastworks and Retaining-walls.—Groyne, Milford Beach.

Reclamation.—Tauranga Harbour; Okahau Bay, Auckland (2); Okahu and Hobson Bays, Auckland Harbour (2).

General.—Construction electric transmission-line over Northern Wairoa River; electric-power line, McCormack's Bay; erection of electric transmission-line, Pukehuia, Northern Wairoa River (2); erection of electric transmission-line, Tangiteroria, Northern Wairoa River (2); septic tank and outfall pipe, Hobsonville Air Base, Auckland Harbour; two crossings of Wanganui River at Piriaka with overhead electric transmission-lines; crossing of Waikato River between Peacocke Road and Hillcrest, Hamilton, by electric transmission-line; erection of electric transmission-line, Uruti Bay, Pomare Bay, Pipiroa Bay and Waikare Inlet; electric transmission-line Veronica Channel (Waikare Inlet); log-boom, Sulphur Point, Tauranga Harbour; sewer outfall, Papakura Channel, Manukau Harbour; Arthur's Nose, Lyall Bay; overhead crossing, electric transmission-line, Waikato River; pipe-line, Rawawara Stream, Waitemata Harbour; railway bridge, Piako River; extension to clubhouse, Panmure, Tamaki River.

AERODROMES AND SUBSIDIARY SERVICES.

The intervention of the war has necessitated every effort being made to accelerate the construction of flying-fields and buildings at Royal New Zealand Air Force Stations to meet the requirements of the Air Force Expansion Programme and the Empire Air Training Scheme. The greater part of this additional work has been completed, and it is expected that the remainder will be finished this financial year. In implementing the construction of buildings the ready co-operation received by this Department from building contractors merits high praise.

The policy of utilizing modern earth-moving machinery, wherever possible, has proved its worth especially in the construction of flying-fields and the levelling of building-sites.

Civil Aviation Programme.

Work has progressed towards establishing additional aerodromes and air-route services along existing and projected air routes. Construction of civil aerodromes and landing-grounds has been proceeded with, but subsequent to the outbreak of war no new major civil aerodrome-construction projects have been commenced.

At the 30th June, 1940, there were eighty-three aerodromes and landing-grounds available for use. This figure includes ten emergency-landing grounds and five Air Force Stations. Construction is proceeding on four new civil aerodromes and two new emergency-landing grounds.

Air-route services consisting of radio communications, radio direction-finding, and meteorological information have been extended. Several new radio stations have been completed and radio-direction-finding equipment has been installed in special accommodation.

Musick Point Aeradio Station.

Transmitting-station.—Two 150 ft. and four 75 ft. towers, on concrete foundations, were erected and fenced in. The roadway giving access to the site was formed and metalled, electric power and water-supply have been provided, a temporary transmitting-station and temporary married quarters were erected, and a commencement made with the construction of the permanent transmitting-station and the operators' residences.

Receiving-station.—The access road to Musick Point was formed, metalled, and sealed, and 13 chains of access to residential sites were formed and metalled. Water and electric power supply have been provided for, and the erection of two 75 ft. towers completed. The temporary receiving-station, the short-wave Adcock building, and two transformer sheds, together with five temporary married quarters, were erected. Residential sites were levelled off, and the erection of six residences and single men's quarters is now in progress.

Overseas Air Route.

A complete overseas air terminal has been provided at Auckland. This comprises moorings' facilities for landing passengers and freight, administration and workshop buildings, all at Mechanics, Bay, and a seaplane-hangar and facilities for slipping flying-boats at Hobsonville. All these facilities have been provided by the New Zealand Government and are in addition to those established by Pan American Airways.

Emergency flying-boat moorings are being laid at Kaipara and Cornwallis, Manukau Harbour, while a marine survey of portion of Kaipara Harbour is shortly to be commenced to determine the location of an emergency alighting area for all classes of flying-boats.

To assist in the safe operation of aircraft over long ocean spaces it has been necessary to provide new aeradio facilities. A subsidiary station has already been erected at Awarua, Southland, and work has been in progress at the Musick Point Aeradio Station, Auckland. In addition, New Plymouth

Aeradio Station, which was completed for internal air-route purposes, is being extended to provide further facilities for the Trans-Tasman Service.

Considerable work has been carried out in the permanent establishment of the aeradio station on Raoul Island, in the Kermadecs Group, and this work is proceeding.

Royal New Zealand Air Force Stations.

Many hundreds of buildings, ranging in size from large wooden and concrete hangars to small technical buildings, together with services and amenities essential to the well-being of small towns, have been provided in addition to the construction and extension of flying-fields. All these works have been completed in the least possible time by using mechanical equipment wherever practicable.

No. 1 Flying Training School, Wigram.

The building programme for Wigram was continued at normal pace until the outbreak of war, when the position was reviewed, and it was decided to bring the station to a standard of wartime efficiency in the minimum of time. On 2nd September building-sites were pegged out and contractors interviewed, while owners of additional properties required for aerodrome expansion were given notice to relinquish. By 4th September contractors had their workmen and materials on the ground, and emergency work was inaugurated, double shifts being worked in many instances.

The work completed and occupied during the year is as follows:—

Buildings: Sergeants' mess and ration store, temporary timber hangars Nos. 1 and 2, car-shelters, instructional gas-chamber, workshops additions, lubricant store, engine-test house, main store No. 2, officers' mess and quarters, concrete hangars Nos. 3 and 4, instructional building, airmen's hutments (4), lavatory block, subdivisions of annexes of timber hangars, lecture block, N.C.O. pilots' dormitory, airmen's mess, additions to motor-transport shed, various garages, vegetable-store, electrical substations, electrical and wireless school, temporary workshop, canteens, and institute building.

Flying-field: Owing to increased flying activities, including night flying, all obstructions around the aerodrome were removed or reduced to a safe height. The levelling of some 75 acres of land for an extended flying-field has been commenced with the aid of mechanical plant.

Other Services: The water-tower was brought into use during the year and is now functioning satisfactorily. Large extensions have been necessary to the sewerage system, and as a result the Imhoff tank showed signs of overloading. Temporary measures have therefore been adopted to meet the situation until a scheme of co-ordination with the Christchurch Drainage Board has been finalized. Electrical reticulation is in hand. Roading has also been proceeding, and permanent sealing has been carried out. Tree and hedge planting have been completed, and further work of this nature is in hand. There are now three underground fuel-storage tanks installed at the Station.

No. 2 Flying Training School, Woodbourne, Blenheim.

Levelling and sowing over the whole of the flying-field and the formation of roads were completed during May, 1939, and a contract was let for the erection of hangars and other structures. Buildings erected during the year cover an area of 356,162 square feet.

A large programme of miscellaneous works has been carried out comprising: 181 chains of boundary fencing; a concrete-lined well 60 ft. deep for a permanent water-supply; laying of approximately 122 chains of water-main 3 in. diameter and over; 115 chains of main under 3 in. diameter, and service connections to all buildings; preparation and sealing of 122 chains of internal roading, 68 chains of footpaths, and sealing of certain areas around buildings; laying approximately 201 chains of sewer mains, and construction of a septic tank; the construction of an open fire-tank 100 ft. by 33⅓ ft. in reinforced concrete; construction of twelve sealed tennis-courts; the installation of four fuel-tanks for the motor-transport section, and three large tanks for bulk fuel; 110 chains of underground electric transmission-line, laying 34 chains of overhead electric transmission cable, 98 chains of underground telephone-line, and 47 chains of service connections; erection of a bomb-store involving 5,000 cubic yards of protective earthwork; preparing lawns and laying out the grounds generally; and numerous miscellaneous works for the Air Force.

No. 3 Flying Training School, Ohakea.

Further development of this Station has been undertaken, the major portion of the programme for the construction of an Operations Station being completed. The conversion of the station into an Observers' School and, later, provision for conversion into a Flying Training School have received attention.

Grading, grassing, and drainage of 316 acres of flying-field have been completed, 25 miles of field tile under-drains being installed and 330 miles of mole-drains being formed. Approximately 250,000 cubic yards of material was handled in this portion of the work. 280 chains of open drains have also been constructed.

All trees and telegraph and power lines obstructing air approaches to the landing-ground have been removed.

Altogether 3 miles 23 chains of road have been formed, 3 miles metalled and 1 mile 44 chains sealed. Some 5½ miles of kerbing and channelling have been completed and 1½ miles of footpaths constructed.

General levelling work within the buildings area has been undertaken, some 45 acres being treated, whilst the preparation of sites for some sixty-seven buildings has been completed.

The following buildings, having a total floor area of 268,500 square feet, have been completed: Two concrete arched hangars, including annex accommodation (floor area, 57,500 square feet each); administration building; water-tower (100,000 gallons); hospital block; electric-standby-set house;

airmen's and N.C.O.'s barracks and mess (concrete); airmen's and N.C.O.'s barracks and mess (wood); officers' mess and quarters; permanent housing (thirty-one residences); Public Works office and depot; wireless-transmitting station; guard-house; miscellaneous structures at air firing and bombing ranges.

In addition, work has been carried out on: Bulk fuel underground installations; transformer-bank, electrical switchgear and standby Diesel generation set; fire-reserve concrete water-tank; machine-gun ranges (3); bomb storehouses (6); bomb-component stores (2); protective traverses for danger areas; stop-banks for flood protection; boundary and subdivisional fencing; and provision of playing-fields and general recreational facilities.

Preparation and maintenance of lawns and areas for planting of shrubs, trees, and garden plots have also received attention. Whilst an average of 350 men have been employed, plant and mechanical equipment has been used wherever savings in time and money could be effected.

Much work has been involved in provision of underground services. Electrical reticulation from substation to switchboards in the various residential and technical buildings has involved the laying of 10½ miles of underground cables.

The permanent water-supply has been installed, a 6-ft.-diameter well being sunk approximately 40 ft. (caisson work), water being pumped from it to water-tower, from which reticulation for fire-fighting and technical and domestic purposes is carried to station buildings through some 4 miles of asbestos, cast-iron, and G.W.I. piping.

Nearly 11 miles of concrete and earthenware drains have been laid to provide storm-water and sewer drainage, and some 140 small concrete underground structures have been constructed. Concrete pipes of up to 42 in. diameter have been installed. A septic tank and a 4 in. sewer siphon-discharge-outfall main has been laid. Construction of a 27-in.-diameter siphon, some 1,400 ft. long, terminating in a velocity-check concrete structure provided an interesting feature of storm-water disposal system. Filter-beds provided for sewage treatment prior to discharge into the Rangitikei River.

A 100-pair underground telephone installation has been practically completed, connecting up all phases of station activities.

Whilst the Station was first occupied by Air Force personnel on 12th September, 1939, increased accommodation and the extension of services for new buildings have since been put in hand, and completed to synchronize with the occupation of buildings by Air Force personnel.

Maintenance-work on grounds and buildings and minor alterations and additions to buildings have been undertaken as necessity arose.

Aircraft Depot, Hobsonville.

Accommodation for airmen has been increased by the construction of three single-story wooden dormitories, together with kitchen and mess-room. Quarters and mess for commissioned officers and another building for sergeants have been erected.

An aircraft-repair shop and engine-repair shop, of reinforced concrete, with steel truss roof, having a floor space of 45,000 square feet, have been completed. Two further large equipment-stores have been completed and interior fittings installed.

Other buildings erected were administration building, guard-house, garage, transport shed, and a reinforced-concrete building for testing aero-engines. An institute building has been provided, including a hall with 3,300 square feet of floor space, canteen, and attendants' quarters.

A hangar of light steel construction with 17,000 square feet of floor space and 25,000 square feet of concrete apron has been constructed for the flying-boats of the Trans-Tasman Service.

Internal roads have been formed and metalled and, where possible, tar sealed, and approximately 1 mile of fencing has been erected.

The provision of essential services, including water-supply, sewerage, storm-water drains, and bulk petrol supply has been practically completed.

The permanent P.A.B.X. telephone system has been installed, and cable laying for power-supply and street lighting is proceeding.

Royal New Zealand Air Force Station, Whenuapai.

The construction of a flying-field had been commenced at the beginning of the year, and during the twelve months under review an area of 400 acres has been levelled, drained, and top-soiled and 170 acres grassed and brought into use for flying. In this work some 890,000 cubic yards of excavation were involved, and the total length of drains of various sizes was 41 miles. Due to an exceedingly wet winter season, the grass did not strike as well as was hoped, but quite a good turf is now forming.

Accommodation for airmen, comprising a reinforced-concrete building, with a total floor space of 53,000 square feet, was completed and occupied. This work was accelerated to meet the requirements of the Air Department. A smaller building for the accommodation of commissioned officers is now virtually complete and is partially occupied. The floor area of this is 15,000 square feet.

A hangar of the " temporary timber " type was completed. Construction of two large reinforced-concrete hangars of the type erected at Ohakea has been proceeding at Whenuapai. These buildings have a clear span of 220 ft. and a depth of 170 ft.

A sewerage reticulation scheme with large septic tank and an effluent line and a complete water-reticulation scheme, with a 250,000-gallon reinforced-concrete reservoir have been completed.

Roading for the internal street system of the Air Station has been carried out.

No. 1 Elementary Flying Training School, Taieri.

Upon the outbreak of war, construction work for the establishment of a Territorial Squadron at Taieri was put in hand immediately, together with an extension of the station, to constitute the No. 1 Elementary Flying Training School.

Work commenced on the building programme on 7th September, and the accommodation was ready for occupation by the advance personnel of the Air Force by 16th October.

During this period the following buildings were erected in timber: Officers', sergeants', and airmen's combined mess; one double dormitory block for airmen; two double cubicle blocks for officers, pilot officers, and non-commissioned officers; and one single block, half as dormitory accommodation and half as cubicle quarters; headquarters building; workshops; motor transport garages and shops; institute and canteen building; navigation block; camera obscura; Public Works depot and caretaker's residence. Garages were erected for tanker-wagons, ambulance and fire tender, light-beacon tender, and for motor-cars. The bulk fuel installation included a lubricant and inflammable store, and three underground storage tanks. The total floor area involved approximates 57,000 square feet.

The three mile 6 in. water-supply pipe-line from the Dunedin City's Silverstream Race, the storm-water and sewerage reticulation, septic tank and electric-power supply were all in use on the date of occupation of the station. The formation and sealing of access roads and paths, and the laying of the septic-tank effluent main, and filter-beds were completed. A reinforced-concrete fire-tank, 75 ft. by 30 ft., has been constructed since October.

The construction of two concrete tennis-courts, asphaltic parade ground, and the laying-down of the building surrounds in grass are well advanced. Work is now in hand on the 25-yard machine-gun range and the water-storage tank at the Silverstream Race.

The temporary timber hangar under construction at the end of the last period has been completed. The concrete floor and concrete aprons for this hangar, of a total area of 5,000 square yards, were laid during September.

Extensions to the flying-field were carried out subsequent to the outbreak of war. A further 100 acres, making a total of 200 acres, have now been made available, giving a diagonal field length of 1,500 yards. The required levelling was carried out with modern plant, and the last of the new area was sown down by December. A good grass cover has been obtained, but the area will not be put into regular service until the spring, as the surface is still soft.

No. 2 Elementary Flying Training School, New Plymouth.

The levelling of the extensions was completed, and the New Plymouth Aero Club's buildings, Union Airways Office, petrol-pumps, &c., were removed to the new site set apart for administrative buildings. The old Te Arei Road was closed, levelled, and included in the aerodrome. Trees on surrounding properties were felled and the stumps removed.

On the outbreak of war the aerodrome was taken over by the Air Department for use as an Elementary Flying Training School.

An extensive emergency-building programme, including hangar, dormitories, mess-rooms, headquarters, &c., was carried out in the shortest possible time with the co-operation of the building trade in New Plymouth. The majority of these buildings were erected on the south-east side of the Te Arei Road, the land being taken for defence purposes.

The flying-field and Air Force buildings are now being fully maintained by this Department.

Ground Training School, Weraroa, Levin.

The following new buildings were erected: Three airmen's barracks, equipment-store, double-bay garage, laundry block, hospital block, headquarters block, new officers' quarters (70 per cent. complete), fire-pump house, and guard-house.

New sewerage connections for the above buildings were made to the existing system. Water services were provided and provision made for the getaway of storm-water.

The following buildings were reconditioned and altered: Main institute building converted into main airmen's mess, cottage converted into sergeants' mess, manager's house (two storied) converted into officers' mess, matron's quarters converted to C.O. quarters, store into lecture block, and office into temporary headquarters, gymnasium reconditioned and canteen and projection room added, bathhouse renovated and extended.

An area of approximately 12,000 square yards was graded and metalled for parade grounds, parking areas, roads, paths, &c., of which approximately 10,000 square yards were sealed.

Several old wooden outbuildings were dismantled and re-erected for the Child Welfare Department at the Central Development Farm.

A large number of miscellaneous works were also completed.

General.

Removal of Obstructions surrounding Aerodromes.—Further removal of obstructions in the air approaches to aerodromes has been carried out under the powers of existing legislation. However, much still remains to be done in this direction. Progress has been made with the compilation of zoning plans for obstructions, and it is expected that this work will greatly improve the safety of such aerodromes.

"*Air Pilot*," "*Notices to Airmen*," *and Flying Strip Maps.*—Close co-operation has been maintained with the Controller of Civil Aviation in regard to the correction and amendment of these facilities for pilots.

Aerial Surveys.—A vast amount of survey work in connection with irrigation, drainage, river-control, road-location, forestry, soil survey, and mapping has been supervised on behalf of this and other Government Departments.

Meteorological Services.—The Department has continued to maintain precipitation and anemometer stations at many aerodromes, and, in connection with the Meteorological Section of the Air Department, to analyse this information, which is exceedingly important in the design and construction of aerodromes, and for the safe operation of aircraft.

Maintenance.—Maintenance of flying-fields, buildings, and general services has been carried out by the Public Works Department under arrangement with the Air Department.

PLANT AND MECHANICAL EQUIPMENT.

With the continued programme of railway, hydro-electric, highway, aerodrome, and other construction during the current year, the Department's mechanical resources have been utilized to full capacity. Purchases of new equipment were lower than in the years immediately preceding the period under review, owing to the programme of mechanization reaching the point at which most major construction works have available, and are using, the optimum range of plant for the work in hand.

Local Design and Manufacture.—The plant designed by the Department and manufactured almost entirely in this country is maintaining its previous high standard of efficient service, in addition to being as fully up to date as equipment offered by overseas manufacturers. This applies particularly to the Diesel road-graders, which were first designed in 1935, of which further supplies are now being manufactured with several modifications on the original design. These graders have operated excellently under all conditions.

Plant in Use.—The present equipment in use numbers 4,690 machines, including tractors (wheeled and crawler-track type,) Diesel excavators and drag-lines, compressors, stationary engines, road-graders, ditchers, locomotives, road-rollers, and winches, all of the foregoing being Diesel-powered; in addition to which are carry-all scrapers, rock-rooters, angle-dozers, and other earth-moving equipment which are dependent on tractors for their motive power—these being employed on the construction of railways, highways, irrigation projects, aerodromes, and military camps, hyrdo-electric-power schemes, and land-clearing, as well as the maintenance of highways, transmission-lines, &c.

A method of spoil haulage new to this country will be seen on the arrival of Diesel-powered dumper-trucks which have been ordered and will shortly be operating at the Homer Tunnel

Local Bodies.—In accordance with past practice, the Main Highways Board has arranged the purchase of a certain amount of road plant for local bodies throughout the Dominion, and the Public Works Department has handled the specifications and recommendations for these purchases.

Motor-vehicles.—There has been a considerable decrease in the number of motor-vehicles purchased during the year, but there has been some increase in the allowances paid to officers for the use of their motor-vehicles on departmental business.

Motor-trucks hired from contractors were in considerable use on construction works, the available departmental transport being reserved mainly for maintenance-work.

The following is a summary of costs of the various classes of vehicles owned by the Department for the period under review :—

	Number.	Average Cost per Mile. d.
Cars and light deliveries (10 cwt. to 15 cwt.)	568	4·06
Trucks (1 ton and over)	198	5·99
	766	4·56

Plant-repair Depots.—The repair depots established at the centres of departmental activities have been kept up to date by the installation of further necessary equipment, and they are now in a position to undertake practically all classes of work involved in the maintenance of plant.

Inspection and General.—Field inspection is being regularly carried out, this phase of the work comprising both the testing of units under operating conditions, and the further instruction of operators entrusted with the running of the plant.

This tends not only to reduce maintenance charges to a still lower level, but also to increase materially the useful life of the plant, which remains in continued first-class order.

NAVAL AND DEFENCE WORKS.

The outbreak of war greatly increased the usual programme of construction works in connection with naval and military defence. Two new mobilization camps—Papakura and Burnham (jointly capable of accommodating upwards of five thousand men)—have been practically completed, together with an auxiliary training camp at Waiouru. Necessary extensions to the existing camps at Trentham and Ngaruawahia were carried out, and certain fortifications were brought to completion. Coastal defence outposts have also been improved and augmented.

Altogether, military defence works undertaken during the year as a result of the war involved the erection of 678 buildings, comprising nearly 1,000,000 square feet. In addition to the actual buildings, the programme included other work such as the provision of water-supply and drainage, internal and external roading, sewerage, electric-power reticulation, and other facilities needed to equip the camps for the proper accommodation and training of troops.

The Devonport Naval Base has been pushed forward to completion with the utmost expedition.

TRAMWAYS.

Auckland.—During the year one tram-car, No. 252, was inspected and placed in commission on 20th December, 1939.

Wellington.—Cars Nos. 239 to 256 inclusive were inspected and certificates issued.

New tracks at Hamilton, Calabar, Tirangi, Darlington, Onepu, and Seatoun Roads, at Endeavour, Yule, Resolution, and Allan Streets, and at the Kilbirnie Car-shed have been inspected, passed, and put into use.

Christchurch.—The duplication of the track on the Cranford Street line has been completed, and plans for an extension of the double track for 25 chains beyond Colombo Street have been approved.

Further duplication of tracks have been accomplished over 12 chains of the St. Albans line along Barbadoes Street.

On the Sumner line a loop and minor relocations have been constructed in Grafton Street, Sumner, to enable the proposed lifting of the track through Nayland Street to be proceeded with.

DESIGNING OFFICE.

Prior to the outbreak of war the volume of work in the Design Office had been as heavy as for the previous year. Since August the amount of incoming work has not diminished, although during the latter part of the period under review the number of local-body proposals received for examination, as well as departmental proposals for road and highway bridges, showed a slight decrease.

The amount of work undertaken for the Defence Services has considerably increased, and other work, even though relatively urgent, has had to be left in abeyance, so that at the present time almost the whole staff of the Design Office is engaged on work pertaining to defence. A shortage of trained staff is still being experienced, and the position has been further affected by the enlistment of staff for military service.

Work carried out in connection with Air Force Stations has included the adaptation and preparation of plans for further hangars, bulk-fuel installations, fire-fighting services, and water-supply and drainage schemes. For the Army, consideration has been given to the planning of fire-fighting services and water-supply and sewerage schemes for the various mobilization camps.

Further bridges for railways under construction have been designed, but, for the reasons already stated, plans for railway structures are not as far advanced as would otherwise have been the case.

The Design Office was responsible for the exhibit of models at the Centennial Exhibition showing typical structures designed and constructed by the Department in recent years. While this exhibit did not attract public attention to the same extent as others of a more popular nature it proved to be of considerable interest, and served to convey to the public some idea of the Department's activities.

The checking of the designs of bridges for main highways and roads, prepared in district offices and by local-body and consulting engineers, was carried out as usual, and, in addition, proposals for the Local Government Loans Board and other Departments were examined and reported upon. During the year the number of proposals submitted for checking and examination totalled 325.

HOUSING CONSTRUCTION.

During the year the Public Works Department undertook a large programme on behalf of the Department of Housing Construction in connection with the survey, planning, and construction of new roads, and the installation of storm-water, sewerage and water-reticulation services on areas of land preparatory to the erection of dwellings.

In the Auckland district properties dealt with were at Orakei, Mount Roskill, Point Chevalier, Mount Albert, and Mount Eden, while in Wellington a block of land at Miramar was developed for housing purposes.

The construction of a large sewer through the Hutt Valley was commenced, of which 1 mile 37 chains were completed during the past year.

PUBLIC-BUILDINGS WORKS AND ELECTRICAL OPERATIONS.

Details of public-buildings works and of the operations of the State hydro-electric undertakings are contained in the separate reports, included herewith, by the Government Architect and the Chief Electrical Engineer.

I have, &c.,
J. Wood, M.Inst.C.E.,
Engineer-in-Chief.

APPENDIX C.

ANNUAL REPORT ON BUILDINGS BY THE GOVERNMENT ARCHITECT.

The GOVERNMENT ARCHITECT to the Hon. the MINISTER OF PUBLIC WORKS.

SIR,—

I have the honour to submit the following report on the activities of the Architectural Branch for the year ended 31st March, 1940.

During the year plans were prepared for 558 buildings of an estimated value of £1,698,266, and contracts totalling £872,290 have been let. Contracts to the value of £573,584 for buildings designed prior to 1st April, 1939, have also been let, making the total value of building contracts let during the year £1,445,874.

In addition to the above, buildings have been designed by other branches in Head Office and by District Offices in connection with railway construction, main highways, hydro-electric works, and other activities of this Department.

The most outstanding feature of the year's work of this branch was the large amount of work undertaken in connection with the erection and fitting-up of aerodromes, camps, &c., consequent on the outbreak of war. The enlistment for overseas service of a number of the staff has added to the work of those left, and I am pleased to report that the programme of work has been adhered to with gratifying results.

The enthusiasm and co-operation of builders and merchants has enabled this office to record an output unparalleled in its history. These special works have not interfered unduly with the regular work of the branch.

A constant endeavour has to be maintained to make use of such materials as are available, and much ingenuity is often called upon to avoid using imported materials.

Appended is a schedule of works, which includes maintenance work and contracts prepared in the various District Offices.

VICE-REGAL.

Auckland.—Minor alterations, renovations, and general maintenance were carried out.

DEPARTMENT OF AGRICULTURE.

Auckland.—At Ruakura alterations to the farm office building, the erection of a laboratory and residence, and electrical additions were completed, while maintenance and minor interior additions were carried out at Te Kauwhata.

Stratford.—Alterations and renovations to a cottage at Flock House, Bulls, are in hand.

Wellington.—Erection of a new dormitory block at Feilding Agricultural College was completed, while steady progress was made with the new Animal Health Laboratory, Wallaceville.

Christchurch.—A laboratory, sleeping-quarters, and sheep-yards were built at Kirwee, while renovations and additions were carried out at five other buildings.

AIR DEPARTMENT.

Auckland.—All the works mentioned in my last report, together with eighteen new buildings, were completed at Hobsonville, while at Whenuapai three buildings are in progress and two others were completed. Temporary accommodation was erected at Musick Point, and a commencement made with the residences and single men's quarters. An anemometer mast and buildings were erected at Mangere.

Stratford.—Good progress was made with the building programme at New Plymouth, and at the end of the year practically all the major buildings were completed.

Wellington.—In addition to completing the thirty-five buildings which were in hand at the end of last year, many new buildings were commenced at Ohakea, and speedy progress was made with their construction. At Weraroa ten buildings were erected, contracts were arranged for an additional three, and alterations to various existing buildings were carried out.

Nelson.—A car-shelter was erected at Nelson Aerodrome, while at Woodbourne forty-five buildings were completed and a further twelve are in progress.

Greymouth.—An aeradio-station was completed and one hutment provided at Jackson's Bay.

Christchurch.—Twenty-eight buildings were completed and sundry alterations, improvements, and additions carried out at Wigram. At Harewood seventeen buildings were built, together with latrines, garages, and sheds.

Dunedin.—The temporary timber hangar mentioned in my last report was completed, together with fifteen additional buildings and several garages and stores.

Army Department.

Whangarei.—Two buildings were renovated, and accommodation provided for watching-posts.

Auckland.—A large building programme was carried out at Papakura, and, in addition, accommodation was provided at various lookout posts.

Napier.—Hutments were provided for lookout posts, and minor repairs and renovations carried out at two buildings.

Stratford.—Accommodation at Waiouru was erected and alterations and repairs effected at one building.

Wellington.—At Trentham three buildings which were in progress last year were completed, and, in addition, dormitory blocks, messes and kitchens, stores, ablutions, and sundry smaller buildings were erected. Additional accommodation was provided at Mount Victoria, Palmer Head, Fort Dorset, and at various other locations. Several buildings were erected at Somes Island and all existing buildings were repaired and renovated. Temporary accommodation was arranged at Palmerston North for the Maori Battalion, and in Wellington offices were fitted up for Base Records.

Nelson.—Improvements, repairs, and renovations were effected at four buildings.

Greymouth.—Repairs to three buildings were effected, and additional temporary accommodation provided at Greymouth, Hokitika, and Westport.

Christchurch.—Dormitories, officers' quarters, mess buildings, hospital, and various other buildings were erected at Burnham, and the necessary water, sewerage, and electrical services installed. One large building is in course of construction. Additional accommodation was provided at Godley Head and Battery Point and at several other locations.

Dunedin.—Alterations and improvements were effected at seven buildings.

Navy Department.

Auckland.—Eight new buildings were completed and a further three were put in hand. Renovations to several residences were carried out.

Dunedin.—One new building was erected.

Education Department.

Stratford.—Three new class-rooms and a cloak-room were completed at the Hawera Technical School, while major additions to the engineering block and heating of the main building are in progress. At New Plymouth High School and Technical School window alterations are in hand, and at Stratford Technical School three new class-rooms and a workshop are nearing completion.

Gisborne.—Offices were fitted up for the Child Welfare Branch, and various renovations and improvements to the Gisborne High School carried out.

Wellington.—Office accommodation was fitted up in three buildngs, and renovations and improvements made at four others.

Nelson.—The demolition of the eastern and western wings of the old Nelson Boys' College was completed and the erection of the new building commenced. Temporary accommodation was provided at Richmond Special School, a new art block was completed, and interior renovations and maintenance repairs were carried out. The new additions to Marlborough College are nearing completion.

Christchurch.—Two large laboratories were erected and fitted up, and repairs and renovations to six buildings completed.

Dunedin.—Six staff residences were built, and additions made at Otekaike Special School. A new technical block at Gore High School is nearing completion, and repairs, renovations, and improvements to two buildings were undertaken.

Health Department.

Whangarei.—Alterations were made to the District Office.

Auckland.—Renovations and the usual maintenance were effected at St. Helens Hospital, Nurses' Home, Lister House, and the Ante-natal Clinic, and also at the Hamilton Office.

Wellington.—Accommodation was arranged and fitted up at one building, and renovations carried out at St. Helens Hospital. The new Dental Clinic Building in Willis Street was almost completed, only the interior requiring to be finished off.

Nelson.—The Nelson offices were renovated, and an office transfer was arranged at Blenheim. Sundry works were attended to at four offices.

Christchurch.—The new male pavilion at Hanmer Queen Mary Hospital is nearly completed; repairs were made to four buildings.

Dunedin.—New fire-prevention service was installed and repairs and renovations effected at St. Helens Hospital, Invercargill.

Justice Department.

Whangarei.—Construction of the new Whangarei law-courts has been suspended. Concrete paths were laid at one building, and maintenance and electrical installations carried out at three courthouses.

Auckland.—General repairs, improvements, and maintenance were carried out to ten courthouses. At the Waikeria Borstal Institution a new dairy was completed, two staff houses put in hand, a fire-alarm system installed, and general maintenance completed.

Taumarunui.—Alterations, renovations, and repairs were carried out at three buildings. Minor improvements to two prisons were completed.

Tauranga.—Additions to one building were commenced, and renovations at three courthouses were attended to.

Stratford.—Electrical repairs and additions were attended to at Waitara Courthouse. Interior additions were carried out to the New Plymouth Prison, and extensive roof repairs were completed at the Wanganui Prison.

Wellington.—Interior alterations to the Wellington Courthouse were effected.

Nelson.—Improvements to one building and repairs and renovations to five others were effected.

Christchurch.—Extensive alterations and renovations were made at Waimate, Temuka, and Fairlie Courthouses, and minor repairs made at nine other buildings.

Dunedin.—Steady progress was made with the new Invercargill Courthouse, and repairs, renovations, and improvements were carried out at six buildings.

Mental Hospitals.

Avondale.—Additions to the Nurses' Home and to wards F. 7 and M. 2 were completed. Additional fire-escapes were erected, and various improvements, minor alterations, and general maintenance carried out.

Kingseat.—Villas 7 and 8 were completed during the year, and renovations carried out to villas 1, 2, 3, and 4. The new Nurses' Home is nearing completion, whilst the laying of electric cables for street-lighting is in hand. In addition, sundry alterations, additions, and maintenance were attended to.

Tokanui.—A new apple-storage shed and glasshouse were erected, alterations to office block carried out, and alterations and renovations to several wards and staff residences put in hand. A new villa for farm labourers was also commenced.

Porirua.—Various items of plant were installed, and repairs and the usual maintenance attended to.

Nelson.—The new Ngawhatu Nurses' Home, together with access roading and various service extensions, was completed, the erection of three new male villas is proceeding, water-softener equipment was installed in the boilerhouse, and renovations and repairs were effected at four buildings. Fire-fighting services were inspected and improved.

Hokitika.—The two new villas under construction last year were completed and furniture was installed.

Sunnyside.—During the year new workshops and a block of eighteen garages were built, alterations and additions were made to twenty buildings, and ventilation improvements were carried out to the bakehouse. Equipment was installed in the workshops, laundry, and boilerhouse.

Templeton.—A laundry was built and equipped, two buildings were renovated, and tenders were invited for a new villa. Improvements were made to the Farm School water-supply.

Seacliff and Waitati.—The fire-alarm and telephone systems were improved, and renewals, replacements, and general maintenance carried out. In addition, a new kitchen and stores were built at Waitati and a new house for guinea-pigs was erected at Seacliff.

Native Department.

Whangarei.—One hundred and forty-five new houses, seventeen hutments, thirteen milking-sheds, and nine renovation jobs were completed. Thirty-four houses, four cow-sheds, and seven renovation jobs are in hand.

Auckland.—A total of forty-four cottages were completed, fifteen additional cottages were commenced, while alterations and renovations were carried out to four.

Taumarunui.—Fifteen cottages and six huts were built, while a further six cottages are in course of construction.

Tauranga.—Seventy cottages, sixty-one cow-sheds, and one wool-shed were built, eighteen cottages were renovated, and twenty-five painting renovations were carried out.

Gisborne.—Fifty-two houses were completed and ten are in progress. Minor office alterations were also undertaken.

Napier.—Six houses were built and one renovated.

National Broadcasting and Commercial Broadcasting Services.

Auckland.—Small alterations and repairs were completed at four buildings.

Napier.—Improvements to Opapa Station and the erection of poles on the Napier studio were completed.

Christchurch.—Major alterations and renovations to 3YA studio and repairs to two other buildings were carried out.

Police Department.

Whangarei.—Electric wiring at two police-stations was carried out, and repairs and renovations effected at eleven buildings.

Auckland.—A new building was completed at Papakura, and repairs and renovations were attended to at fifteen stations.

Tauranga.—A new station was put in hand at Rotorua, the Whakatane Police-station and residence was completed, the removal and re-erection of the old Katikati Police-station was carried out, renovations were effected at one building, and maintenance repairs made at three others.

Taumarunui.—General repairs, renovations, and minor alterations at six buildings were undertaken.

Gisborne.—One new garage was built, additions and alterations were effected to six buildings, and renovations to one station carried out.

Stratford.—Alterations were carried out at four buildings, additions to two, and a new office was erected at Waitara.

Napier.—Repairs and renovations to three buildings were carried out, and a new residence was built at Clive.

Wellington.—The Palmerston North Police-station was completed, work was commenced on the erection of a new station at Levin, and repairs, renovations, and minor improvements to fourteen buildings were carried out.

Nelson.—A new lockup was built at Blenheim, garages were erected at two stations, and sundry improvements and renovations effected at nine others.

Christchurch.—New stations, including residence, office, garage, and lockup, were built at Little River and Pleasant Point. A contract was let for a new station at Waimate, and alterations and renovations attended to at twenty-three stations.

Greymouth.—A garage was erected at one station, drainage improvements were effected at Hokitika, and general repairs and maintenance carried out at fourteen other buildings.

Dunedin.—New stations were completed at Mosgiel, Roslyn, Oturehua, and Oamaru, while work is in progress at Port Chalmers. Repairs, renovations, and improvements were made at fifteen stations.

Post and Telegraph Department.

Whangarei.—Extensions to Okaihau and Kaiwaka Post-offices were completed, electric installations were effected at three offices, and renovations carried out to one building.

Auckland.—Additions to the Auckland Chief Post-office, Devonport Telephone-exchange, and Huntly Post-office progressed satisfactorily, while additions to Avondale and Mount Eden Telephone-exchanges were completed. A residence was erected at Papakura, and a post-office and residence was put in hand at Kaukapakapa.

Tauranga.—The erection of a new office and residence at Taupo was commenced and additions and alterations to three buildings carried out.

Taumarunui.—A new residence was built at Taumarunui and a post-office completed at Mahoenui.

Gisborne.—A new automatic-telephone exchange was completed, and renovations and renewals effected at three buildings.

Stratford.—Improvements and alterations were effected at four buildings and renovations at one.

Wellington.—Exterior renovations to the Wellington General Post Office were put in hand. At Palmerston North, alterations and renovations to the old portion of the post-office were commenced and the new addition was completed.

Nelson.—The erection of a new store and garage is proceeding, and minor repairs, alterations, and renovations were carried out at seven buildings.

Christchurch.—New automatic-telephone exchanges were erected at Mount Pleasant and New Brighton, a line-store and garage at Ashburton, and a residence at Waimate. Alterations and renovations were made at thirteen post-offices.

Greymouth.—A new post-office was built at Stockton Mines, and additions and alterations were made at three buildings.

Dunedin.—Work on the new Invercargill Post-office building is progressing, a commencement was made with a new office and residence at Mosgiel, and alterations and renovations at eight buildings were undertaken. Direction-finding equipment was installed at Awarua Radio Station.

Social Security Department.

Whangarei.—Office accommodation was arranged at Dargaville, Kaikohe, and Kaitaia, and renovations carried out at Whangarei.

Auckland.—New and additional accommodation was arranged at Auckland, Hamilton, and Paeroa, and sundry repairs were completed.

Gisborne.—Interior alterations were attended to, and new offices fitted up for the State Placement Service.

Napier.—Renovations to office were completed, and accommodation was provided at Waipukurau.

Christchurch.—Premises were fitted up at Christchurch, Rangiora, Timaru, Ashburton, and Waimate, and repairs effected at one other building.

Dunedin.—Accommodation was arranged and offices fitted up at Dunedin, Oamaru, and Queenstown.

Tourist and Publicity Department.

Taumarunui.—Two new cool stores were erected, and improvements were effected to existing cool-stores at the Chateau Tongariro. In addition, extensions and repairs were carried out at two huts. At the Waitomo Hostel minor improvements and repairs were undertaken.

Dunedin.—At Te Anau Hostel a new water-supply and lighting plant were installed.

MISCELLANEOUS.

Whangarei.—Temporary buildings to house six thousand Maoris, and five permanent beach baches, were erected in connection with the Waitangi celebrations. Two cottages and one cow-shed were completed for the State Advances Department, while four buildings were renovated for the Lands and Survey Department. Two substations are in course of erection and electrical reticulation completed at Okaihau Depot for the Public Works Department. One new lighthouse and associated buildings are in hand for the Marine Department.

Auckland.—Extensive repairs and renovations were carried out to buildings for the Lands and Survey Department. Fair progress is being made with the erection of the new departmental buildings in Shortland Street; a new building, plant store, and garages were erected at the Public Works workshops, and additions to the workshops in Hamilton were put in hand. Two glasshouses and an "insectary" were completed for the Department of Scientific and Industrial Research.

Taumarunui.—New garage, workshops, stores, and draughting-room were erected for the Public Works Department, and alterations to one building and renovations to several others carried out.

Tauranga.—Erection of new cottages for the Internal Affairs Department at Ruatahuna was commenced, and additions and maintenance carried out at the Rotorua Game Farm.

Napier.—The departmental building previously occupied by the Public Works Department was fitted up for occupancy by the Health, Labour, and Land and Income Tax Departments. A departmental garage to house six vehicles was completed; improvements and additions to the Public Works workshops were finished, and a cycle-shed added to the new departmental buildings.

Wellington.—All work in connection with the Government Life Insurance Building was practically completed. A commencement was made with the erection of the new departmental buildings, Stout Street, and steady progress is being maintained. Alterations, renovations, and improvements, including the provision of furniture, were undertaken for the Land and Income Tax Department. Maintenance work and general renovations to State buildings were very heavy and fully engaged a large staff. Sheet-steel piling was driven for the foundations of the new Government Printing Office.

Nelson.—The new Government Life Insurance Building was completed; additions to the Public Works office were carried out, and maintenance, repairs, and renovations effected at five buildings. Additions and alterations were effected at the Appleby Research Orchard.

Christchurch.—A new Wheat Research Building was erected, and a glasshouse is in course of erection at Lincoln for the Scientific and Industrial Research Department. A temporary Public Works store is being built at Addington. Alterations and renovations were made at fifteen buildings. Work on "The Sign of the Takahe" is proceeding steadily. A building programme comprising short-course accommodation and other farm buildings was commenced at Canterbury Agricultural College.

Dunedin.—Repairs, renovations, and improvements were carried out for various Departments.

Greymouth.—Additions to two Public Works offices were undertaken, and repairs and renovations made at Westport, while garage accommodation was provided at the Government Buildings, Hokitika.

Generally.—In addition to the usual maintenance, repairs and renovations, a considerable amount of work was involved in arranging new accommodation and altering existing offices to satisfy the growing needs of expanding Departments. A large staff has been fully engaged in manufacturing furniture for various Departments also. The decoration and illumination of several major public buildings, including the House of Representatives and the departmental buildings, Wellington, was arranged in connection with the New Zealand Centennial celebrations.

I have, &c.,

JOHN T. MAIR, F.R.I.B.A.,

Government Architect.

APPENDIX D.

ANNUAL REPORT OF THE CHIEF ELECTRICAL ENGINEER.

The CHIEF ELECTRICAL ENGINEER to the Hon. the MINISTER OF PUBLIC WORKS.

SIR,—

I beg to report on the position of the development of electric power in the Dominion for the past year, as follows :—

GENERATING SCHEMES IN OPERATION.

NORTH ISLAND ELECTRIC-POWER SYSTEM.

1. Capital Outlay.

At the close of the year 1939–40 the total capital outlay was £9,632,112, representing assets in operation, and £797,128, representing assets not in operation, giving a total capital outlay of £10,429,240, and Table II gives an analysis of this amount.

2. Financial Results.

The total revenue for the year amounted to £1,328,499. Working-expenses were £199,072, and standby charges and power purchased in bulk were £168,943, which resulted in a gross profit of £960,484, equal to a return of 9·97 per cent. on the capital in operation.

After paying interest £345,207, and depreciation £15,477, there was a net profit of £599,800. All arrears of sinking fund were met out of this balance, and the sum of £181,248 was carried to the Reserve Fund.

Comparative figures for the year ended 31st March, 1939, are as follows: Revenue, £1,127,132; working-expenses, £200,438; interest, £353,676; depreciation, £7,228; and King's Wharf charges, £33,547—with a net profit of £530,170.

The accumulated Depreciation Reserve and Sinking Funds as at 31st March, 1940, amounted to £2,240,895. Table I gives full particulars of financial results as well as other relevant statistical information.

3. General.

The units generated and purchased totalled 1,093,708,158 for the system. Units actually sold totalled 981,288,359, and units used for station auxiliaries, &c., totalled 6,211,193.

The balance of 106,208,606 units represents transmission and distribution losses amounting to 9·7 per cent. of the total output.

The maximum load on the system was 218,300 kW. and the average load factor 57·19 per cent. The total connected load was 1,380,713 kW. and the demand factor or ratio of maximum load to connected load was 16·54 per cent.

4. Construction, Operation, and Maintenance.

HAMILTON DISTRICT.

(1) CONSTRUCTION.

(*a*) POWER-STATIONS.

Arapuni.—Orders have been placed for Nos. 5 and 6 generating units, each of 24,000 kVA. capacity, and the associated equipment. The installation of these two units will complete the ultimate station development with a total installed generating-capacity of 166,950 kVA., and turbine capacity of 220,000 b.h.p.

(*b*) SUBSTATIONS.

Belmont.—Material is on order for a 10,000 kVA., 50/11 kV. substation to serve as a fourth supply point for the Waitemata Power Board.

Bombay.—Two 3,000 kVA. 50/11 kV. banks of transformers were installed in May in place of the two existing 1,500 kVA. banks. Work is proceeding on the replacement of the 11 kV. feeder switchgear by a new ten-panel, metal-clad, unit-type switchboard.

Edgecumbe and Waiotahi.—An 11 kV. booster transformer was put into service at each substation in July.

Frankton (New Zealand Co-operative Dairy Co.).—A new 1,000 kVA. 11/·415 kV. bank of transformers was installed, in place of an existing 400 kVA., three-phase transformer, in March, 1940.

Hamilton.—A new sixteen-panel, duplicate busbar, metal-clad switchboard was installed in the main building, and the change-over from the original 11 kV. switchgear in the old switch-room was carried out in July. A new carpenter's shop and linemen's depot was completed.

Henderson.—New truck-type O.C.B.'s were installed in place of the existing 11 kV. feeder O.C.B.'s in April, 1939. Work is proceeding on the installation of two new 3000 kVA. 50/11 kV. banks of transformers to replace the existing banks. Material is on order for the installation of two 15,000 kVA. 110/50 kV. banks of transformers.

Kaikohe.—A 750 kVA. 50/11 kV. bank of transformers from Te Awamutu was installed, and supply was commenced to the Bay of Islands Power Board through a temporary 11 kV. outdoor cubicle on 15th December, 1939. A start has been made on the erection of the substation buildings and cottages.

Kaitaia.—The construction of a 750 kVA. 50/11 kV. substation as a second supply-point for the Bay of Islands Power Board was commenced in March.

Kerepeehi.—An 11 kV. booster transformer was put into service in May.

Lichfield.—A start has been made on the construction of a 1,000 kVA. 50/11 kV. substation as an additional supply-point for the Thames Valley Power Board.

Manunui.—A cubicle switch and metering equipment were made up and installed, and 11 kV. supply was made available from Ongarue on 13th June.

Marereiu.—An 11 kV. booster transformer was put into service in April, 1939.

Maungatapere.—An 11 kV. booster transformer was put into service in April, 1939. Three new cottages are being built.

Mount Roskill.—Material is on order for a 30,000 kVA. 110/22 kV. substation to serve as a second supply-point for the Auckland Power Board.

Ngongotaha.—The 6·6 kV. bus was extended, and eight 11 kV. O.C.B.'s (including a spare) from Hamilton were installed in place of the existing 6·6 kV. feeder O.C.B.'s. The change-over was carried out in March, 1940. Three additional 15 kVA. single-phase service transformers were installed in January to provide three-phase supply for the staff cottages, &c.

Ongarue.—The construction of a 2,250 kVA. 110/11 kV. substation was completed, and supply was commenced to the Taumarunui Borough Council on 3rd May. The borough continued to carry portion of its own load until 11th October on account of a delay in the completion of the borough substation programme. Three staff cottages were completed in June.

Penrose.—The assembly and installation of a 20,000 kVA. synchronous condenser was commenced in August and will probably be completed by the end of May. Preparations are in hand for the installation of a temporary 10,000 kVA. 110/50 kV. bank of transformers to ease the loading on the existing 22/50 kV. banks pending the erection and putting into service of a 110 kV. transmission-line to Henderson. Work is proceeding on tower foundations for extensions of the 110 kV. steel structure for additional incoming and outgoing lines.

Tahekeroa.—A new 2,250 kVA. 50/11 kV. bank of transformers was put into service in place of the existing 1,000 kVA. three-phase transformer (and spare transformer) on 15th October. An 11 kV. booster transformer was installed in May. Three garages were erected at staff cottages.

Te Awamutu.—One of the 1,500 kVA. 50/11 kV. banks of transformers from Bombay was installed in August, and the other in September, in place of the two existing 750 kVA. banks.

Waikino.—A 25 kVA. local service transformer was installed to give supply to three new staff cottages, two of which were completed in July and one in August.

(*c*) TRANSMISSION AND DISTRIBUTION LINES.

Arapuni–Edgecumbe 110 kV. Line.—The section from Arapuni to Hamurana was completed and put into service at 50 kV. in January, 1939, supplying the Ngongotaha–Waiotahi section of the old 50 kV. line through temporary jumpers at Hamurana. The remainder of the line was completed in June, but owing to severe vibrations in the long span at the lake crossing this section was not put into service until September following investigations with vibration recorders and the fitting of vibration dampers. The line is being operated at 50 kV. pending the installation of 110 kV. equipment at Edgecumbe at some future date.

Arapuni–Bunnythorpe 110 kV. Line (Arapuni-Middle Road Section).—Survey of the Ongarue-Middle Road section is nearing completion. The clearing of the route is well advanced, and a start has been made on the delivery of tower steelwork to sites. Survey is proceeding on the Arapuni-Ongarue section.

Arapuni–Penrose 110 kV. Tower-line No. 2.—Tower-erection was commenced in March, 1939, and at the end of the financial year 442 towers had been erected and 31 miles of line had been wired up. The line is due for completion in June, and no difficulty is expected in keeping to this programme.

Penrose–Henderson 110 kV. Lines.—Work is proceeding on the pegging of tower positions. Preparations are in hand for a start on tower-erection in May, 1940.

Karapiro–Hamilton 110 kV. Line.—A reconnaissance survey was made to determine on which side of Arapuni–Hamilton line the new line should be placed.

Maungatapere–Kaikohe 50 kV. Line.—Pole-erection was started in August, and the line was put into service on 15th December, 1939. A good deal of clearing and other work remained to be done, and this was completed in April.

Kaikohe–Kaitaia 50 kV. Line.—Survey was completed, and a start was made on pole-erection in February.

Takapuna–Belmont 50 kV. Line.—Survey was completed.

Ongarue–Taumarunui 11 kV. Line.—The double-circuit line was completed and put into service on 3rd May, 1939.

Taumarunui–Manunui 11 kV. Line.—The line was completed and put into service on 13th June, 1939.

(*d*) WAIKATO RIVER POWER SURVEY.

Surveys and investigations were continued in relation to further power schemes on the Waikato River, and test bores were put down at Taupo, Whakaara, Otaranga, Ohakuri, and Karapiro. Arrangements are in hand for the construction of a diversion channel and control gates near the bridge at Taupo to regulate the flow from the lake, and for the construction of an 85,000 kW. power-station at Karapiro. Work is proceeding on sub-surface investigations at Ohakuri, and on sites for a permanent village and temporary workers' accommodation at Karapiro.

(2) Operation and Maintenance.

(a) power-stations.

Arapuni.—No. 8 generator was returned to service on 26th April, 1939, after being shut down since 29th March, 1939, for repairs to three coils of the stator winding that were damaged by a flashover caused by an accidental discharge of water.

Routine resistance tests on the generator stator windings showed a rising resistance on the winding of No. 2 stator. The generator was shut down in October, and a complete new winding ordered in 1936 was installed. The unit was returned to service on 9th April, 1940. The old winding was found to have a number of burns and defective joints.

Severe pulsations of the control valve of No. 1 unit in December were practically eliminated by fitting air-release cocks to the pressure-pipes. Trouble was experienced at the same time with the drain valve, the cause being a broken spindle.

Metering-equipment giving quarter-hour summation readings of the total station output was made up by the Test Department and put into service in July.

New type bushings and contacts were fitted to Nos. 10, 26, and 28 110 kV. O.C.B.'s. A H.T. bushing on a transformer in the 110/50 kV. bank was found to be smoking and ejecting heated compound. The bushing was taken out of service before a total breakdown occurred.

Flashboards were made up and installed in July to enable the level of the spillway crest to be raised, if required, from R.L. 320 ft. to a maximum of R.L. 324 ft. 6 in., with the object of conserving surplus water.

Three total station outages occurred during the year. Two were caused by the failure of a 110 kV. bushing on O.C.B. 26 on 5th November, 1939, and on O.C.B. 28 on 6th December, 1939, and the third was caused by the automatic trippings of the generator O.C.B.'s on a heavy surge on 27th February, 1940. So far nothing has been found to account for the third outage.

The maximum load on the station was 118,200 kW., and the output for the year was 654,507,000 units. Corresponding figures for the previous year were 100,000 kW. and 585,779,100 units.

Horahora.—This station was operated in parallel with Arapuni throughout the year. No. 2 turbine was out of service from 19th November till 20th December for repairs to a bearing that was damaged by heating. The isolating-links and other connections on the station 5 kV. bus were overhauled and painted with heat-indicating paint.

Penrose Diesel Plant.—The plant was given a short maintenance run at weekly intervals, but was not placed on load during the year. No. 3 engine has been out of commission since October, 1938, when a number of parts were withdrawn for urgent use at Dobson. Further parts were forwarded in May. Endeavours are being made to have replacements made up in New Zealand.

Okere (Tourist Department, Rotorua).—This 200 kW. station was run by the Tourist Department over the evening peak-load period six days a week for many years, but it was shut down at the end of September following a decision that owing to the obsolete nature of the plant and the necessity for costly remedial measures it was no longer worth maintaining.

(b) substations.

(i) *110 kV.*

Penrose.—A transformer in one of the 22/50 kV. banks broke down during a thunderstorm in June, and a 22 kV. S.C. cable-box on the same transformer bank broke down in August. Thirty-one cracked-pin insulators and five faulty strain insulators on the 110 kV. structure were replaced. Transformers were dried out for Henderson and Tahekeroa Substations, and for the Hobsonville and Whenuapai Air Bases, and a large amount of material was made up for lines and substations.

Bombay.—A spare 50 kV. O.C.B. was forwarded to Penrose for use with a temporary 110/50 kV. transformer bank. The flexible-braid connections on the 110 kV. and 50 kV. structures were replaced by new clamp and copper-strip connections. An 11 kV. incoming feeder O.C.B. broke down in May and was replaced by a spare from Penrose; the existing 11 kV. feeder switchgear is now being replaced by new switchgear of higher rupturing capacity. An 11 kV. outdoor trifurcating-box on an incoming feeder broke down in November.

Hamilton.—No. 6 110 kV. line O.C.B. was forwarded to Penrose for use with a temporary 110/50 kV. transformer bank; one of the bushings was found to be badly damaged by burning. All 110 kV. bushings on the 110/50 kV. transformer bank were overhauled, and were fitted with caps of an improved type. New copper-strip connections were fitted to the 110 kV. structure. The original 11 kV. feeder switchgear was transferred to Ngongotaha, and the old switchroom is being used as a store and office pending the installation of H.T. testing equipment at some future date. An 11 kV. trifurcating-box on a new take-off structure broke down shortly after being livened up in July, and an 11 kV. S.C. cable box on one of the 50/11 kV. transformers banks broke down in December.

Ongarue.—This substation was put into service in May. Trouble was experienced with the operation of the 110 kV. A.B.S. and earthing-switches, due to faulty design. New parts were supplied by the makers and were fitted in November and December. Gas-detectors have been fitted to the main transformers, and co-ordination gaps have been fitted to the transformer bank 110 kV. A.B.S. A breakdown in the H.T. winding of a transformer in the 110/11 kV. bank occurred in August. The transformer is still out of commission pending the arrival of new windings.

(ii) *50 kV.*

Henderson.—A defective 50 kV. transformer bushing, and a defective string of insulators on the 50 kV. structure were replaced. Two telephone-line relays and a Power Board ringer were installed.

Huntly.—The relays on an 11 kV. feeder O.C.B. taken over from the Power Board were replaced following incorrect operation in June.

Mamaku.—Two defective poles on the 50 kV. A.B.S. structure were replaced in August, and an additional line A.B.S. was installed on the Arapuni side of the structure to enable the substation to be supplied via Ngongotaha during shutdowns of the Arapuni–Mamaku section of line. A defective 50 kV. transformer bushing was replaced.

Mareretu.—A breakdown of an 11 kV. S.C. cable on the incoming feeder occurred in April. A flashover on two 11 kV. panels was caused by lightning in July, and a discharge was recorded by a surge counter on the 50 kV. lightning-arrester at the same time.

Matamata.—The oil in the 11 kV. cable terminal boxes on the main transformers was replaced by semi-fluid compound as the oil had been finding its way into the cable bushings in the booster transformer cubicle switch. A defective 50 kV. O.C.B. bushing was replaced.

Maungatapere.—The 11 kV. incoming feeder O.C.B. was damaged in July by a flashover caused by lightning. Trouble was experienced with one of the main transformers in September due to arcing caused by the tap-changing switch making poor contact. The 10-ton chain blocks were transferred to Kaikohe.

Ngongotaha.—Two defective 50 kV. O.C.B. bushings and two defective 50 kV. pin insulators were replaced.

Rotoiti.—A 100 kVA. three-phase transformer that broke down in February, 1938, was repaired and returned to service in parallel with the existing transformer in May, 1939. A flashover occurred between the flexible inlet leads on the 6·6 kV. O.C.B. during a gale in June.

Tahekeroa.—When the six-pole isolating-switch of the booster transformer was opened on 3rd November a flashover occurred causing a short substation outage. Nine faulty insulators have been replaced on the 11 kV. bus.

Takapuna.—A flashover similar to the one at Tahekeroa on 3rd November occurred when the six-pole isolating-switch of the "follower" booster transformer was opened on 24th November.

Te Awamutu.—Telephone-line relays were installed. An outage was caused by a flashover on a 50 kV. insulator during live-line testing in May. A defective 50 kV. pin insulator was replaced, and all insulators on three 50 kV. A.B.S.'s also were replaced. A breakdown of a 50 kV. bushing on one of the 500 kVA. transformers from Bombay occurred shortly after the transformer was livened in July.

Waihou and Waiotahi.—Telephone-line relays were installed at each substation.

Waikino.—A defective 50 kV. O.C.B. bushing was replaced. A flashover occurred on the 11 kV. overhead mains running to the synchronous condenser in November, and a wall of the condenser building was set alight.

(iii) *General.*

Booster Transformers.—An investigation into the cause of the flashovers on the six-pole isolating-switches at Tahekeroa and Takapuna in November showed that the switches had not been designed to break magnetizing current. An offer has been received from the makers to supply suitable barriers for installation in the switch cubicles at the various substations.

Metal markers have been fitted to the position-indicator slide of the booster transformers at a number of substations to show the range over which the indicator has worked.

(*c*) TRANSMISSION AND DISTRIBUTION LINES.

(i) *110 kV.*

Arapuni–Penrose.—Five faults occurred during the year, two being caused by lightning, and one each by a scrub fire, a falling tree, and a haystacker. The earth-wire on the wood-pole line has been removed from a further 148 poles. The legs and shear plates on a large number of towers were inspected for signs of rusting at and below the ground-line, and traces of rust were found on the legs of several towers. Treatment consisted of cleaning and painting, but in the case of two towers the legs were also concreted in.

Arapuni–Stratford.—Two faults occurred on the section of line in this district, both being due to lightning causing flashovers on steel towers. Considerable damage was done to access tracks by an exceptionally severe storm in February. Work is still proceeding on the removal of numerous slips that occurred during this storm.

(ii) *50 kV.*

Penrose–Takapuna.—An outage was caused in January by a piece of fencing-wire being thrown on to the line. The telephone-line was broken in the harbour-crossing at Hobsonville, due presumably to the line being fouled by the mast of a large boat.

Henderson–Maungatapere.—One flashover was caused by lightning in June, and two flashovers occurred between the 50 kV. line and the telephone-line during severe storms in August and January.

Bombay–Waikino.—An outage was caused by hay being blown on to the line in December. Defective copper-weld sheathing was the cause of a broken telephone-wire.

Waikino–Aongatete.—Four 50 kV. pin insulators broke down during three severe storms in October, November, and January. About ninety cracked insulators were located during live-line testing, but owing to difficulty in getting the line out of service only twenty-three of these have so far been replaced.

Horahora–Matamata.—A number of tower-legs that were found to be corroded were strengthened by bracing with angle iron. A flashover was caused in June by a piece of fencing-wire being thrown on to the line.,

Matamata–Waihou.—The half-way A.B.S. was dismantled in March. The telephone-line was damaged through being fouled by a haystacker.

Arapuni–Ngongotaha.—With the new Arapuni–Edgecumbe line in service providing alternative means of supply to Ngongotaha and to the Bay of Plenty substations, it has been possible for the first time to arrange extended shutdowns of the old 50 kV. line for thorough inspection and overhaul. A total of forty-two defective 42 ft. poles has been replaced during the year. An additional line A.B.S. was installed at Mamaku in August to enable the line to be isolated on either side of the substation. An outage was caused by lightning in January, and in the same month a conductor was damaged by pitting when a lineman threw a "metallic" measuring-tape over the conductor when attempting to measure the ground clearances of the telephone-line.

Ngongotaha–Edgecumbe.—A flashover was caused by a broken binder in May, one conductor being burned through. The telephone-line in the sulphur area at Tikitere was renewed in three spans. One corroded wire on the telephone-line in this area broke during the year.

Edgecumbe–Waiotahi.—A flashover occurred between the 50 kV. line and the telephone-line during an exceptionally severe storm in January. Owing mainly to blocked roads and the dislocation of communication systems as well as to trouble on a sectionalizing A.B.S. caused by a blade being blown out of alignment, the line was out of service on this occasion for 10½ hours.

(iii) *11 kV.*

Hamilton–Frankton.—The four circuits at Hamilton substation were changed over to a new take-off structure when the new 11 kV. feeder switchgear was put into service in July. An A.B.S. was installed at pole 124 to enable the feeder supplying the New Zealand Dairy Co. to be isolated if necessary without interfering with supply to the New Zealand Railway susbtation.

Grand Junction Tap Line.—This line is no longer required, and is being dismantled.

(iv) *General.*

Line-maintenance.—Routine work was carried out on the various lines according to schedule. Poles were tested by boring, and grub holes were cleaned out and filled with compound. Insulator testing was carried out on the 110 kV. and 50 kV. lines.

Insulator Replacements.—The results of insulator testing or inspection are as follows:—

——	110 kV. Units.	50 kV. Units.	50 kV. Pin.
Number tested	49,065	11,393	13,852
Number defective by test	..	..	136
Number defective by inspection	6	..	38

Total number tested, 74,310; total number defective, 174; percentage defective, 0·234.

All but nine of the 174 defective insulators were part of shipments of two makes ordered in 1920 and 1924–25 respectively, which are being replaced whenever opportunity permits; 43 were replaced under live-line conditions.

Pole Replacements.—Sixty-eight defective wood poles consisting of 58 I.B. poles, 9 M.A.H. poles, and 1 silver-pine pole were replaced. Of this number, 52 had defective heartwood, including 30 with knot-holes or split timber as well; 10 had decayed or extensive knot-holes; 3 were damaged by fire; and 3 were undersized or slim poles.

(*d*) TESTING.

Routine testing of meters, relays, instruments, batteries, &c., was carried out according to schedule. Hipot tests were made on all 110 kV. and 50 kV. bushings, and six 50 kV. bushings were found defective. Extensive tests were made on sample sets of distance relays of different makes to determine their suitability for use on 110 kV. lines. 11 kV. feeder equipment taken over from the Power Boards at various substations was tested, and the wiring checked.

Installation tests were carried out on new equipment at twelve existing substations, and at two new substations and two new supply-points. A line-drop compensator was made up for the booster transformer at Horahora, and indicators were made up for the booster transformers at all substations to show their range of operation.

At Arapuni summation-metering equipment was designed, constructed, and put into service to indicate and record the total station output. Alterations were made to the reverse power relays to improve their characteristics. Routine resistance tests on the generator stators showed No. 2 stator to be again faulty; monthly tests were made until the generator could be released for rewinding.

(*e*) GENERAL.

Troubles on Department's System.—The following table gives an analysis of troubles experienced in the last three years :—

Description.	Year ending 31st March,		
	1938.	1939.	1940.
6·6 or 11 kV. lines—			
Defects	1	3	1
External causes	3	..	2
33, 50, or 66 kV. lines—			
Defects	5	10	7
External causes	2	3	4
110 kV. lines—			
Defects	..	3	..
External causes	..	..	3
Lightning	11	6	14
Storms, nature of trouble not discovered	2	..	..
5, 6·6, 11, or 22 kV. apparatus	12	6	13
33, 50, or 66 kV. apparatus	6	8	5
110 kV. apparatus	3	2	2
Generators or synchronous condensers	..	1	1
Relays	..	1	5
Control circuits and batteries	..	..	2
Operation: Mistakes	3	8	4
Operation: Accidents	3	2	2
Other causes	..	4	1
Cause unknown or fault not located	..	2	4
Totals	51	59	70

Circuit miles of lines in operation at 31st March, 1940: 11 kV., 75·41; 33 kV., nil; 50 kV., 466·04; 66 kV., nil; 110 kV., 491·92.

Number of substations in service at 31st March, 1940: 11 kV., 3; 33 kV., nil; 50 kV., 18; 66 kV., nil; 110 kV., 4.

Number of consumers: Bulk, 15; wholesale, 5.

Load.—The units generated at Arapuni, Horahora, and King's Wharf totalled 755,114,249, an increase of 24·3 per cent. over the total output in the previous year. Units actually sold (within the district) totalled 522,709,013, compared with 450,205,766 in the previous year. In addition, there was a net supply of 169,055,140 units to the Southern System. Units lost in transmission and distribution amounted to 59,490,343, representing 7·88 per cent. of the total output.

The maximum load on the generating-plants was 144,900 kW., compared with 120,000 kW. in the previous year, and the maximum load excluding supply to the Southern System was 118,300 kW. The average load factor was 59·49 per cent.

The total connected load in the district increased from 598,707 kW. to 688,961 kW., and the demand factor or ratio of maximum load to connected load was 17·17 per cent.

Load Despatching and System Operation.—All departmental generating-stations, King's Wharf and Evans Bay steam-stations, and all other stations owned by supply authorities which have agreements with the Department, operating in the North Island of New Zealand, have been placed under the control of the District Electrical Engineer, Hamilton.

The establishment of this unified control was necessary in order to operate the hydro-stations, together with the steam-stations, in the most economical manner and at the same time carry out the maximum of maintenance-work and ensure that ample generating-capacity was available when and where required.

Load-despatching was commenced on 9th June, 1939, and the unified control has resulted in a marked improvement in the utilizing of available power resources. The output of the hydro-stations has been increased, that of the thermal stations reduced, and maintenance-work on the system increased.

Preliminary data has been obtained and investigating work carried out with a view to taking over the control of switching operations on the system. This will not be possible until further communication channels have been provided.

Full use has been made of the radio transmitters at Mangahao and Waikaremoana in conjunction with a receiver at Hamilton, where a transmitter will also be installed shortly.

B. PALMERSTON NORTH DISTRICT.

1. CONSTRUCTION.

(*a*) POWER-STATIONS.

Mangahao Power-house and Headworks.—During the year the site for two permanent cottages to replace temporary ones at Mangahao No. 1 dam was surveyed and a renovation contract for four cottages, Mangaore Village, was let and practically completed.

New 11 kV. O.C.B.'s have been installed throughout, with the exception of those on Horowhenua Nos. 1 and 2 Feeders and Headworks No. 1. Fourteen have been installed—three to be installed—a total of seventeen.

A new set of 110 kV. potential transformers and new impedance distance type relays are on order.

Waikaremoana Power-house and Headworks.—During the year the erection of new reinforced-concrete social hall and departmental stable has been completed.

The erection of No. 3 unit with its transformer tank and controls was completed during the year, and the machine was tested and placed on load on 7th December, 1939, and, with the exception of the main rotary valve, has given good service.

This valve has been the subject of discussion with the suppliers, who are taking the necessary steps to put it into satisfactory operating order.

No. 3 pipe-line was completed, tested, sand-blasted, and painted, and is now in good order.

The controls for the surge-chamber gates were raised, and a building to house these is to be erected shortly.

The new 400-volt switchboard was erected during the year and put into service.

A new 11 kV. structure for supply to the village, Piripaua, Lake House, and Thomas' Mill has been erected, and supply to the village changed over to a new transformer erected near the office.

A new 11 kV. O.C.B. panel was erected for supply to test tank.

A new 3 ft. rectangular weir was built below the spillway from Lake Kaitawa so that a better check may be kept on the leakage water.

High-speed excitation for Nos. 1 and 2 units is being installed, and the standby exciter has been erected.

New steelwork, O.C.B.s, A.B.S.s, and lightning-arresters for ten new bays of 110 kV. switchgear are all on order, and also for one new 50 kV. bay to supply second line to Ruakituri.

For new power-station at Piripaua, steelwork, transformers, switchgear, turbines, generators, exciter-sets, oil-tanks, oil-filter, crane, workshop outfit, penstock-gates, O.C.B.s, relays and supervisory control equipment, &c., all on order and material arriving, while steady progress is being maintained. The erection of power-house and headworks is under the direction of the District Engineer, Napier.

(*b*) SUBSTATIONS.

Bunnythorpe.—One new cottage and five single-stall garages erected.

Seven 2·5 M.V.A. T.C.O.L. transformers were ordered, and preparations for installation made.

Dannevirke.—Two new 110 kV. bays have been erected during the year, and existing switchgear renovated and a new pad for second transformer put down.

Gisborne.—New distribution board for 400/230 volt supply has been erected.

Transformer-renewal and new bay of switchgear under consideration.

Hawera.—A plan for enlargement of four-roomed cottage to five rooms prepared and tenders invited. Garages completed and bowser installed.

One 3 M.V.A. tap-changing on load three-phase regulating transformer.

Transformer replacement was delayed pending arrival of new transformers for Bunnythorpe Substation.

Khandallah.—Two cottages and two garages (one single-stall and one two-stall) were erected.

The new 20 M.V.A. transformer bank was connected up. Three new 110 kV. O.C.B.s installed on transformer banks. One new 110 kV. O.C.B. installed on Melling Line. Old O.C.B. on Melling Line was re-allocated as bus-tie. Three 110 kV. potential transformers installed. New disconnects for O.C.B.s on Nos. 1 and 2 transformer banks erected. New line relays ordered; line control cables and ducts to suit being installed. Owing to ingress of moisture, alterations were made to new O.C.B.s to prevent recurrence of trouble. 20 M.V.A. synchronous condenser under consideration.

Mangamaire.—Erection of one cottage, four single-stall garages, and one two-stall garage completed.

A new 110 kV. bay erected and new A.B.S.s and switch fuses installed in other bays. A new transformer pad put down in order to shift second transformer to mid-bay position.

Marton.—Material for two 110 kV. bays to hand. The Civil branch is at present installing new traverser track, transformer and tower pads. Two 2,000-gallon oil-tanks on order, also new 11 kV. cable and cable-boxes.

Masterton.—Single-men's quarters erected. New 110 kV. bay; new lightning-arresters; three new 110 kV. potential transformers and 2 new 110 kV. line O.C.B.s erected.

Mataroa.—Plans and specifications prepared for three cottages, one single-men's quarters, and one five-stall garage. The site has been levelled, spoil shifted for access road, improvements made to approach to county road, and access road fenced.

Melling.—Plans and specifications prepared for second cottage and garage. Three 11 kV. panels installed and connected up, and second set of transformer cables installed.

Three new O.C.B.s arrived; required alteration owing to ingress of moisture. Alterations effected; installation in progress.

Transformer pad for new bank in hands of Civil branch also. Extension to switchroom. New 110 kV. relay and control panels, new 11 kV. switchgear and control panels, and new set of metering ordered.

Napier.—Erection of new cottage and garage completed. New A.B.S. for Woodville line duplication erected. Two 10 M.V.A. tap-changing on load-transformer banks; new 110 kV. line O.C.B. New relay and control panels and new 11 kV. switchgear and control panels ordered.

New Plymouth.—New transformer-house erected; new crane delivered and erected. Traverser track in hand.

Ohakune.—Four cottages, single-men's quarters, three two-stall garages at present in course of erection and are due to be completed in July, 1940.

Stratford.—Five M.V.A. 50/33/11 kV. auto transformer bank arrived and dried out ready for service.

Steelwork for extension to 110 kV. bay and for three new 50 kV. bays to hand. Foundations, also installation of traverser track and turntable, with district office of Public Works.

Waipawa.—New well sunk and connected to service; water-supply much improved.

New bay of steelwork with 110 kV. switchgear erected and A.B.S.s in existing bays renewed.

Wairoa.—Investigations have been carried out with a view to shifting this substation to a new site in consequence of its proximity to the Wairoa Aerodrome.

Woodville.—Two 110 kV. bays of steelwork and switchgear erected.

(*c*) PATROL DEPOTS.

Akatarawa.—Erection of two cottages, single men's quarters, and two two-stall garages completed.

Kotemaori.—Erection of two cottages, single men's quarters, and two single-stall and one two-stall garages completed.

Ruakituri.—Erection of two cottages, single men's quarters, a stable, and two single-stall and one two-stall garages completed.

(*d*) TRANSMISSION-LINES.

(i) *110 kV. Lines.*

Khandallah–Featherston.—The section of this line from Melling to Featherston, and the telephone-line, was erected during the year.

Woodville–Featherston.—The section from Masterton to Featherston, including the telephone-line, completed by December, and the whole Melling-Masterton section tested and found correct.

Woodville–Napier Duplication.—Material ordered, tenders invited — construction to start immediately.

Bunnythorpe–Ongarue.—Surveys completed, materials ordered and arriving, and tower-erection proceeding.

(ii) *11 kV. Lines.*

Tuai-Piripaua.—This line and telephone-line put into service.

Palmerston North.—Extension to garage workshop and blacksmith's shop at present under way.

2. OPERATION AND MAINTENANCE.

(*a*) POWER-STATIONS.

Waikaremoana.

Power-house.—Wood, &c., cleaned from machines. Nos. 1 and 2 machines inspected and cleaned and some wedges replaced in generator windings. Joint failed and repaired on drain-valve Larner-Johnson valve No. 2 machine.

Several faulty post insulators replaced on 110 kV. structure, and one 110 kV. O.C.B. bushing overhauled and fitted with new cap.

Inside walls of power-station painted to improve lighting.

Mangahao.

Headworks.—One large slip between Nos. 1 and 2 dams blocked the road, and several smaller slips occurred during the work of clearing. These, with smaller slips at intervals, necessitated fairly heavy maintenance. The total rainfall for the year was as follows: No. 1 dam, 146·67 in.; No. 2 dam, 163·11 in.; No. 3 dam, 109·38 in.; power house, 66·84 in.

Silt and rubbish caused trouble on disperser valve, necessitating repairs on two occasions.

Power-house.—Buckets have required frequent renewals on all units. No. 1 governor pump was fitted with new gears.

Control-board modification has been carried out.

Pipe-line routes have been illuminated and regular patrols maintained.

Lightning caused damage to one Horowhenua regulator, necessitating new leads and bushings. The same storm caused damage to C.T. bushings and busbars on No. 4 generator cubicle.

Installation of new switchgear carried out.

All regular maintenance and tests performed throughout the year.

(*b*) SUBSTATIONS.

Bunnythorpe.—Cracked insulators necessitated replacement of four units. A defective pull rod on one 110 kV. O.C.B. replaced, and indicator repaired. Battery was desludged and new separators fitted. Deadmen and eyebolts installed in preparation for transformer-shifting and an oil-pipe run from store to workshop. Control cable laid in readiness for O.C.B. for Bunnythorpe–Ongarue line.

Dannevirke.—Pump motor rewired and motor overhauled. New C.T.s installed in synchronous condenser cubicle.

Gisborne.—Three 50 kV. post insulators replaced, and 11 kV. switches overhauled.

Hawera.—Potential transformer bushing repaired and 110 kV. bushing on spare transformer replaced. Auto transformer on kVA. meter changed.

Khandallah.—Heating in C.T. chambers of several 11 kV. switches necessitated emptying the compound-filled chambers—tightening connectors, making and fitting lock-nuts to prevent recurrence.

The synchronous condenser bearings gave trouble. They were renewed during the year, but trouble persisted; has now been overcome by introduction of circulating and cooling system (not permanent as yet). Contacts on Hutt Nos. 1 and 2 and railway O.C.B.s required renewal. Oil in O.C.B.s also renewed. Telephone switchboard was made up and installed. Printometer D.C. supply changed over to trickle charger. Special heater tank made up to supply steam for salt-spray testing on insulators. One new transformer tank developed a crack which necessitated emptying of oil and welding. Old lightning-arresters dismantled awaiting renewals. Oil in O.C.B.s, P.T.s, &c., circulated as required.

Mangamaire.—New C.T.s installed on metering. Pull rods were replaced in No. 2 O.C.B. New trip coils installed on No. 2 incoming transformer cubicle.

Outdoor 400 volt and alarm circuits were renewed.

Heavy rain caused ingress of water to condenser air ducts.

Repairs effected to prevent a recurrence of trouble.

Masterton.—Flashover occurred on 11 kV. side of local service transformer; repairs effected.

Marton.—Three post insulators on A.B.S. replaced. Telephone switchboard reconditioned. Fault on auxiliary switch on reclosing mechanism repaired. Transformer taps changed from 112,500 to 110,000.

Melling.—Telephone switchboard made up and installed in substation. New switchgear and renewals installed. Oil circulated as required.

Napier.—Several cracked post insulators on 110 kV. structure replaced. 11 kV. switchgear contacts cleaned and oil filtered as required.

New Plymouth.—Transformer bank was shifted to a temporary position to allow alterations to track and pads to proceed. 11 kV. cables were shifted clear of site of new building.

Okato and Opunake.—A fault caused by contact between wires on temperature protection at Okato due to insulation perishing. Protection removed as installation of additional transformer capacity obviated its necessity at present.

Stratford.—Regular maintenance duties carried out and operation satisfactory. New 50/33/11 transformers dried out.

Waipawa.—Current transformer of increased capacity installed. Wiring of meters and relays renewed throughout. Alterations made to the tripping and alarm circuits.

Wanganui.—Fault on 11 kV. bus-bars due to current transformer failures on Wanganui Nos. 1 and 2 feeders caused considerable damage. Switchgear was by-passed and repairs effected. Hand-trip lever on No. 6 O.C.B. required repairs. Overheating on one blade of No. 14 O.C.B. isolator was due to excess of grease; repairs effected. Transformer taps changed from 112,500 to 110,000.

Woodville.—Failure of post insulators on No. 38 O.C.B. isolating-switch resulted in damage to control wires (in conduit); post insulators changed and new conduit and wiring installed. Pull rod on No. 2 O.C.B. failed, and was renewed. Other defective post insulators on O.C.B. isolators changed. Extensive alterations in progress.

General.—Throughout maintenance duties have been regularly attended to; in particular, oil tests and oil filtering and circulation carried out as required and "Hipot" tests on bushings taken.

(*c*) TRANSMISSION-LINES.

(i) *110 kV.*

Mangahao–Khandallah Duplicate Lines.—Insulator testing and cleaning, with numerous replacements, required for higher insulation were thoroughly executed during the year. New strands were required in red-phase conductor at pole 84. Several weights with cracked hooks required replacements. Faulty conductor at pole 79 replaced. Rusty lower members throughout were scraped clean and painted. Several poles required straightening.

Telephone-line: Alterations required at Onslow Road; requiring a new pole. A new hut was erected at Brandons, and lightning-arresters installed on both lines. Broken leads at Manawatu, Manakau, and Brandons Huts repaired, also a break between Horokiwi and Brandons. A pole was shifted at Waikanae River crossing to avoid erosion.

Khandallah–Melling.—Insulator tests and cleaning completed throughout. Insulators changed as required. During overhaul U bolts were changed on tower 24, and tiedowns on tower 25 and chafers on tower 17 replaced. Guard for aerial ropeway at McCurdys re-erected and poles reguyed.

Telephone-line, including Melling–Masterton Section: Broken insulator replaced near Browns and broken binders replaced on tree section, Rimutaka. Telephone-line deviation at Khandallah (State housing) required and carried out. Telephone-lines run at Akatarawa Depot.

Mangahao–Bunnythorpe Duplicate Lines.—Pole-to-pole inspection made; insulators tested, cleaned, and renewed as required. Tracks and culverts attended to. Weights replaced due to broken hooks on P. 262.

New blocks to H poles 197, 218. Turnbuckles on 197 and 198, 218 and 219.

Two strings, broken by stones, replaced.

Telephone-line: Two defective poles replaced. Alterations made at Bunnythorpe to suit Power Board extensions.

Bunnythorpe–Marton–Wanganui.—Overhaul subsequent to pole-to-pole inspection made. Insulators tested and defective units replaced. Wires changed over at poles 105 and 106 to allow pile-driving for bridge over Makino stream; reverted to normal upon completion. Pole 74 at Oroua River shifted back 1 chain due to erosion following heavy flood.

A fault causing interruption was due to geophysical surveyors shooting a wire over 110 kV. line.

Telephone-line: Subsequent to inspection throughout the year, sixteen poles were replaced and sixteen other cross-arms renewed.

Fault due to broken jumper repaired. Deviation to line made at Whales' property. The Bonny and Turakina Huts rewired. Pole at Kakariki washed out; replaced in new position. A 52 ft. pole erected at Kiwitea Stream, and new pole on Wing's property. Line deviated near pole 350. A fault due to an elevator fouling the line was repaired.

Wanganui–Hawera–Stratford.—Regularly patrolled. Insulators tested throughout and defective units replaced. Bracing refitted on structure 96. Conductor renewed at tower 29 following on flashover damage. Internal bracing of structure 166 repaired. Repairs were effected to A.B.S. at Waverley, and weights were changed on structure 583. A fault occurred at Wanganui River due to a suicide.

Telephone-line: A fault due to sagging of wires from heat of gorse fire repaired. Several telephone cross-arms were replaced, and trees cut back where required.

Stratford–Pohukura.—One fault, due to lightning flashover at tower 200 (blue-phase No. 8 unit damaged) repaired. Insulators tested, and defective units replaced.

Telephone-line: Sag at tower 186 adjusted. Pole-to-pole inspection made, and several days spent on line overhaul.

Bunnythorpe–Woodville.—Pole-to-pole inspection made. Insulators tested, and defective units replaced. Four broken strings replaced. Heavy track-maintenance required on this section during bad weather.

Telephone-line: Four defective poles were replaced and others desapped.

Woodville–Masterton.—Pole-to-pole inspection made. Insulators tested throughout, and defective units replaced. A track over Burney Hill made to give better access to line with truck. Cross-braces repaired at pole 1233, line (9). Weights replaced due to broken hooks.

Telephone-line: Pole-to-pole inspection with subsequent overhaul. All copper sleeves cut out; several cross-arms replaced and huts attended to. Poles were replaced. A broken cross-arm and leakage at Bruce's Hut caused interruptions. Snow loading on Power Board lines causing contact with telephone-line and a wireless aerial fouling line caused other interruptions. Floor in Toss' Hut replaned. The No. 8 S.W.G. near Hukanui replaced by stranded wire. Six poles replaced, and defective insulators on another four poles replaced. Due to erosion of Mangatainoka River, ten poles were moved back nearer to main line.

Woodville–Dannevirke–Waipawa–Napier.—Pole-to-pole inspection, insulator testing, and subsequent replacements. Defective strings on forty-five poles of Dannevirke Hill section replaced. Metal caps on pole tops completed.

Telephone-lines: Pole-to-pole inspection and overhaul. One fault repaired and three poles replaced.

Napier–Waikaremoana Duplicate Lines.—An earthquake caused breakage of post insulators on Pihanui section switch; posts changed also on isolating-switches at Waikoau, Kotemaori, and Pihanui. Conductors examined for vibration breaks, and several found. Dampers of the "by-pass" type were fitted to this line in the summer of 1937–38, while at the same time all broken strands were replaced and in bad cases new pieces of cable let in. An examination of the cable in February, 1940, revealed the presence of further breaks, and these have been replaced. The evidence indicates that the breaks recently discovered were either old breaks which were missed during the installation of the dampers or breaks which were partially completed at the time of installation of dampers, and have subsequently extended to completion.

Telephone-line: A short deviation made at Mohaka River to avoid slipping country, and one pole replaced at peg 305.

(ii) *50 kV. Lines.*

Stratford – New Plymouth.—Insulators tested and defective units changed. Parallel groove-clamp bolts on four strain poles changed. Cross-arm renewed on pole 15. Pole 182 came over, due to drain close by breaking away. Pole replumbed and strutted across drain. Pole 142 blocked. Broken binder pole 45 (yellow phase) replaced. A shattered insulator renewed and cross-arm replaced. Pole 124 stubbed due to a bad knot; pole 247 replaced, and several others desapped.

Telephone-line: Pole-to-pole inspection and overhaul made. Insulators shattered by rifle fire replaced.

Waikaremoana–Gisborne.—Insulators tested and changed were necessary. Post insulators changed on isolating-switches at Ruakituri, Tiniroto, and Hangaroa.

Telephone-line: Damaged horn gap; lightning-arrester replaced. Lightning damaged insulators on sectionalizing switch at Ruakituri, which had to be replaced.

Waikaremoana–Wairoa.—Line deviated at Piripaua to avoid canal, and the drastic overhaul of this line has now been completed, a certain amount being done under live-line conditions.

(iii) *Distribution.*

Khandallah (11 kV. Lines).—New A.B.S. erected on structure for Hutt feeders; repairs effected to damaged railway feeders. Some poles required strutting due to road alterations, and position of pole 14 changed. Deviation of lines through State housing settlement made. Pole 85, railway-line, desapped and cross-arm refitted.

(iv) *General.*

(1) *Khandallah High-tension Testing-set.*—When in use this set was chiefly required for retests on insulators found defective in live-line testing.

In addition, sample strain and suspension insulators have been subjected to test.

Salt spray, rain, and flashover tests carried out for comparison on two types of 11 kV. insulators submitted.

Tests on 11 kV. strain insulators and comparative tests on two types of 11 kV. strain.

(2) *Insulator Deterioration.*—Live-line testing of insulators gave the following results:—

——	Pin.	Strain.	Suspension.	Total.
Total number tested—				
110 kV.	..	15,915	76,736	92,651
50 kV.	3,234	1,938	1,219	6,391
Number defective—				
110 kV.	..	2	257	259
50 kV.	13	..	..	13
Percentage defective—				
110 kV.	..	0·013	0·33	0·28
50 kV.	0·40	..	..	0·20

(*d*) COMMUNICATION SYSTEM.

Test Department carried out periodical tests and inspection of high-tension telephone equipment at power-stations and substations.

Owing to the non-delivery of neophones, the signalling-system is at present only temporarily connected into service, but is functioning satisfactorily.

The operation of radio-phone channel has been quite satisfactory, and arrangements are in hand to install additional band to cover poor-reception period. Improved communication between Mangahao and Arapuni has resulted from the installation on No. 4 telephone-line at Stratford Substation of telephone with ringing repeater.

The standardization of telephone and alarm-circuit apparatus at all substations is proceeding.

(*e*) TEST DEPARTMENT.

Acceptance and installation tests were conducted on new equipment prior to going into service, in particular on No. 3 unit at Tuai. These tests included governor speed-rise tests, efficiency tests, and exciter-response tests. The Test Department also assisted at Tuai in the installation of control panels and excitation equipment generally.

All requisite maintenance tests were conducted throughout the year on revenue and demand-metering equipment, indicating and recording instruments, relays, batteries, and battery-charging equipment at both power-stations and all substations.

A considerable amount of testing and repair work, involving recoverable charges, was carried out for various consumers.

Preparation made at various points for the installation of new relay equipment delivery of which is now overdue.

Owing to growth of load, higher-rates current-transformers have been installed at several substations, and a periodical survey of load conditions made.

The routine six-monthly megger tests, made by the field staffs, on all system apparatus were graphed and analysed, and further action taken where necessary. "Hipot" stick tests were made on practically all of the system 110 kV. and 50 kV. bushings. Eight doubtful bushings were removed from service for overhaul.

Special field tests on protective apparatus involved in certain system interruptions have been conducted and reports submitted.

Maintenance repairs on printometers, contactors, meters, relays, fuses, and various instruments, involving subsequent tests and recalibrations, have been conducted systematically, and all equipment maintained in good condition.

(*f*) GENERAL.

(1) *Load.*—The maximum load on the system was 94,900 kW., compared with 76,250 kW. last year. The output 507,649,049 units, compared with 434,016,391.

Comparative results are:—

——	Year ending 31st March,	
	1939.	1940.
System maximum demand (kW.)	76,250	94,900
Percentage increase for year	24·8	24·5
Net system unit output	434,016,391	507,649,049
Percentage increase for year	20·8	17·0
Annual load factor	64·9	60·9

The Mangahao–Waikaremoana system was again operated in parallel with the Arapuni system throughout the year. The following table gives interchange of power for this year and last year:—

	Year ended 31st March,	
	1939.	1940.
Supply from Arapuni—		
Maximum demand (kW.)	36,000	40,080
Units purchased	106,042,550	169,506,740
Supply to Arapuni—		
Maximum demand (kW.)	15,720	14,520
Units sold	329,000	451,600

(2) *Reliability of Supply.*—During the year there were in all fifty-six faults on the department's system, fifteen of which caused no interruption. The following is a comparative analysis of troubles for the past four years.

Analysis of Troubles on Department's System for the Four Years ended 31st March, 1940.

Description.	Year ended 31st March,			
	1937.	1938.	1939.	1940.
6·6 or 11 kV. lines—				
Defects	3	..	..	1
External causes	..	..	..	5
33, 50, or 66 kV. lines—				
Defects	1	1	3	..
External causes	..	..	1	1
110 kV. lines—				
Defects	..	..	..	..
External causes	6	2	4	4
Lightning	5	7	8	10
Storms: Nature of trouble not discovered	..	..	4	2
6·6, 11, or 22 kV. apparatus	6	3	1	5
33, 50, or 66 kV. apparatus	1	1	1	1
110 kV. apparatus	4	6	2	2
Generators or synchronous condensers	..	..	..	..
Relays	..	4	1	..
Control circuits and batteries	..	1	..	..
Operation mistakes	2	4	7	3
Operation accidents	2	1	1	..
Other causes	..	8	17	14
Cause unknown	4	2	4	8
Totals	34	40	54	56

SOUTH ISLAND ELECTRIC-POWER SUPPLY.

Introductory.

The year ended 31st March, 1940, was the twenty-fifth year of operation of the Lake Coleridge undertaking, and the fifth complete year of operation of the Waitaki Scheme. It also represented the second year of operation since taking over the Arnold River Scheme and the fourth year since taking over the Monowai Scheme.

The above stations, with the Dobson Diesel Station when required, have been in parallel most of the period.

1. Capital Outlay.

The capital outlay at 31st March was £6,936,917, of which assets to the value of £209,057 were not in operation.

2. Financial Results.

The total revenue for the year was £613,612, and working-expenses totalled £174,959, making a gross profit of £438,653, which equals a return of 6·52 per cent. on the average capital outlay in operation.

The interest-charge for the year was £246,919, which, together with depreciation £124,931, was met from revenue, leaving an amount £66,802 available for the sinking fund this year. The deficiency of this account was £252,671 at the end of the year.

The accumulated depreciation reserve and sinking funds at the 31st March, 1940, amounted to £1,172,631, and the Reserve Fund £87,199.

Table I gives full particulars of the financial results and also statistical returns of operations for the year.

The detailed operating-costs given in Table III show the total cost per unit generated for the year as 0·1135d., compared with 0·1381d. for the previous year, a decrease of 17·81 per cent.

The cost per unit water power was 0·0196d. and Diesel power 1·9949d.

3. General.

The total units generated (including supply from Dobson Diesel Station) were 369,658,515, representing an increase of 13·27 per cent. on those of last year. Of these units, 285,122,362 were sold by Christchurch District and 26,111,957 by Southland District, while 4,050,664 were otherwise accounted for. The balance of 54,373,532 units represents transmission and distribution losses, and amounted to 14·7 per cent. of the units generated.

The maximum system load increased from 69,610 kW. to 76,660 kW., including Monowai, an increase of 10·12 per cent. The average system load factor was 55·39 per cent., including supply to Monowai district. Excluding Monowai, the system load was 70,060, an increase of 15·75 per cent., and the corresponding load factor 55·78 per cent.

A. CHRISTCHURCH DISTRICT.

4. Construction, Operation, and Maintenance.

(1) Construction.

(*a*) *Power-stations.*

Lake Coleridge Power-station.—The contract for the erection of six dwellings, seven garages, and a social hall was completed during the winter. A six-stall garage was constructed on the pipe-line flat, and, in addition, five individual and one two-stall garages were erected by the Department.

Continuous water-level indicator to the control-room was installed in No. 1 surge chamber in December.

Waitaki Power-station.—New construction work in connection with the two new units was commenced during the year. Eighteen cottages, a number of huts, and tents for the accommodation of the erecting staff were completed.

One set of stop logs for the suction-tube were made and Nos. 3 and 4 suction-tubes were dewatered and prepared for turbine erection.

No. 3 turbine was set in position and concrete poured to floor-level. No. 3 rotor has been assembled, and the stator is being jointed. Two banks of 11/110 kV. transformers have been dried out and are being erected. The steelwork extension to the outdoor station was erected and switches and overhead wiring completed.

In the village three new houses have been completed. Eight single garages and two five-stall garages are being erected.

Arnold Power-station.—Repairs to Kaimata Dam and alterations to the design of the surge chamber were completed.

(*b*) *Substations.*

At Addington the installation of a new 20,000 kVA. Metro-Vick. transformer-bank and a new ASEA 66/33 kV. 5,000 kVA. transformer-bank were nearly completed.

At Timaru the new ASEA 7,500 kVA., 110/11 kV. automatic tap-changing transformer-bank was installed. The existing pads were altered, and also the connections between the top and bottom busses on the outdoor steel structure, to permit the energizing of the top bus at 110 kV. for supply to the new bank.

The tap-changing and control panels were installed in the switch-room.

A temporary bus, as an adjunct to the bottom bus, was erected for improved flexibility. The new bank was put into operation on 29th April, 1939.

At Glenavy seventy insulators on the outdoor structure were replaced.

At Palmerston, supply was given to the Otago Power Board on 1st May, 1939. Lightning-arrester gaps were fitted, and an English Electric voltage regulator installed.

At Southbrook additional 33 kV. switchgear was erected.

The Waipara Substation was almost completed at the end of the year.

(*c*) *Transmission-lines.*

Work was completed on the Southbrook–Culverden 33 kV. line, Waipara Substation being livened up on 19th December, 1939.

The poles were distributed to several railroad stations for the Timaru–Ashburton 110 kV. line.

The 11 kV. line at the Causeway (Sumner Borough Supply) was rebuilt on the seaward side of the Causeway and the original line dismantled.

The 11 kV. substation at Belfast was erected for additional supply to Waimairi County Council.

Two 11 kV. 0·2 cables and two pilot cables were laid and jointed between Addington and Milton Street, and switchgear at Jerrold Street Substation.

(*d*) *Telephone System.*

A new cordless telephone-exchange was provided for Lake Coleridge control-room and placed in service in August.

(*e*) *Test Department.*

Final field-tests were made at the Palmerston South Substation.

Switchgear and metering equipment was installed in the Arahura and Ngahere Dredges, and local service was installed in the latter.

Cable-pressure tests were carried out for the New Zealand Railways Car and Wagon Department, and metering was installed and tested.

An O.C.B. voltage regulator and control panel were installed at the Waipara Substation, as well as metering and local service.

The phasing of new supply was checked for the Westland Power Co.

Temporary installation was effected of drawout truck and metering for the Kanieri Electric Co.

At the Arahura Substation installation and field-tests of 5,000 kVA. synchronous condenser were effected.

Ironclad switchgear ex Kaiata Substation was re-erected at the Blackwater Substation, together with local service panel and 32 v. battery.

Installation of 7,500 kVA. on load tap-changing transformer was effected at Timaru Substation.

At Lake Coleridge the construction and installation of water-level indicator, telephone-exchange, and telephone relay panel were carried out.

Intercoil connections were made on No. 3 machine at Waitaki Power-station.

Telephone-exchange was made and installed at Gore Substation, and two indoor 66 kV. C.T.'s were converted for outdoor use.

Work for other Departments.—In connection with the Centennial Exhibition a synchronized lighting scheme was devised, made, and installed for the model of Canterbury.

For the Riccarton Borough Council the new switchgear in the Foster Street Substation was tested.

For Burnham Military Camp a fire-alarm system and a hospital annunciator board were made.

At Wigram Aerodrome three permanent 11 kV. substations were established, a considerable extension of 400 volt underground reticulation was completed, a standby Diesel-driven alternator was erected, and an automatic water-heater load-controller was devised and made.

A four-panel sheet-steel switchboard was assembled and erected in the Electrical and Wireless School.

During the year 214 test reports were made and 59 drawings were completed. In addition, the draughting staff have been supervising work at Wigram.

(*f*) *Survey.*

Surveying and pegging of the Hororata–Highbank and Ashburton–Timaru lines were completed. Stub setting was also carried out for the Hororata–Highbank line.

(*g*) *West Coast Electrification.*

The West Coast system has been paralleled with the Waitaki–Coleridge system, and has functioned satisfactorily. There have been a few interruptions due to snow on the Coleridge–Otira 66 kV. transmission-lines.

Substations.—At Otira part of the outdoor structure has been erected and the substation building completed. Four cottages, four single-stall garages, and two two-stall garages are nearing completion.

At Blackwater new 11 kV. switchgear for the Power Board and dredge has been installed.

Ngahere Substation was completed and livened up on 10th December, 1939.

(*h*) *Defence Works.*

Wigram Aerodrome.—At Galway Crescent and officers quarters subs. were installed, and underground cable was installed as required to supply the buildings.

Burnham Military Camp.—Full reticulation and wiring of hutments were carried out. This required the erection of 183 poles, 3½ miles of reticulation, and 125 services from mains.

In view of the urgency of this camp, the work was carried out with all available linemen, wiremen, and erection gangs, including artisans loaned by the Ashburton Power Board, private contractors, and the Christchurch City Council, to give supply to the various buildings as they were ready for occupation. It was necessary to have a gang of wiremen and linemen there continuously for the six months of construction.

Other work for defence purposes included a 3 kV. line to Godley Head from Sumner; the temporary supply, laying, and jointing of 11 kV. cables at Wigram Aerodrome; full reticulation and wiring of Burnham Military Camp; and the commencement of the 33 kV. substation and 11 kV. lines and reticulation at Harewood Aerodrome.

(2) Operation and Maintenance.

(*a*) *Power-stations.*

General.—During the year the Lake Coleridge and Waitaki stations operated in parallel satisfactorily with Waipori and Monowai as required. Lake Coleridge and Waitaki were separated on three occasions, due once to fault conditions on lines, once for time correction (pre-arranged), and once in connection with work for the installation of a new unit.

Monowai was paralleled with the system on 8th May, 1939, but was off the main system several times before finally shutting down for repairs on 4th November, 1939. One machine came in again for a few hours on 22nd and 24th March.

Arnold river, after a lengthy shut down, was paralleled with the system again on 23rd May, 1939.

The Dobson Diesel Station was used to assist over peaks and to conserve water between 16th May, 1939, and 1st September, 1939.

Lake Coleridge Power-station.—Work was continued on several new protective groynes, and on repairing others, along the west bank of the Harper, and down-stream from the main diversion groyne. Later, road-repair work was undertaken.

Heavy snowfalls were experienced, the melting of which relieved the water shortage. The minimum level reached was 1,665·75 ft. on 27th August, 1939, but recovery was rapid and overflow commenced in November.

On 29th February, 1940, there occurred the highest flood so far recorded in the Rakaia, Wilberforce, and Harper Rivers. Extensive damage was done to groyne-work on the Harper.

Except for a temporary blockage due to a flood on 13th January, 1940, the Acheron diversion has functioned successfully. Scooping operations on shingle were carried out at the Intake until September.

No. 1 Machine: Sealing-rings of 42 in. Sewar valve replaced with hard rubber rings made in Christchurch. In January the relief valve was overhauled, runner inspected, and projecting concrete chipped away in outlet duct.

Nos. 2 and 3 Machines: Minor adjustments to governors. No. 3 machine broke down 30th July, 1939, due to snow being drawn in with ventilating air. Means are being taken to avoid a similar occurrence in the future. A new English Electric steel runner was fitted in Christchurch during the shut down and the governor and Larner Johnson valve were overhauled.

No. 5 Machine: In February portions of the stator laminations broke away, cutting one of the stator coils, which was replaced.

Nos. 6 and 7 Machines: Main gates were dismantled and repair work carried out. No. 7 turbine was completely overhauled, governor overhauled, and the generator windings were cleaned and varnished.

No. 9 Machine: Shut down, clearances of turbine runner adjusted, thrust ball-race tracks reground, and new balls fitted, &c. Stator windings cleaned, and steps taken to prevent oil being drawn into the windings.

Switchgear, Transformers, and Telephone-lines: Routine tests were carried out, including megger tests on switchgear, inspection of O.C.B.'s, oil-filtration, &c.

The two remaining generator panels were provided with D.T.L. relays.

Waitaki Power-station.—Apart from routine attention, no repairs have been necessary on the turbines, generators, transformers, switchgear, and auxiliary turbines and generators. Twenty-nine defective pillar insulators were replaced on the outdoor structure. On the headgates the filling-valve spindles of No. 1B and No. 2C were renewed.

The average monthly river-flow varied from 4,164 to 26,366 cusecs.

On 1st March, 1940, the river-flow was 70,600 cusecs, the highest since the completion of the dam. Over the crest of the dam 5 ft. 11½ in. were registered, and the maximum tailrace was 694 ft. 6 in., 5 ft. 6 in. over the stop-log platform. No damage was caused by the flood, a certain amount of scouring has taken place in the tailrace, and the general level is a few inches lower. Maximum lake-level was at midnight, 1st March, 1940, the level being 758 ft. 11½ in.

The expansion joints in the dam were filled with bitumen and galleries and water-channels cleaned out.

Automatic lake-level recorders at Lakes Ohau, Pukaki, and Tekapo were inspected periodically. The recorder at Lake Tekapo stopped during September, and was restarted in October.

(*b*) *Substations.*

General maintenance and operating was carried out at all substations.

(*c*) *Transmission-lines.*

A general overhaul of all transmission and distribution lines was carried out, including tree-cutting, testing and renewal of decayed poles, replacing of all defective insulators, and attention to breakdowns and prompt restoring of power.

All 33 kV., 66 kV., and 110 kV. insulators, with the exception of the lines with O.B. insulators (which in the past have performed to almost 100-per-cent. efficiency) have been tested.

During the year 35 poles were renewed, of which 8 were renewed by live-line methods, and 408 insulators were replaced, of which 18 were replaced by live-line methods.

Altogether 73,429 insulators were live-line tested, of which 789 were defective.

The number of defective insulators this year is greater than in other years, and these insulators are mainly Bullers. The cause of this may be the late starting of testing owing to Defence activities, associated with the severity of last winter and the exceptionally dry summer.

After exceptional snow and rains, the tower footings on Mount Misery started falling away, and after unsuccessful attempts to repair them with rocks and boulders as used at first, a gang of workmen proceeded to make permanent repairs with netting and rock.

The reconstruction of the Foster Street Substation, supplying Riccarton Borough Council, was carried out.

The charring of knots in poles has been carried out on the Culverden line, and new Ashburton–Timaru line poles, with satisfactory results.

Work done for outside bodies includes deviation of traction 11 kV. feeders at Waltham yard for Railway Department, oil-filtering for Riccarton Borough Council, Lyttelton Harbour Board, and National Broadcasting Station 3YA at Gebbies Pass.

(*d*) *Test Department.*

Full test and inspection of O.C.B.'s to schedule was not possible, but all O.C.B.'s reaching 100 fault marks were inspected and reconditioned where necessary and where maintenance was lagging most. The relays were tested, and the quarterly tests of M.V. switchgear at Addington and Timaru were conducted.

Bulk-supply meters received regular attention, and clockwork overhaul is now being done by the staff instead of outside firms.

Repairs were made to Arahura and Dobson switchgear following lightning damage.

All insulators removed from lines following field tests were tested before being destroyed.

Inspection of electrical installations supplied direct has been carried out as required.

(3) Rainfall and Lake Levels, Year ended 31st March.

The maximum flow at Waitaki for the year was 70,600 cusecs on 1st March, 1940, while the minimum flow 3,800 cusecs was on 8th August, 1939.

Lake Coleridge rainfall was 23·89 in.; Harper rainfall was 23·89 in.; Waitaki rainfall was 17·44 in.

These rainfalls are considerably below the average.

B. INVERCARGILL DISTRICT.

1. Capital Outlay.

All assets, representing a capital outlay of £1,661,747, were in operation at 31st March, 1940.

2. Gross Revenue.

Comparative statement covering two years' operations :—

	Units sold.		Revenue.	
	1938–39.	1939–40.	1938–39.	1939–40.
			£	£
Domestic	5,670,000	6,525,225	64,717	66,216
Commercial*	2,478,335	2,666,850	29,448	28,482
Industrial	7,065,067	6,847,280	29,245	28,072
Bulk for resale	8,480,823	10,072,602	23,035	25,279
	23,694,225	26,111,957	146,445	148,049

* Includes business premises, motors for rural power, departmental use, and street lighting.

3. Consumers and Tariffs.

Consumers increased by 431.

Connected load increased by 3,884 kW.

As a result of the reduction in retail tariff made by the Hon. the Minister of Public Works the domestic consumption increased by 855,225 units or 15·08 per cent.

4. Construction, Operation, and Maintenance.

(1) Construction.

(*a*) *Power-station and Headworks.*

The generating-plant at Monowai was shut down from 4th November, 1939, to 1st April, 1940, for a major overhaul.

The main pipe-line was scraped and painted, and repairs were made to the concrete work at the intake gates and at the surge chamber.

The generators and turbines were overhauled and painted. All electrical gear was overhauled.

(*b*) *Substations.*

Gore Substation.—A 66 kV. synchronizing P.T. was installed on the Winton line. A structure was erected to suspend the 110 kV. lightning-arresters. A new local service panel and transformer were installed. A new 11 kV. feeder take-off structure was erected. A climb-proof fence was built round the outdoor switchgear.

Invercargill Substation.—Transformer pads were placed in readiness for the new 66/11 kV. transformers.

(*c*) *Transmission-lines.*

Half-way Bush - Gore 110 kV. Line.—Weight-hanging and clean-up work on this line has been completed.

Winton–Invercargill and Winton–Gore 66 kV. Line.—The double-circuit part of this line, 90 chains between Winton Substation and Gap Road, has been rebuilt.

(*d*) *Telephone System.*

The trunk telephone system has been extended to Winton, mainly on the Railway Department's poles. To bridge the gap between Winton and Monowai will require the construction of a 45-mile line across country, and 13½ miles of this line have been completed.

(*e*) *Distribution.*

Ten miles of 11 kV. lines were erected and ½ mile removed. One mile of additional 3·3 kV. line was erected. As some of this H.T. was erected in the place of L.T., and further, as extra transformers were erected, the total length of L.T. line in the system was decreased by 6 miles.

An extra thirty transformers were erected, increasing the transformer-capacity of the system by 615 kVA.

(f) Operators' and Faultsmens' Accommodation.

Extensive building work has been done during the year.

Two new cottages and a communal garage were erected at Monowai, and nine huts were renovated, as were other houses in the village. A septic tank was constructed.

At Invercargill Substation three houses and single-men's quarters were erected and two new cottages and single-men's quarters are being built at Gore.

A house was purchased for the Distribution Engineer at Winton.

A faultsman's cottage and combination garage and store have been erected at Waimahaka, and combination garage-store built for faultsmen at Riverton and Otautau.

(2) Operation and Maintenance.

(a) Power-house and Headworks.

Until 8th May, 1939, the Gore load was carried by the Coleridge system, leaving Monowai to supply the rest of Southland. On 8th May the two systems were put in parallel, and from that date until the station was shut down for overhaul on 4th November, Monowai ran almost continually at full load, supplying the surplus power to the northern system.

Trouble was experienced with voltage regulation at Monowai at low-power factors when in parallel with the main system.

The cable from the power-house to the substation, supplying the south bank of transformers, broke down on two occasions, and a temporary overhead line has been erected in its place.

On the 1st April, 1940, when the station took up load after overhaul, the lake-level was at its maximum.

(b) Substations.

On two occasions surges following faults in the northern system caused an O.C.B. at Winton to operate and resulted in interruption. The whole Southland system was without power for eight minutes following a line-fault near Glenavy in December.

66 kV. fuses blowing at Winton and Ohai caused interruptions at these substations. 66 kV. O.C.B.'s at Winton have been overhauled, as were the 11 kV. O.C.B.'s at Winton, Gore, and Invercargill.

(c) Transmission-lines.

Overhaul work was continued on the Gore–Winton 66 kV. line, and a large number of poles replaced in the Invercargill–Winton 66 kV. line. An aeroplane fouled this line on 3rd June, 1939, and caused a serious interruption to the power-supply of Invercargill.

(d) Distribution-lines.

Overhaul work on a section-by-section basis has been continued on the 11 kV. and low-tension lines during the year, although depletion of staff and lack of material owing to the war have hampered this work.

(e) Consumers' Installations.

During the year all the range consumers' metering has been altered so as to allow them to take advantage of the new tariff. Satisfactory progress has been made with re-inspection work.

(f) General.

Overhauling of distribution transformers was continued. Tests were made on consumers, appliances, on relays, on gloves, and on large numbers of consumers' meters. Earth testing and improving were carried on throughout the year.

A pole-factory has been built at Winton, primarily for the construction of 35 ft., 30 ft., and 25 ft. poles, but with provision for manufacture of 42 ft. and 50 ft. poles. Production was commenced during March, 1940, and six 35 ft. poles were turned out. More moulds are under construction, and it is expected that all requirements in 35 ft., 30 ft., and 25 ft. poles will be met by the output of this factory.

(g) Units Generated and Purchased.

Generated at Monowai	27,189,142
Of these supplied to Waitaki Coleridge	8,513,226
Supplied to Southland from Waitaki Coleridge	15,555,741
Generated at Invercargill Steam Station	29,313
Southland System—Total	34,260,970

REGISTRATION OF ELECTRICAL WIREMEN.

Two examinations for electrical wiremen and two for electrical servicemen were held during the year. There were 527 candidates for the written part of the wiremen's examination and 113 candidates for the written part of the servicemen's examination. There were 355 candidates for the practical part of the wiremen's examination and 99 candidates for the practical part of the servicemen's examination. The number of candidates sitting for the September, 1939, examination was the highest on record. One hundred and eighty candidates passed the written part of the two wiremen's examinations and thirty-eight passed the written part of the two servicemen's examinations. One hundred and eighty-three candidates passed the practical part of the two wiremen's examinations and sixty passed the practical part of the two servicemen's examinations.

The results of the servicemen's examinations, taken as a whole, continue at a high level, but the results of the wiremen's examinations are still very disappointing. In the practical part of the wiremen's examination a large number of candidates fail to obtain a reasonable number of marks for measurements; bending and setting of conduit; cutting, screwing, and cleaning the ends of conduit; connections; and the wiring-up of the plug-sockets.

The time for the practical part of the wiremen's examination was extended to four hours in September, 1937, and the results were so successful that it was decided to apply the extended time to the written part of the wiremen's examination in September, 1939. The results with the written part, however, were not satisfactory, and the three-hour period was reverted to in March, 1940.

No less than ten consumers were prosecuted during the year for doing their own wiring; four salesmen were prosecuted for doing wiring; one consumer was prosecuted for failing to give information which might lead to the identification of the person who did wiring; one manufacturer was prosecuted for failing to keep a record of assembly and repair work and for failing to have the work inspected; and seven contractors were prosecuted for failing to notify the Electrical Supply Authority of intention to carry out electrical wiring.

The installation by incompetent persons of radio sets and electrical domestic equipment, such as washing-machines, &c., continues to give concern. Endeavours have been maintained to rectify the position, and it can be said that at present much better circumstances prevail than was the case a few years ago. The question of properly testing radio sets before leaving the factory was taken up with the manufacturers, and attention was directed to the statutory requirements that assembly and repair work must be inspected and tested by a registered or licensed wireman.

Information regarding registration was forwarded to the technical schools for the guidance of students, and further efforts have been made to deal with apprenticeships to the electrical wiring trade.

The statistics for the year ended 31st March, 1940, are set out below (the figures in parentheses are for the previous year):—

Number of meetings	17	(18)
Registrations—		
Inspectors	38	(51)
Wiremen—		
Full registration	123	(115)
Limited registration	85	(97)
Provisional licenses	64	(34)
Temporary permits	18	(15)
Examinations—		
Wiremen's—		
Candidates—		
Written part	527	(449)
Practical part	355	(311)
Passed—		
Written part	180	(110)
Practical part	183	(164)
Highest marks—		
Written part	91	(89)
Practical part	93	(91)
Servicemen's—		
Candidates—		
Written part	113	(108)
Practical part	99	(82)
Passed—		
Written part	38	(54)
Practical part	60	(52)
Highest marks—		
Written part	89	(84)
Practical part	95	(91)
Defective work reports	51	(17)
Endorsements made	2	(3)
Endorsements removed	3	(3)
Breach of Act reports	59	(102)
Prosecutions authorized	36	(59)

DESIGN OFFICE.

Electrical Section.

In the year under review a large amount of detail design work was carried out for new power-stations for Highbank and Waikaremoana Lower Development, and extensions to existing power-stations at Arapuni, Waitaki, and Waikaremoana. Preliminary design work was carried out for the proposed new power-station and outdoor station at Karapiro.

The continued growth of load called for a further review of the installed transformer capacities at all substations. An extensive programme was drawn up for increasing the installed transformer capacities to meet anticipated demands, the displaced banks at larger substations being utilized as far as possible to augment the capacity at smaller substations.

The increasing demand on the power systems is necessitating the replacement of much of the older switchgear. The position has been accentuated by the fact that most of the older types of switchgear, which were purchased before the manufacturers had facilities for testing under short-circuit conditions, have had to be derated as a result of subsequent tests.

A standard type of control panel has been developed for electrically-operated switchgear. This is of sheet steel with miniature instruments, uniform types of control switches and indicators, and, as far as possible, uniform wiring, the panel being finished in a colour which will relieve eye-strain.

Hamilton District.

Arapuni Power-station.—Drawings were prepared for switchgear and other equipment required for Nos. 5 and 6 generating-units and the two additional outgoing lines.

Karapiro Power-station.—A preliminary design was prepared for the generating-station and outdoor station. The layout provides for three similar generating-units, each of which will be larger in electrical output and in physical dimensions than any other generating unit in the Dominion. The main turbines will be the Kaplan or variable pitch propellor type.

Buildings were designed for Mount Roskill substation and a workshop building for Henderson substation.

An extensive 110 kV. and 50 kV. switchgear installation was designed for Hamilton No. 2 substation, which will be the tie-in point for Karapiro and the main supply-point for the 50 kV. system. Other design work for this district included 110 kV. switchgear for Ongarue substation, 50 kV. switchgear for Belmont and Hangatiki substations, and additional 50 kV. switchgear for Hamilton No. 1 substation.

For handling transformers a 25-ton steel gantry was designed for Hamilton No. 2 substation, and a 40-ton traverser truck for Mount Roskill substation.

Palmerston North District.

Waikaremoana Main Power-station.—The design work for No. 3 main generating-unit and associated equipment was completed.

Waikaremoana Lower Power-station.—The design of the power-station building was completed. Arrangement drawings were prepared for indoor and outdoor equipment.

Khandallah Substation.—Details were prepared for a proposed 20,000 kVA. synchronous condenser installation and building extensions to house same.

Christchurch District.

Highbank Power-station.—A considerable portion of the design work for the power-station building was carried out. Layout drawings were prepared for indoor and outdoor power-station equipment.

Waitaki Power-station.—Reinforced-concrete foundations were designed for generating units Nos. 3 and 4. Layout and detail drawings were prepared for new control panels, cable installation, and outdoor equipment on transformer platform.

Ashburton Substation.—A new substation building, a cottage, 110 kV. switchgear, and steelwork to replace existing pole-mounted equipment were designed.

Hororata Substation.—Designs for outdoor switchgear with switchgear for all 66 kV. and 110 kV. lines radiating from Hororata, and the necessary 66/110 kV. auto-transformers, were completed.

Transmission-lines.

Drawings and specifications were prepared for tendering purposes for steel towers to be used on the Penrose–Henderson 110 kV. line and the Waikaremoana 110 kV. tie line connecting the lower power-station at Piripaua with the main power-station at Tuai.

Effects of snow loading on conductors were investigated for the West Coast lines over Arthur's Pass and the central portion of the line from Bunnythorpe to Ongarue.

Consideration was given to the utilization elsewhere of the steel masts on the 50 kV. Penrose–Henderson line when the new 110 kV. line is ready for service. These masts will be used on a deviation of the Henderson–Takapuna line, which is to be undertaken in order to remove the high aerial conductors over the harbour near Hobsonville Aerodrome.

During the year a number of stringing charts for different lines were prepared, investigations into the strengths of concrete poles and steel towers were carried out, and clearances for river and harbour crossings of Electric Supply Authorities lines were checked.

HYDRAULIC SECTION.

Investigation.—Further studies have been made of schemes on the Waikato River, and examination of the foundation rocks at Karapiro and Ohakuri have been made by boring and by geophysical methods.

Taupo Control.—Designs have been prepared and a contract let for control gates at Taupo. Removal of obstructions and deepening the river channel will be done later.

Waikaremoana.—Detail designs for the lower development headworks have been continued throughout the year.

Karapiro.—Investigations on the dam-site have been practically completed, and the principal features of the station have been designed. The station will have a capacity of 90,000 kW. in three units. Specifications for the main units are being prepared.

Highbank.—The design of headworks for this station, on the Rakaia River near Methven, has been pushed forward, and a contract let for steel penstocks.

Tekapo.—The main features of this scheme have been worked out, and details are being considered concurrently with the methods of construction. Specifications for a single unit of 21,600 kW. are being prepared.

Cobb River.—Prior to this scheme being taken over investigations were made, including the general design and economic aspects of the undertaking.

I have, &c.,
F. T. M. KISSEL, B.Sc., M.I.E.E., A.M.I.C.E.,
Chief Electrical Engineer.

TABLE I.—SUMMARY OF FINANCIAL AND OPERATING STATISTICS FOR NORTH ISLAND AND SOUTH ISLAND ELECTRIC-POWER SYSTEMS FOR THE YEAR ENDING 31ST MARCH, 1940.

NOTE.—"North Island system" includes Arapuni–Horahora–Mangahao–Waikaremoana all interconnected. "South Island system" includes Lake Coleridge–Waitaki–Southland–Arnold River (Westland) all interconnected.

(*a*) Financial.

	1939–40 (Sixth Year).
(1) **Capital outlay**—	
Assets in operation—	£
North Island system	9,632,112
South Island system	6,727,860
Total assets in operation	16,359,972
Assets not in operation—	
North Island system	797,128
South Island system	209,057
Total assets not in operation	1,006,185
Total capital outlay	17,366,157
(2) **Revenue for year**—	
North Island system	1,328,499
South Island system	613,612
Total revenue for year	1,942,111
(3) **Costs**—	
Working-costs—	
North Island system	368,015*
South Island system	174,959
Total working-costs for year	542,974
(4) **Capital charges**—	
Interest—	
North Island system	345,207
South Island system	246,919

	1939–40 (Sixth Year).
(4) **Capital charges**—*continued.*	
Depreciation—	£
North Island system	15,477
South Island system	124,931
Total capital charges for year	732,534
(5) **Total costs for year**	1,275,508
(6) **Net profit for year**—	
North Island system	599,800
South Island system	66,802
Total **profit** for year	666,602
(7) **Accumulated Depreciation Reserve**—	
North Island system	1,081,075
South Island system	755,026
Total Depreciation Reserve	1,836,101
(8) **Accumulated Sinking Fund**—	
North Island system	1,159,820
South Island system	417,605
Total Sinking Fund Reserve	1,577,425
Arrears in Sinking Fund payments not yet appropriated—	
North Island system	Nil.
South Island system	252,671
(9) **Reserve Fund**—	
North Island system	181,248
South Island system	87,199
Total Reserve Fund	268,447

* Includes £65,304 standby charges.

(Continued on next page.)

TABLE I.—SUMMARY OF FINANCIAL AND OPERATING STATISTICS FOR NORTH ISLAND AND SOUTH ISLAND ELECTRIC-POWER SYSTEMS FOR THE YEAR ENDING 31ST MARCH, 1940—*continued.*

NOTE.—"North Island system" includes Arapuni–Horahora–Mangahao–Waikaremoana all interconnected. "South Island system" includes Lake Coleridge–Waitaki–Southland–Arnold River (Westland) all interconnected.

(*b*) Operating Results.

	1939–40 (Sixth Year).
Maximum load (kilowatts)—	
North Island system	218,300
South Island system	76,160
Average load (kilowatts)—	
North Island system	124,853
South Island system	42,198
Average load factor—	Per Cent.
North Island system	57·19
South Island system	55·41
Units output—	Units.
North Island system	1,093,708,158
South Island system	369,658,515
Combined	1,463,366,673
Units distributed—	
Units sold—	
North Island system	981,288,359
South Island system	311,234,319
Combined	1,292,522,678
Units unsold (station auxiliaries, &c.)—	
North Island system	6,211,193
South Island system	4,050,664
Combined	10,261,857
Total units distributed, North Island system	987,499,552
Total units distributed, South Island system	315,284,983
Line losses—	Units. / Per Cent.
Transmission—	
North Island system	105,450,911 / 9·64
South Island system	43,844,488 / 11·86
Combined	149,295,399 / ..
Distribution—	
North Island system	757,695 / 0·069
South Island system	10,529,044 / 2·85
Combined	11,286,739 / ..
Total line losses, North Island system	106,208,606 / 9·71
Total line losses, South Island system	54,373,532 / 14·7*

	1939–40 (Sixth Year).
Revenue—	
Per kilowatt (system maximum)—	£
North Island system	6·09
South Island system	8·00
Per unit generated—	d.
North Island system	0·292
South Island system	0·398
Per unit distributed—	
North Island system	0·323
South Island system	0·482
Per unit sold—	
North Island system	0·325
South Island system	0·489
Working-costs—	
Per kilowatt (system maximum)—	£
North Island system	1·69
South Island system	2·28
Per unit generated—	d.
North Island system	0·0808
South Island system	0·1136
Per unit distributed—	
North Island system	0·0894
South Island system	0·1375
Per unit sold—	
North Island system	0·0900
South Island system	0·1394
Capital charges—	
Per kilowatt (system maximum)—	£
North Island system	1·65
South Island system	4·85
Per unit generated—	d.
North Island system	0·0791
South Island system	0·2414
Per unit distributed—	
North Island system	0·0877
South Island system	0·2923
Per unit sold—	
North Island system	0·0882
South Island system	0·2963
Total costs—	
Per kilowatt (system maximum)—	£
North Island system	3·34
South Island system	7·13
Per unit generated—	d.
North Island system	0·1599
South Island system	0·3550
Per unit distributed—	
North Island system	0·1771
South Island system	0·4299
Per unit sold—	
North Island system	0·1782
South Island system	0·4357

* Retail distribution losses in Southland area 23·78 per cent.

Table II.—Analysis of Capital Outlay as at 31st March, 1940.

North Island System.		South Island System.		Combined Totals.
Headworks and power-stations—		Headworks and power-stations—		
Land, fencing, and roading—	£	Land, fencing, and roading—	£	£
Arapuni	110,842	Coleridge	24,385	
Horahora	3,208	Waitaki	48,441	
Mangahao	72,130	Southland	12,226	
Waikaremoana	67,303	Arnold River (Kaimata)	1,456	
				339,991
Headworks—		Headworks—		
Arapuni	1,284,955	Coleridge	551,736	
Horahora	151,527	Waitaki	1,073,524	
Mangahao	846,314	Southland	86,816	
Waikaremoana	145,468	Arnold River (Kaimata)	107,132	
„ Lower development	320,220			4,567,692
Generating-station, buildings, and village—		Generating-station, buildings, and village—		
Arapuni	431,238	Coleridge	100,732	
Horahora	61,353	Waitaki	470,482	
Mangahao	176,735	Southland	43,184	
Waikaremoana	180,629	Arnold River (Kaimata)	8,617	
				1,472,970
Generating plant and machinery—		Generating plant and machinery—		
Arapuni	702,073	Coleridge	184,621	
Horahora	96,201	Waitaki	306,289	
Mangahao	199,071	Southland	60,037	
Waikaremoana	270,425	Arnold River (Kaimata)	26,103	
				1,844,820
Auxiliary stations (three)—Penrose, Huntly, Grand Junction	81,399	Auxiliary station (one)—Dobson (ex Lyttelton)	136,445	217,844
Transmission and distribution—		Transmission and distribution—		
Primary distribution—		Primary distribution—		
11 kV. lines	53,592	11 kV. lines	535,987	
33 kV. lines	..	33 kV. lines	59,002	
50 kV. lines	434,341	50 kV. lines	..	
66 kV. lines	..	66 kV. lines	626,099	
110 kV. lines	1,516,598	110 kV. lines	351,675	
Secondary distribution	..	Secondary distribution	318,995	
				3,896,289
Substations—		Substations—		
11 kV. substations	12,853	11 kV. substations	..	
33 kV. substations	..	33 kV. substations	29,659	
50 kV. substations	303,366	50 kV. substations	..	
66 kV. substations	..	66 kV. substations	411,973	
110 kV. substations	952,052	110 kV. substations	256,277	
				1,966,180
General—		General—		
General offices, garages, stores, and other accommodation	64,829	General offices, garages, stores, and other accommodation	21,572	
Telephone services	81,978	Telephone services	70,219	
Explorations and preliminary surveys; engineering, office, and general expenses; charges and expenses of raising loans	825,031	Explorations and preliminary surveys; engineering, office, and general expenses; charges and expenses of raising loans	531,939	
Interest during construction	983,509	Interest during construction	481,295	
				3,060,372
Grand totals	10,429,240		6,936,918	17,366,158

Table III.—Operating or Working Costs for Year ended 31st March, 1940.

—	North Island System.				South Island System.			
	Cost.	Cost per Unit.			Cost.	Cost per Unit.		
		Generated.	Distributed.	Sold.		Generated.	Distributed.	Sold.
	£	d.	d.	d.	£	d.	d.	d.
(*a*) Hydro stations	61,724	0·0144	..	..	30,030	0·0196	..	..
(*b*) Fuel stations	343	..	..	..	12,817	1·9949	..	..
(*c*) Auxiliary stations, power purchased, and standby provision	168,943	0·6107	..	..	338	2·7674	..	..
	231,010	0·0507	0·0561	0·0565	43,185	0·0280	0·0339	0·0344
(*d*) Transmission and communications	31,776	0·0070	0·0077	0·0078	17,281	0·0112	0·0136	0·0138
(*e*) Substations	34,422	0·0076	0·0084	0·0084	20,672	0·0134	0·0163	0·0165
(*f*) Distribution	2,049	0·0004	0·0005	0·0005	19,474	0·0126	0·0153	0·0155
(*g*) System operations	13,827	0·0030	0·0034	0·0034	7,826	0·0051	0·0062	0·0062
(*h*) Management and general expenses	54,931	0·0121	0·0134	0·0134	66,521	0·0432	0·0523	0·0530
	368,015	0·0808	0·0894	0·0900	174,959	0·11359	0·13754	0·13939

	North Island System.		*South Island System.*	
Units generated—				
Hydro	1,027,311,195		368,087,262	
Fuel	..		1,541,940	
Purchased	66,396,963		29,313	
		1,093,708,158		369,658,515
Units distributed	..	987,499,552		315,284,983
Units sold	..	981,288,359		301,234,319

APPENDIX E.

SIXTEENTH ANNUAL REPORT OF THE MAIN HIGHWAYS BOARD.

The Hon. the MINISTER OF PUBLIC WORKS.

SIR,—

In accordance with the provisions of section 24 of the Main Highways Act, 1922, the Main Highways Board has the honour to submit its sixteenth annual report for presentation to Parliament.

The report covers the period from 1st April, 1939, to 31st March, 1940, though a number of matters referred to are carried beyond the latter date for convenience and completeness of record.

GENERAL.

The present length of main highways maintained or subsidized by the Board is 12,355 miles, and particulars of expenditure for the year ended 31st March, 1940, as well as a detailed statement on the position of various works, are shown later in this report. Of the total length of main highways 3,987 miles have been classified as State highways, and special reference to these trunk routes is made in another part of the report.

The total expenditure from the Main Highways Account for the financial year ended 31st March, 1940, amounted to £5,673,954, compared with £5,185,803 for the year immediately preceding, an increase of £488,151. Of total expenditure, general improvement works show an increase of £238,763 and loan charges an increase of £231,613. It is interesting to note that maintenance charges have been reduced by £9,428, and this in spite of the fact that the highway mileage has been increased by 149 miles during the year.

PERSONNEL.

Consequent upon his impending retirement as Assistant Engineer-in-Chief of the Public Works Department, Mr. A. J. Baker resigned his seat on the Board and the office of Deputy Chairman. Mr. W. L. Newnham, second Assistant Engineer-in-Chief of the Public Works Department, was appointed to fill the vacancy. The Board recorded in its minutes its deep appreciation of the valuable services rendered by Mr. Baker during his term of office.

Another loss was sustained when Mr. G. W. Albertson relinquished the position of Highways Engineer, consequent upon his appointment as Director of Housing Construction. Mr. Albertson proved himself a capable and efficient officer, and during his term many outstanding highway improvement works were carried to completion. The Board recorded its appreciation of his work. The position of Highways Engineer was filled by the appointment of Mr. F. Langbein, formerly District Engineer of the Public Works Department at Christchurch.

LEGISLATION.

New legislation affecting the Main Highways Board during the past year has been *section 3 of the Finance Act, 1939*, empowering the Minister of Finance to borrow up to an additional amount of £3,200,000 for the purpose of construction of main highways. The total loan authority for highways now amounts to £12,700,000.

The *Hutt Road Act, 1939*, abolished the Wellington City and Suburban Highways Board of Control as from 1st April, 1940, repealed certain enactments making special provision for the construction and maintenance of the Hutt Road and certain other roads and streets situated in or near the City of Wellington, and made provision for matters incidental thereto.

The State has taken over the control of the main routes which were previously maintained by the Suburban Board, with the assistance of the usual highways subsidy.

The remaining main highways will in future be maintained under subsidy by the respective local bodies or the Main Highways Board, whilst other roads or streets formerly controlled by the Suburban Board will now be under the direct control of the authorities concerned. The responsibility for the repayment of the loans raised on behalf of the Suburban Board has been assumed by the Government.

Finance.

The actual income of the Main Highways Account from revenue sources for the financial year 1939–40 amounted to £2,758,808. The following table shows how this amount is made up, and also the corresponding figures over the previous nine years. In addition to this amount, £2,685,727 was borrowed for main highways. The annual loan charges against the Main Highways Account increased from £439,541 for the year 1938–39 to £671,154 for the year 1939–40 :—

—	1930–31.	1931–32.	1932–33.	1933–34.	1934–35.	1935–36.	1936–37.	1937–38.	1938–39.	1939–40.
	£	£	£	£	£	£	£	£	£	£
Proceeds of tax on tires and tubes collected through the Customs Department	129,188	84,649	63,253	62,979	91,693	93,308	138,894	158,526	149,017	102,706
Registration and license fees of motor-vehicles, &c.	397,139	372,224	354,216	354,444	355,990	397,606	545,763	523,853	575,170	588,386
Motor-spirits tax ..	1,219,209	1,231,202	644,126	669,868	970,506	1,449,125	1,697,942	1,918,486	2,083,278	2,057,001
Mileage-tax ..	..	..	..	1,133	1,284	1,616	3,290	6,162	7,474	10,715
Totals ..	1,745,536	1,688,075	1,061,595	1,088,424	1,419,473	1,941,655	2,385,889	2,607,027	2,814,939	2,758,808

It will be noted that income from revenue sources for the year 1939–40 was £56,131 less than for the year immediately preceding. This reduction is chiefly accounted for by the amount received from the Customs tax on tires and tubes, which is £46,311 less than for the year 1938–39. It is interesting to note that the tire-tax last year amounted to 6s. 6d. per motor-vehicle per annum, whereas in 1924–25 it amounted to £1 12s. 5d. per motor-vehicle.

Revenue from the mileage-tax levied in respect of motor-vehicles using other than motor-spirits and trackless trolley-omnibuses increased by £3,241 over the amount received in the previous year, and indicates the greater use of passenger and general transport vehicles having Diesel or electrical power units.

The gross importation of motor-spirits since 1927 has been as follows, and these figures are usually accepted as providing an index of maintenance and construction requirements.

	Gallons.		Gallons.
1927 (January to December) ..	48,000,000	1934 (January to December) ..	64,600,000
1928 ,, ..	54,500,000	1935 ,, ..	65,300,000
1929 ,, ..	62,400,000	1936 ,, ..	86,800,000
1930 ,, ..	68,300,000	1937 ,, ..	85,700,000
1931 ,, ..	61,800,000	1938 ,, ..	102,300,000
1932 ,, ..	58,400,000	1939 ,, ..	103,700,000
1933 ,, ..	55,400,000		

It will be noted that, although the petrol restrictions operated over the period 4th September, 1939, to 30th November, 1939, the gross total importations for the calendar year were 1,400,000 gallons in excess of that imported for the calendar year immediately preceding.

The following is a summary of expenditure from the Main Highways Account for the year ended 31st March, 1940.

	£	Expenditure. £
Maintenance—		
North Island	888,900	
South Island	413,012	
		1,301,912
Renewals—		
North Island	166,478	
South Island	24,161	
		190,639
Construction and Improvements—		
North Island	1,966,113	
South Island	1,140,358	
		3,106,471
Administration and general charges		197,264
Loan charges (including commutation of toll-gate charges and of Hutt Road fees)		671,154
Subsidy on rates		206,514
		£5,673,954

An analysis of the expenditure for 1939–40 by the Board and by local authorities on **maintenance** of main and State highways as distinct from renewals, construction, interest on loans, and other overhead charges is shown in the tabulation below :—

—	Board's Contribution.	Local Authorities' Contribution.	Total.	Percentage Board's Contribution to Total.	Percentage Local Authorities' Contribution to Total.
	£	£	£		
North Island	888,900	96,540	985,440	90·20	9·80
South Island	413,012	54,828	467,840	88·28	11·72
Total	1,301,912	151,368	1,453,280	89·59	10·41

An analysis of the actual expenditure by the Board on maintenance in each Island, as compared with the number of motor-vehicles in each Island at the 31st March, shows the following comparisons for the last ten years in percentages :—

—	1930–31.	1931–32.	1932–33.	1933–34.	1934–35.	1935–36.	1936–37.	1937–38.	1938–39.	1939–40.
North Island—										
Maintenance expenditure	59·23	62·31	62·84	63·80	65·44	64·80	66·82	66·46	69·26	68·28
Motor-vehicles ..	63·84	63·77	63·78	63·94	64·31	64·84	65·30	65·70	65·89	65·93
South Island—										
Maintenance expenditure	40·77	37·69	37·16	36·20	34·56	35·20	33·18	33·54	30·74	31·72
Motor-vehicles ..	36·16	36·23	36·22	36·06	35·69	35·16	34·70	34·30	34·11	34·07

NOTE.—Prior to 1936–37 these percentages relate rather to expenditure from the Revenue Fund, but as from 1st April, 1936, true maintenance figures have been recorded.

The following table shows an analysis of expenditure for the year 1939–40 by the Board and by local authorities on **renewals** in respect of main and State highways :—

—	Board's Contribution.	Local Authorities' Contribution.	Total.	Percentage of Board's Contribution to Total.	Percentage of Local Authorities' Contribution to Total.
	£	£	£		
North Island	166,478	21,469	187,947	88·58	11·42
South Island	24,161	3,459	27,620	87·48	12·52
Totals	190,639	24,928	215,567	88·43	11·57

An analysis of the Board's expenditure and the expenditure by local authorities for the year 1939–40 on **improvements and construction** shows the following position in respect of main and State highways :—

—	Board's Contribution.	Local Authorities' Contribution.	Total.	Percentage of Board's Contribution to Total.	Percentage of Local Authorities' Contribution to Total.
	£	£	£		
North Island	1,966,113	107,684	2,073,797	94·81	5·19
South Island	1,140,358	40,227	1,180,585	96·60	3·40
Totals	3,106,471	147,911	3,254,382	95·46	4·54

The following tabulation shows the amounts which have been provided by the Board and the local authorities on maintenance, renewals, and construction during the last ten years in respect of the complete highways system :—

—	1930–31.	1931–32.	1932–33.	1933–34	1934–35.	1935–36.	1936–37.	1937–38.	1938–39.	1939–40.
	£	£	£	£	£	£	£	£	£	£
Maintenance by Board ..	872,577	849,734	600,324	674,026	932,675	1,190,179	900,731*	1,074,112*	1,311,340*	1,301,912*
Maintenance by local authorities	317,839	215,568	168,466	187,735	226,554	284,423	196,023*	153,443*	152,730*	151,368*
Construction by Board ..	667,902	361,969	159,323	198,295	325,483	428,084	1,501,261†	2,318,600†	3,058,346†	3,297,110†
Construction by local authorities	150,984	94,973	43,181	55,997	57,975	78,263	103,260†	108,225†	134,359†	172,839†
Totals	2,009,302	1,522,244	971,294	1,116,053	1,542,687	1,980,949	2,701,275	3,654,380	4,656,775	4,923,229
Percentages.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Maintenance by Board ..	73·3	79·8	78·1	78·2	80·5	80·7	82·1	87·5	89·6	89·6
Maintenance by local authorities	26·7	20·2	21·9	21·8	19·5	19·3	17·9	12·5	10·4	10·4
Construction by Board ..	81·6	79·2	77·6	77·0	84·9	84·5	93·6†	95·5†	95·8†	95·1†
Construction by local authorities	18·4	20·8	22·4	23·0	15·1	15·5	6·4†	4·5†	4·2†	4·9†

* These figures represent true maintenance expenditure, whereas in preceding years expenditure under the Revenue Account was shown. † These figures and percentages relate to renewals and construction; previously renewals have been absorbed in both maintenance and construction.

The maintenance figure in the above tabulation excludes indirect charges such as supervision and interest, but includes the cost of flood-damage restoration. It will be noted that expenditure on constructional work was approximately £277,000 greater than in the previous year, and, further, that, although the proportion found by local authorities for maintenance has remained stationary, there has been a slight increase in the proportion found by local authorities for construction works.

The following statement shows the total expenditure by the Board in each Island on both maintenance and construction for the financial year ended 31st March, 1940, the latter including renewals. The figures take into account administration charges, but exclude interest on highway loans :—

—	Expenditure on Maintenance.	Expenditure on Renewals and Construction.	Total Expenditure in each Island.	Percentage of Expenditure in each Island.
	£	£	£	
North Island	927,027	2,224,064	3,151,091	65·70
South Island	430,727	1,214,468	1,645,195	34·30
Totals	1,357,754	3,438,532	4,796,286	100·00

Maintenance.

The total maintenance expenditure by the Board and by local authorities amounted to £1,453,280, compared with £1,464,070 the previous year.

The decrease is £10,790, and the average cost per mile has decreased from £119·9 in 1938–39 to £117·6 in the year under review. This figure is considerably higher than the corresponding one for 1937–38, which was £101·2 per mile. This increase is to some extent due to higher costs of labour and materials during the past two years.

Floods causing extensive damage have occurred very persistently, and the cost of restoration has been very considerable, although, fortunately, the amount involved has been appreciably less than last year. For the year under review the cost of restoration was £92,797, as compared with £204,068 for the previous year.

The reduction in cost per mile of maintenance is due, no doubt, in a slight degree to the increasing length of sealed surfacing. This has now reached 26 per cent. of the total highway mileage, and as further lengths of sealing are carried out a larger reduction in maintenance costs on this account may be expected.

Another feature which influences, and will increasingly influence, the maintenance cost is the imposition of petrol restrictions since the outbreak of war. Restrictions of this nature were in operation from 4th September to 30th November, 1939, and again from 1st February to 31st March, 1940, practically five months, but the lifting of the restrictions for two months, including the Christmas holidays, resulted in very heavy consumption during that time. With the tightening up of the restrictions and the prospect of a more strict enforcement over a longer period it may be anticipated that the maintenance costs will experience a more appreciable reduction.

There is, however, an increase in the number of motor-vehicles, which, though not very great, must tend to increase the cost of maintenance, particularly of the gravel-surfaced highways. During the year the number of vehicles licensed increased from 307,926 to 317,526, an increase of 3·12 per cent., and the estimated number actually on the road increased by 6·5 per cent.

Generally speaking, the highways over the entire system have been maintained in very fair condition. Flood damage and reconstruction work were responsible for the lowering of the standard at times, but this, of course, is unavoidable. Any complaints investigated which concerned faulty maintenance have almost invariably been found to have reasonable explanations, and have been remedied as speedily as possible.

TABLE 1.—MAINTENANCE OF MAIN HIGHWAYS (INCLUDING BRIDGES).

Highway District.	Length Maintained.	Expenditure.													
		Board.	Local Authorities.	Total.	Average per Mile per Annum.										
					1939–40.	1938–39.	1937–38.	1936–37.	1935–36.	1934–35.	1933–34.	1932–33.	1931–32.	1930–31.
	M. ch.	£	£	£	£	£	£	£	£	£	£	£	£	£
1. Auckland North	837 63	82,234	10,961	93,195	111·2	100·7	115·1	93·2	110·1	97·9	71·6	61·2	79·2	83·4
2. Auckland South	1,514 19	158,521	28,833	187,354	123·7	129·2	126·2	119·3	181·4	141·1	124·6	106·9	145·3	175·8
3. Tauranga	710 67	150,882	3,124	154,006	216·7	158·8	128·4	84·3	153·1	87·1	72·9	61·9	70·7	80·4
4. Gisborne	395 37	78,945	5,773	84,718	214·2	266·5	215·2	182·9	178·1	164·9	106·4	96·3	117·3	163·5
5. Napier	742 78	98,410	11,478	109,888	147·9	285·6	99·6	82·4	138·9	117·7	81·4	79·3	75·9	121·2
6. King-country	602 25	84,835	7,195	92,030	152·8	113·0	95·3	116·5	89·2	99·7	70·8	57·1	70·0	85·8
7. Taranaki	474 17	51,739	4,104	55,843	117·8	122·1	94·7	104·1	123·4	102·5	83·8	84·5	125·2	136·0
8. Wanganui	533 49	71,510	7,164	78,674	147·4	157·1	152·5	115·9	122·0	87·5	80·8	66·0	101·0	126·7
9. Wellington West	504 79	69,419	7,799	77,218	152·9	105·7	102·9	121·9	164·1	124·7	106·0	110·8	149·8	179·0
10. Wellington East	504 41	42,405	10,109	52,514	104·1	88·9	89·4	108·0	175·3	181·3	114·9	91·4	128·6	141·6
Totals, North Island	6,820 75	888,900	96,540	985,440	144·5	149·5	119·7	109·0	143·2	118·3	91·3	81·0	104·5	124·8
11. Nelson	694 50	73,935	5,949	79,884	115·0	108·5	99·2	80·3	116·8	101·1	74·1	66·6	103·6	82·0
12. West Coast	576 57	93,373	5,568	98,941	171·6	157·4	145·5	141·8	214·5	142·6	110·8	104·1	136·7	122·4
13. Canterbury North	373 58	30,454	3,780	34,234	91·6	83·8	92·8	64·3	62·8	55·7	58·3	50·0	55·4	72·6
14. Canterbury Central	762 1	43,903	7,998	51,901	68·1	71·2	63·1	54·6	81·1	55·2	50·9	50·2	76·5	75·2
15. Canterbury South	834 15	36,591	7,563	44,154	52·9	58·3	52·6	54·0	96·7	66·9	59·3	67·0	78·7	88·0
16. Otago Central	842 19	48,441	7,070	55,511	65·9	66·5	53·8	49·5	70·1	75·1	50·3	46·4	52·8	36·4
17. Otago South	529 17	27,371	7,977	35,348	66·8	96·6	76·5	62·8	97·8	84·6	73·8	72·8	99·5	90·8
18. Southland	921 3	58,944	8,923	67,867	73·7	61·5	74·8	57·2	57·1	53·9	44·4	41·6	43·2	58·7
Totals, South Island	5,533 60	413,012	54,828	467,840	84·7	83·5	77·9	67·5	96·2	77·6	62·7	60·3	77·4	75·8
Totals, Dominion	12,354 55	1,301,912	151,368	1,453,280	117·6	119·9	101·2	90·5	122·4	100·3	78·5	70·7	92·5	103·1

FLOOD DAMAGE.

This matter has been referred to above. In 1938–39 the cost of restoration was unprecedented, amounting to £204,068, but this figure should, in reality, be substantially increased as much of the expenditure incurred did not come to charge until the year now under review. Serious floods occurred during the latter period, particularly in the centre of the North Island and on the West Coast of the South Island, so that though the amount expended upon flood-damage restoration fell far short of the figure for the previous year, it was nevertheless very substantial, and, it is to be hoped, well above the average of years to come.

The cost of restoration of flood damage was £92,797, and of this, Stratford District spent £27,716, Napier District £20,235, and Taumarunui District £14,900.

A pleasing feature is the small amount of damage that has taken place to recently-built bridges as compared with the far more extensive damage to the older structures. This bears testimony to the soundness of the modern design.

CONSTRUCTION, RECONSTRUCTION, IMPROVEMENTS, AND RENEWALS.

The expenditure on the three items—construction, reconstruction, and improvements—was £3,106,471, as compared with £2,878,308 in the previous year; on renewals (which comprises almost entirely the renewal of bridges) £190,639 was spent, as compared with £180,038 in the previous year.

The various district reports which follow later give details of the more important individual works which have been carried out under this heading. A summary of work completed is as follows:—

Improved formation	401 miles 40 chains.
Metalling	284 miles 78 chains.
Dustless surfacing (mileage added)	433 miles.
Bridges	11,676 lin. ft.

In 1938–39 a record of 385 miles of new sealing was achieved, this being an advance of 97 miles on the previous year's figure, which till then was the greatest length completed during any one year. For the year under review the record has again been bettered, 433 miles of new sealing having been carried out; this is equal to the distance from Wellington to Auckland. Had it not been for difficulties which were experienced in procuring prompt supplies of bitumen, the length would have been considerably greater.

Another feature which has detrimentally influenced the mileage of sealing is that contractors were taken away from highway contracts to do work in military camps and aerodromes.

The total length of dustless surfacing on highways is now 3,233 miles.

The bridge construction programme discloses that 11,676 lineal feet of bridges were completed. This does not approach the record of the previous year, when the corresponding figure was 25,561 lineal feet. Last year was phenomenal in that three very long bridges—the Rakaia (5,760 ft.), Whirokino (3,600 ft.), and the North Rangitata (2,122 ft.)—were included in the total, and it is safe to predict that this record will last for many years. This year's figure must be considered quite satisfactory, as it is easily the second best year's achievement since the Main Highways Board came into operation.

TABLE 2.—CONSTRUCTION WORK COMPLETED DURING YEAR 1939–40.

Highway District.	Formation and Widening.	Gravelling and Metalling.	Tar and Bituminous Sealing.	Road- and Plant-mix Bituminous Surfacing.	Bituminous Macadam (Penetration).	Portland Cement Concrete.	Bridges.	Engineering Surveys.
	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	Ft.	M. ch.
1. Auckland North	19 66	7 55	29 34	..	..	..	1,518	23 69
2. Auckland South	64 49	62 51	99 66	12 26	..	..	628	45 51
3. Tauranga	28 37	26 42	30 10	..	..	..	1,015	22 60
4. Gisborne	9 5	3 38	8 53	..	..	..	1,258	8 29
5. Napier	31 61	20 74	11 47	5 64	..	..	556	34 62
6. King-country	22 64	21 43	8 72	..	..	..	297	5 21
7. Taranaki	28 55	2 15	19 72	..	..	..	292	..
8. Wanganui	24 73	..	37 33	..	..	..	218	38 41
9. Wellington West	18 72	..	19 9	0 41	..	..	304	15 16
10. Wellington East	11 19	..	10 29	0 9	..	..	508	14 28
11. Nelson	22 73	36 8	20 56	..	..	..	850	76 35
12. West Coast	42 14	43 39	24 10	0 26	..	..	910	37 51
13. Canterbury North	5 33	5 29	8 74	..	..	..	120	27 20
14. Canterbury Central	4 28	5 53	33 55	26 62	..	..	224	29 58
15. Canterbury South	10 56	7 64	29 24	10 44	..	..	1,752	45 62
16. Otago Central	21 24	25 28	15 73	..	..	..	255	27 53
17. Otago South	22 27	16 19	10 51	..	..	..	208	38 29
18. Southland	12 4	..	25 27	3 40	..	..	763	24 3
	401 40	284 78	443 75	59 72	..	..	11,676	515 48

Table 3 below shows the extent and types of work carried out on the main highways system by the Board and local authorities each year since the Board commenced active operations in 1924:—

Year.	Formation and Widening.	Gravelling and Metalling.	Tar and Bituminous Sealing.	Road and Plant-mix Bituminous Surfacing.	Bituminous Macadam (Penetration).	Bituminous Concrete.	Portland-cement Concrete.	Bridges.
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Ft.
1924–25	19	63	6	..	6	..	..	2,434
1925–26	45	88	16	..	45	4	6	5,168
1926–27	174	151	35	..	38	12	16	6,408
1927–28	173	133	83	..	34	..	6	7,760
1928–29	224	185	122	..	51	14	11	9,482
1929–30	173	179	133	..	39	31	12	7,547
1930–31	130	128	95	..	41	14	9	11,175
1931–32	139	69	129	..	32	9	3	4,062
1932–33	56	45	72	..	8	..	..	3,178
1933–34	44	28	75	..	7	..	1	4,988
1934–35	113	69	172	27	3	..	2	6,641
1935–36	152	98	245	91	2	..	..	8,718
1936–37	272	131	184	67	3	..	..	9,575
1937–38	329	241	282	49	..	..	..	11,106
1938–39	491	188	357	67	2	..	..	25,561
1939–40	401	285	444	60	..	..	..	11,676
Totals	2,935	2,081	2,450	361	311	84	66	135,479

TABLE 4.—LENGTHS OF MAIN HIGHWAYS METALLED AND SURFACED SINCE INCEPTION OF BOARD'S OPERATIONS (9TH JUNE, 1924).

At close of Period ending	Total Main Highways.	Type of Surface.			Dustless Surfacing added during Year.	Percentage of Dustless Surfacing to Total Main Highways.
		Pumice and Clay.	Gravel and Macadam.	Dustless Surfacing.		
	Miles.	Miles.	Miles.	Miles.	Miles.	
9th June, 1924 ..	5,954	1,535	4,171	248	..	4·2
31st March, 1925 ..	5,954	1,472	4,222	260	12	4·4
,, 1926 ..	6,272	1,384	4,557	331	71	5·3
,, 1927 ..	6,391	1,233	4,726	432	101	6·8
,, 1928 ..	6,608	1,100	4,953	555	123	8·4
,, 1929 ..	10,403	915	8,735	753	198	7·2
,, 1930 ..	10,408	736	8,705	967	214	9·3
,, 1931 ..	10,419	608	8,685	1,126	159	10·8
,, 1932 ..	10,846	539	9,009	1,298	172	12·0
,, 1933 ..	10,878	494	9,005	1,379	81	12·7
,, 1934 ..	10,974	466	9,047	1,461	82	13·3
,, 1935 ..	11,557	397	9,494	1,666	205	14·4
,, 1936 ..	12,048	390	9,715	1,943	277	16·1
,, 1937 ..	12,114	353	9,634	2,127	184	17·6
,, 1938 ..	12,136	332	9,389	2,415	288	19·9
,, 1939 ..	12,206	295	9,111	2,800	385	22·9
,, 1940 ..	12,355	251	8,870	3,233	433	26·2
Percentage at 31st March, 1940	100	2·0	71·8	26·2	..	..

A general description of the more important highways activities in each district is given hereunder :—

Whangarei District.

During the year activities have been mainly centred on the furtherance of the sealing and bridging programmes. There is a marked improvement in the sealing figures for the year, the total of 32 miles being well in excess of that completed in 1938–39.

Twenty-one new bridges were constructed, eighteen being on State highways and designed for two-way traffic.

Reconstruction and widening works in hand have been advanced a further stage, but, generally speaking, activities in this direction have been somewhat restricted in favour of sealing.

On the Whangarei–Awanui State highway reconstruction was carried out on the Hikurangi–Waiotu, Mitchell's–Waiomio, Waiomio–Kawakawa, and Kawakawa–Moerewa sections, while a major deviation on Turntable Hill is well under way, and when completed will eliminate a particularly tortuous and dangerous section of highway.

The largest bridge constructed on this highway, the Waitemanu, on a 40-chain deviation, has effected a great improvement in this locality.

The completion of a further 3½ miles of sealing provides a continuous sealed surface between Whangarei and Hikurangi, and a similar length north of Kaitaia toward Awanui was also sealed.

The construction of Mitchell's Bridge and embankments, south of Waiomio, eliminates a further section previously subject to flooding.

Reconstruction in the Wheki Valley section of the Whangarei–Dargaville State highway was advanced a further stage, while the 200 ft. Awakino Bridge on the outskirts of the Borough of Dargaville replaces an old wooden single-way structure.

On the Dargaville-Maungaturoto State highway sealing has been completed over the 6-mile length between the Northern Wairoa Bridge and Mititai, and this work is being extended for a further mile. Reconstruction preparatory to sealing is in hand between Raupo and Ruawai, and reconstruction and realignment have been carried out in the Townships of Paparoa and Maungaturoto.

The construction of the Brynderwyn Valley Deviation between Maungaturoto Township and its junction with the Nos. 4 and 5 State highways is now completed. Seven two-way concrete bridges were erected on this length.

Good progress has been made on the Whangarei–Oakleigh section of the Whangarei–Maungaturoto State highway. The construction of the Otaika Deviation and Bridge is well advanced, and the length of 3¼ miles between Long's Corner and Oakleigh has been sealed.

The sealing of 8¼ miles between the Township of Waipu and the junction of Nos. 3, 4, and 5 State highways, including the hill section of the Brynderwyn Deviation, provides a continuous sealed surface between the points mentioned.

On the Birkenhead–Maungaturoto State highway, construction at the Topuni end has been pushed forward, and is now well towards completion. The length between Kaiwaka and the junction with Nos. 3 and 4 State highways, which was reconstructed last year, has been primed and the greater part sealed.

Work on the subsidized highways consisted principally of the sealing of short lengths through the populated and business areas of Rawene, Kohukohu, Motukaraka, Ohaeawai, Kaeo, and Awanui.

Improvements near Mort's Bridge on the Pakaraka–Awanui highway were further extended.

With the erection of the Wairoro No. 2 Bridge, improvements to the Te Pua section of the Lake Omapere–Maungaturoto highway are now complete.

Auckland District.

A sealing programme approximately equal to the 101-mile record of the previous year was carried out in this district, the distance covered being over 99 miles, but a proportion of this consisted of the renewal of deteriorated surfacing and the sealing of certain lengths already treated with a priming-coat. The net addition was 46¾ miles, and the position is that 93 per cent. of the State highways have now been rendered dustless, together with 27 per cent. of the subsidiary highways.

In the northern area reconstruction was continued, 3¾ miles being completed on the Birkenhead–Maungaturoto highway, as well as 7½ miles of sealing. The 62 ft. Dairy Flat Bridge was completed, and a retaining-wall built at Hadfield's Bay.

On the Helensville highway the widening of the shoulders between the Whau Bridge and Henderson was completed.

Farther north reconstruction was continued, and 3¼ miles received a sealing-coat.

In Helensville improvements were carried on, and the erection of the railway overbridge put in hand.

No major works have been necessary between Auckland and Hamilton, but proposals for widening and realignment to Papakura, and also the 6-mile length from Tilsley's Deviation to Rangiriri, are under investigation.

South of Hamilton reconstruction was continued in the Otorohanga County. The dustless surfacing is now practically at the northern boundary of Otorohanga Borough, and only 4 miles of the State highway remains to be sealed.

The construction of the Otorohanga Overbridge is in progress.

On the Pokeno–Paeroa highway a further 11¾ miles was rebuilt and sealed in the Waikato County, making a total length of 16½ miles from Pokeno. Some resurfacing was also carried out on the Hauraki Plains section. Widening and sealing have been in progress over considerable lengths of the Thames–Paeroa highway. From Paeroa eastward, reconstruction has been continued, 2¼ miles near Waikino being practically completed. Heavy rock walling is being erected along the Ohinemuri River.

On the Hamilton–Paeroa highway 3½ miles of plant-mix coat was laid at Motumaoho and 2½ miles at Tatuanui. An 11-chain deviation was constructed at the latter corner, and one of 14 chains at Murphy's Corner.

The 150 ft. bridge over the Piako River is in progress. On the Hamilton–Rotorua highway a seal-coat was applied over 49 chains between Hillcrest and Cambridge, also on 52 chains of the Karapiro Bridge approaches, which work is now completed.

Between Tirau and Tapapa 3½ miles of base-course was laid and primed, and 5 miles sealed.

On county highways much useful work has been in progress. The Kumeu–Albany reconstruction has been continued, base-course metal being laid over a length of 1 mile and 2¾ miles on the Henderson–Kumeu highway has reached the priming stage.

The new Brigham's Creek – Hobsonville highway has been reconstructed for practically its full length, and 3½ miles has been sealed.

On the Hamilton–Raglan highway a further 4¼ miles was reconstructed and sealed, and between Papakura and Clevedon 6¼ miles of sealing was applied, and a 33 ft. bridge erected. On the Drury–Waiuku highway 2½ miles was reconstructed and surfaced, bringing the dustless length to 13¼ miles. Further work is in progress.

Improvements, including sealing, have been completed on the Tahuna–Ohinewai highway over 9¼ miles, and 4¾ miles is in hand on the Pukekohe–Glenmurray highway, a length of 3 miles farther south being completed during the year.

The Mangere Bridge at Onehunga, an early reinforced-concrete structure of seventeen spans, which partly on account of its very exposed position had developed serious surface-deterioration, has been under extensive repair; the work is nearing completion, fourteen spans being accounted for.

Between Te Kauwhata and Waitakaruru 1½ miles was sealed and a further 2 miles of reconstruction completed, and on the Pukekohe–Bombay highway 3¾ miles in heavy formation was completed and sealed, there being now a continuous length from Pukekohe to the State highway junction near Bombay.

Good progress has been made on the Papakura–Titi highway, the 9¾-mile length from Papakura to Kingseat was improved and sealed, and a contract let for the reconstruction of the remaining 7 miles of the division.

On the Frankton–Pirongia highway a 7 mile length in the Waipa County was brought up to the sealing stage, a single coat being applied. The second coat is in hand. The Tuakau – Port Waikato highway is being improved, metalling being completed over the greater part of the 2½ miles under treatment. Three miles of reconstruction and sealing is in hand between Te Awamutu and Cambridge, and a 66 ft. bridge has been erected. In the Piako County 3 miles of the Taupiri–Morrinsville highway was reshaped and metalled, completing the division, and 3¼ miles of this received a sealing-coat.

On the Pipiroa–Coromandel highway widening was continued, and rubble sea-wall protection placed over 1¾ miles. In the bays a total length of 2¾ miles of sealing was applied. Extensive work is in hand on the Waitoa–Taupo highway from Tirau southward, some 10 miles of formation and metalling and 5¼ miles of sealing being carried out during the year. The Putaruru South overbridge, 225 ft. long, was erected, also a stream-bridge, and the 87 ft. Ngutuwera Bridge is in hand.

A reconstruction and sealing contract of 5¾ miles was completed on the Pairere–Kaimai highway, and a 6-mile contract on the Kihikihi–Arapuni highway was brought to the sealing stage.

On the Waihi Beach highway a length of 2¾ miles was reformed, metalled, and sealed, and a second section of similar length is in hand.

The new Waihi–Coroglen highway has been materially improved by widening and metalling.

A considerable number of subsidiary highways have also received attention at the hands of the responsible local bodies.

Tauranga District.

On the Paeroa–Whakatane State highway 5½ miles of widening and re-alignment have been carried out, principally near Otamarakau, and 2 miles of sealing was applied adjacent to Whakatane.

Six concrete bridges were erected, and the railway overbridge at Katikati was widened and provided with a footway.

Between Rotorua and Whakatane the reconstruction programme was continued, 2 miles 10 chains of heavy formation being completed on the Lakes section, and 6¼ miles sealed at Rotoma Hill. The Tikitere Deviation was also sealed. Between Edgecumbe and Whakatane, 5½ miles of formation and metalling were carried out, and 3¾ miles sealed. A 150 ft. bridge is being erected over the Tarawera River.

On the Whakatane–Gisborne highway 3½ miles of re-alignment was completed towards Taneatua and 40 chains sealed. At Waiotahi 60 chains of formation is in hand, and 22 chains was reconstructed and sealed in the Opotiki Borough.

South of Rotorua 2¾ miles was sealed between Wairakei and Taupo, and a further 2 mile length prepared for sealing.

On the Taupo–Napier highway the Rangataiki River Bridge, a single 40 ft. span, was completed, 45 chains of the Runanga Deviation formed, and 1 mile of this metalled.

At the Waitahanui Township on the National Park – Taupo highway 1½ miles has been prepared for sealing.

Reconstruction on the Waitoa–Taupo highway was continued, ¾ mile of formation and 7¼ miles of metalling being carried out.

Work on the Matamata–Tauranga highway, Kaimai Hill section, comprised 1¾ miles of heavy formation, 3¼ miles of base-course, and 4¾ miles of sealing. The major deviation, 3 miles in length, has been opened for traffic. The 120 ft. Tuakopai Bridge was erected.

On the Opotiki – Te Araroa highway 4¼ miles of reconstruction and six bridges were completed. The latter, together with three large concrete culverts, have completed the elimination of all fords on this section. A major deviation at the Maraenui Hill has shortened the route by 37 chains.

Sealing was carried out on the Mount Maunganui highway (64 chains), and Lake Tarawera highway (8 miles 50 chains.).

Gisborne District.

Climatic conditions during the year were favourable for construction and maintenance, floods and slips being at a minimum. Consequently the general condition of the highways remained at a very good standard throughout.

On the Whakatane–Gisborne via Waioeka State highway regrading of two short sections of Trafford's Hill and the northern side of Otoko Hill afforded a great improvement in driving conditions over two sections of bad alignment. The Otoko contract comprised very heavy earthwork, 56,000 cubic yards in a length of 91 chains.

The use of powerful modern plant enabled completion in summer and obviated the dislocation of traffic which prolongation into winter must have caused.

Sealing was advanced by 3¼ miles of 2-coat work on a stabilized shingle base northward from Ormond. The surface through Matawai Township was reconstructed and prepared for sealing.

The new Waipaoa River Bridge at Kaitaratahi of six 90 ft. steel-and-concrete spans was opened for traffic.

On the Gisborne Te Araroa highway the six mile-sealing contract at Tatapouri was finished off. The lengths through Te Puia and Tikitiki Townships were strengthened and stabilized in preparation for sealing. Through Tokomaru Bay Township a deviation to give better alignment was completed, and the strengthening and stabilizing of the remainder of the length is well advanced.

To eliminate trouble experienced through frequent silting from the Hikuwai River floods, 44½ miles from Gisborne, a contract for 1 mile 12 chains of heavy regrading was put in hand.

A considerable amount of work has been carried out on this highway in repairing damage caused by the disastrous floods of 1938. Washouts and subsidences have been filled in and regraded, fillings and bridge approaches raised and widened, and groynes built where required. Tree-planting activities for stabilization purposes have been extended. The Board's nursery established at Aorangi is now able to supply all trees required. One particularly bad area of subsidence comprising 330 acres on either side of the highway in the Mangahauini Valley, near Tokomaru Bay, is being taken for tree-planting and regeneration of native forest.

On the Gisborne–Napier via Hangaroa highway 6¼ miles of second-coat sealing was completed, also a further 3 miles of reconstruction.

On the Opotiki – Te Araroa section of the coastal route the Whangaparaoa Bridge and the Mangatutu Bridges were completed.

Material is being assembled for five other bridges on this highway.

On the Gisborne–Wairoa via Morere highway improvements to grade and alignment were carried out at McDowells' and Adair's, between Manutuke and Muriwai, and on Kopua hill.

Further lengths of sealing were carried out on the Patutahi–Rere and the Gisborne–Ormond via Waiohika highways, the latter being now surfaced over its whole length.

The Koranga Stream Bridge on the Matawai–Koranga highway and the Waiwhero Stream Bridge on the Opotiki–Matawai via Motu highway have been replaced by new concrete structures.

On other secondary highways, the roadway and footpaths through Ruatoria Township have been reconstructed ready for sealing, and in Whatatutu Township the sealing of both was completed.

Napier District.

The setbacks to reconstruction at the time of the April, 1938, flood have now been overtaken, and most of the restoration work, with the exception of the construction of the new bridges on the Wairoa route, has been completed.

War conditions have been reflected in the closing of three major works, and on account of the difficulty in procuring bituminous materials several programmes for sealing had to be curtailed.

On the Taupo–Napier State highway the transfer of men necessitated the closing-down of the Runanga Deviation, of which 2½ miles of formation has been completed and 1½ miles metalled. From Te Pohue southward the realignment and widening carried out over the last few years is now practically continuous, and half this length has been either primed or primed and sealed.

On the Gisborne–Napier highway a start has been made on the construction of a concrete bridge 316 ft. long and 55 ft. above water-level, over the Mangapoike River at Opoiti; the foundations in the river have been completed. The location of the new bridge requires a deviation of ¾ mile, which is almost completed. Short timber bridges at Mill Creek and Opoiti (Bayly's Bridge) are being replaced by twin 6-ft.-pipe culverts. The Ohinepaka overbridge has been completed at the crossing 6 miles south of Wairoa. The construction of 3 miles from Turiroa to Ohinepaka is being carried out to modern standards and, except for metalling and finishing, is almost completed. The sealing of 2 miles between Wairoa and Frasertown was completed early in the year. From 5 miles south of Mohaka Bridge widening has been carried out for the full length of the section. Following flood restoration, further realignment has been carried out near Tangoio, and a 3-mile length has been primed ready for sealing. A water-tunnel 9 ft. by 8 ft. 7 in. by 191 ft. was driven and concrete-lined at McKenzie Creek.

Footpath construction is in hand in the Wairoa Borough.

The Napier – Palmerston North highway still needs extensive resealing in places, and these are being re-aligned and widened. A start was made in July on the 10 mile 70 chain length between Pakipaki and Te Aute, and 76 chains of re-alignment clear of the present roadway is now ready for metalling. The erection of the 178 ft. Maharakeke Bridge has been commenced, and a deviation and approaches extending over 1 mile have been completed. Deviations of 21 chains at the Waipawa–Dannevirke County Boundary, 42 chains at Matahiwi North, and 31 chains at Matahiwi South have much improved the alignment by easing or eliminating sharp curves. The Papatawa Overbridge and approaches have also been completed.

Extensive improvements have been made in the Taradale Town District, where the main street through the township has been reconstructed and sealed.

On the Waipawa–Tikokino and Waipawa – Onga Onga highways the sealing programme has been continued, 3 miles of surfacing being laid.

The 2-mile section of the Dannevirke–Waipukurau highway, which was reconstructed and widened last year, has been sealed, and a further length of 3 miles 54 chains is in preparation for next season.

On the Fernhill–Takapau via Maraekakaho highway Douglas' Bridge of one 20 ft. span has been erected.

On the Waipukurau – Matamau highway the Papatu Overbridge has been erected, though the approaches had not been completed at the end of March.

The Ngaruroro Bridge at Pakowhai, on the Farndon–Pakipaki highway, consisting of nine 75 ft. spans, was more than half-completed.

On the Lake House – Hopuruahine section of the Rotorua–Waikaremoana highway widening work has now ceased for the present. This 12¾-mile length is now greatly improved, but is far from finished. At Waihirere Bluff extensive stone walls have been built, and this most difficult stretch is now safe for drivers.

Taumarunui District.

Sealing contracts totalling 8 miles 52 chains were completed on the Hamilton – Te Kuiti State highway, Hangitiki – Te Kuiti Section, and the Te Kuiti – New Plymouth State highway between Mahoenui and Mokau, this latter length being now completely sealed.

Reconstruction in preparation for further sealing is in hand on these highways and on the Te Kuiti – National Park highway, the total length involved being 19¼ miles.

On the inland arterial route between the Ohura Turnoff and Taumarunui, 6 miles of reconstruction, some in very heavy formation, was completed, and 2 miles is in hand. A 12 ft. arched culvert 60 ft. long was erected on the 22 chains Maungatupoto Deviation, which will include a bridge over the Ohura River.

South of Taumarunui, on the Manunui–Piriaka section, 40 chains of formation and 36 chains of river-protection work were completed with the exception of the top-course of gabions. The severe flood in February caused considerable damage to the uncompleted stone work, which has now been repaired.

Between Owhango and Oio formation and metalling were continued.

The Spiral Overbridge of four 45 ft. spans was completed, and a pedestrian subway was added to the Short Street crossing elimination in Taumarunui Borough.

On the subsidiary highways the principal works were the completion of 3 miles of metalling on the Waitawhena Road between Piopio and Tatu, the reconstruction of 1 mile on Bruce highway near the Chateau, two short bridges, and the improvement of a number of sharp corners in the steep country typical of this district.

Taranaki District.

On the 100-mile section of the Auckland–Wellington arterial highway traversing this district the old standards of construction, good though they were for the time of their adoption, are being rapidly modernized.

Between Mokau and Tongaporutu the formation has been widened from 16 ft. to 20 ft. over a distance of 4 miles 29 chains, and similar work is being carried on to the Okau Road Junction, $2\frac{3}{4}$ miles being completed.

The Mount Messenger length has been scarified, reshaped, and metalled over $5\frac{1}{4}$ miles, and 42 chains of formation has been widened.

The Mimi Valley Deviation was prepared for sealing, which work has been postponed under existing conditions. A further length of the deviation was opened to traffic. Farther south towards Waitara reconstruction has been continued, and two major deviations are in hand.

Between Waitara and the Pukearuhe Junction $8\frac{1}{4}$ miles of emulsion sealing was carried out.

The reconstruction between Waitara and New Plymouth is approaching completion, the work during the year comprising 1 mile 70 chains of formation, 45 chains of metalling, and 2 miles of sealing.

The erection of a concrete bridge, 135 ft long, over the Waiongona Stream is well advanced.

South of New Plymouth the Rugby Road subway has been practically completed. This work eliminates the last level crossing on the State highways in Taranaki.

The Tariki-Waipuku Deviation, which by-passes two crossings, has been sealed.

Except for $1\frac{1}{4}$ miles, the 6-mile length between Waipuku and Stratford has been reconstructed and sealed.

A concrete bridge, 105 ft. long, has been completed over the Kahouri Stream.

Between the Ngaere Overbridge and Eltham reconstruction is being carried out, and a water-tunnel 369 ft. in length has been driven.

A seal-coat was applied to the 2-mile Boylan Road section, and reconstruction is in hand to Te Roti.

Between Hawera and the Manawapou Bridge, $2\frac{1}{2}$ miles of sealing was completed.

On the coastal highway via Opunake, $1\frac{1}{4}$ miles was re-aligned at Oakura, including a 50-chain deviation through a cutting.

A 95 ft. concrete bridge over the Otahi Stream has been completed.

On the Stratford–Taumarunui highway, 5 miles of formation and $2\frac{3}{4}$ miles of metalling have been carried out in the Tangarakau Gorge.

The $4\frac{1}{2}$ miles of clay surfacing remaining on this highway constitutes the only unmetalled length in the district.

Improvement works comprising principally the widening of existing sealed surfaces, general reconstruction and sealing, and some bridge-work are in hand or recently completed by the responsible local bodies on thirteen of the secondary highways.

Wanganui District.

The Hawera–Wanganui State highway, in traversing the seaward fringe of the coastal plain, crosses a series of valleys which have been eroded by the action of rivers and streams. The road, as originally laid out, crossed these valleys somewhat promiscuously. The works now in progress at Manawapou, Manutahi, Whenuakura, and Okehu, on which a total length of 1 mile 65 chains of reconstruction was completed during the year, have been designed to improve alignment and width and also, where practicable, to ease the grades.

A contract was let for reconstructing and sealing $3\frac{1}{2}$ miles extending northward from the Friends' School – Virginia Lake Deviation. When these works are finished the northern approach to Wanganui will have been modernized. The deviation, which is well in hand, will eliminate a series of sharp bends on narrow formation near the city boundary.

Steady progress was maintained on the National Park – Wanganui highway. Heavy construction, which is now being carried out at the southern end of the Waimarino County, will be continued to Raetihi, involving the rebuilding of a continuous length of $17\frac{1}{4}$ miles, which at present is much below highway standard. During the year 4 miles of reconstruction was completed, nearly all in the Wanganui County. Sealing is being extended northward, and $5\frac{3}{4}$ miles, mostly 2-coat work, was completed.

It is of interest to note that this, as well as the Horopito–Bulls via Taihape State highway, affords a shortening of some 40 miles on the Wellington–Auckland run compared with the Taranaki route, though the conditions as to grades, surface, &c., are at present very different. Between Taihape and Bulls, a distance of 56 miles, 95 per cent. is now sealed. Although the highway is rather winding between Utiku and Mangaweka, a greatly improved surface has been obtained. During the year 20 miles of new sealing was completed.

The Wanganui River (left bank) highway, which is maintained by the Board, suffered from floods on three occasions, the worst damage occurring in February, when a record flood in the river rendered the highway impassable. Lengths between Pipiriki and Parakino, totalling 6 miles, were buried in silt, in some places to a depth of 6 ft., the average being about 3 ft.

On three highways—Rapanui, Wanganui–Kauangaroa, and Curl's Bridge – Upper Tutaenui—in the Waitotara, Wanganui, and Rangitikei Counties respectively, extensive reconstruction was carried out. On the first-mentioned highway, 4½ miles was formed and metalled, 4 miles of the Wanganui–Kaungaroa highway between Wanganui and Fordell was completed, and the Curl's Bridge – Upper Tutaenui highway was reconstructed for a distance of 4¼ miles.

The Pipiriki–Raetihi section of the Pipiriki–Raetihi–Ohakune highway suffered considerable flood damage in February. Two large concrete culverts were constructed in Ohakune, and a contract was let for a third, east of Raetihi.

Two concrete bridges were completed on the Raetihi–Ohura highway. Both bridges were no sooner completed than the flood destroyed the old structures. A contract was let for renewing the superstructure of the Manganui-a-te-ao River Bridge on the same highway, and the original 100 ft. understrutted span was also washed away, unfortunately, in this case before the completion of the new work.

In the Patea County sealing was extended on the Kaharoa, Kohi, and Waverley Beach highways.

Wellington District.

The three works of major importance on the State highways which were in progress at the close of the previous year—namely, the reconstruction of the Hutt Road and Ngahauranga Gorge, and the new sea-level road to Paekakariki—are now completed, except for a few details.

Briefly, the net result of these works may be summarized as greatly increased traffic-capacity and safety on these sections of highway, together with a saving of 5 miles in distance, and nearly 500 ft. in height between Paremata and Paekakariki.

Taking into consideration the intensity of traffic and the permanent nature of these works, the economics of the improvements require no comment. An interesting feature has been the outlining of a considerable length of the new highway with special reflector-markers, which are an invaluable assistance to the safety of night-driving.

The 2¾ mile Whirokino Deviation south of Foxton, with its 3,720 ft. bridge, has proved its value on several occasions of high flood in the Manawatu River during the year. Its associated work, the renewal of the 550 ft. wooden bridge over the river itself, has been deferred.

Improvements by short deviations and renewal of minor bridges are being carried out between Levin and Paekakariki.

On the Palmerston North – Napier highway the widening of the 3¾ mile Manawatu Gorge section has been continued, 1½ miles being completed except for sealing. West of Palmerston the railway overbridge at Longburn Junction, which is a nine-span structure 360 ft. in length, is practically completed, and the approach ramps are well advanced.

By way of contrast, the Ashhurst overbridge east of Palmerston, which was also completed, has a single skew span of 24 ft. The approaches in this case, however, include major realignment at a highway junction, and extend over a total length of 1 mile 34 chains.

The Levin – Palmerston North highway, which formerly could only be regarded as a very mediocre southern approach to the city, has during the past two years been thoroughly transformed into a modern highway. The switch-back grades have been eased, curvature improved, and the road widened, metalled, and sealed. Two short lengths involving the construction of bridges remain to complete, the bridges themselves being now in hand. Work during the year comprised 3 miles of formation and 7 miles of sealing.

In the Manawatu County the reconstruction of the Awahuri and Mount Stewart highways, connecting Feilding with the arterial State highway, has been continued. The total length is 5¼ miles and some heavy formation was involved. The work is now practically completed to the priming stage, the sealing and some bridging remaining to be done.

The Greatford–Ashhurst highway in the Oroua County was reconstructed and primed over 2 miles of its length, and a similar length of the Waitarere Beach highway has been completed and prepared for bituminous treatment.

On the Upper Hutt – Waikanae highway a further length of 2¾ miles was sealed at the northern end, and the 3-mile Johnsonville–Newlands highway was reconstructed and sealed throughout.

Severe flood damage was incurred in December on the Hutt County section of the Masterton–Wellington State highway, part of the Taita Gorge protective works being destroyed and the Mangaroa Bridge damaged. A reinforced-concrete bridge on the adjoining Waikanae highway had one pier washed away, but the structure did not collapse. Remedial measures are in hand.

In the Greytown Borough the reconstruction and sealing of the State highway section, 67 chains in length, was completed.

The suspension bridge over the Ruamahanga River in the Masterton County, built in 1904, was completely reconditioned, and, except for its narrow width, will be satisfactory for some considerable time. The widening and improvement of the 4-mile Makuri Gorge section of the Pahiatua–Akitio highway was continued, 2 miles 70 chains being now completed.

Reconstruction and sealing were completed or are in progress on a number of the county highways in the No. 10 District, in lengths averaging some 2½ miles, and several important bridges are being erected, notably the Taueru of one 95 ft. and two 76 ft. spans, Whakataki No. 2 (one 65 ft. and two 52 ft. spans), Wainuioru (one 75 ft. and two 47 ft. spans), and Napiers Bridge East (four 40 ft. spans), the two latter being completed during the year.

Nelson District.

With the continuation during the past year of the reconstruction programme on the various State highways in the district, the requirements of traffic for some years to come are being provided for.

A total length of 25 miles has received a sealing-coat, and a further 18½ miles is being prepared for sealing.

On the Picton–Christchurch highway a further ¾ mile has been sealed in Picton Borough, and the Elevation Hill of 1½ miles and the Elevation-Para section of 3¼ miles have been reconstructed and sealed. These sections cover the most populous area between Picton and Tuamarina.

Between Blenheim and Riverlands, 4½ miles has been similarly treated, and between Riverlands and Dashwood 4½ miles of dust-laying seal coat has been applied.

Reconstruction on this highway includes 3¼ miles between Seddon and Ward, and the sealing of this will give a continuous length of 18 miles of dustless surfacing from Blenheim southward.

On the 2¼ mile deviation between Tuamarina and Spring Creek, which eliminates two level crossings, formation has been completed except for bridge-approaches, and of the two bridges included in the deviation the 140 ft. Spring Creek Bridge has been completed, and the 960 ft. Wairau Bridge is approaching completion.

Farther south a contract has been let for the 70 ft. Tirohanga Flat Bridge and its accompanying deviation. The latter work will replace three small bridges in urgent need of renewal, and a section of highway subject to periodic flooding. The 250 ft. Kekerangu River Bridge has been completed.

On the Blenheim–Nelson highway a further 3½ miles have been sealed between Renwicktown and Kaituna. The 13-mile section between Rai Valley and Wangamoa Hill, including the Rai Hill and the Collins and Wangamoa Valleys, is being prepared for sealing, for which a contract has been let.

A contract has been let for raising the road-level at Double Crossing near Havelock, which, when completed will obviate traffic being held up by floods.

The major reconstruction on the Wangamoa Hill has been continued, a further 1¾ miles to the foot of the hill on the Nelson side having been completed. The section is now ready for preparation and sealing.

On the Richmond–Collingwood highway 5¼ miles of sealing was carried out on the Moutere Hill, which gives a sealed length on this highway of some 29 miles. The railway overbridge and approaches at Appleby and the reconstruction of the 16-mile Takaka Hill section have been completed.

A further 2½ miles of reconstruction has been carried out between Takaka and Onekaka.

On the Nelson–Westport highway between Hope Saddle and Eight Mile widening and improvements to grade and location have been continued for a further 4¼ miles, the work now being completed to Owen Bridge, 19 miles from Hope Saddle. A large retaining-wall is in hand near Gowan Bridge, and a second near O'Sullivan's Bridge has been completed, providing an addition to the highway width in this locality. Two large reinforced-concrete box culverts have been constructed between Kohatu and Korere, and the approaches are in hand.

Protective fencing, chiefly on hill sections, has been continued on this and other State highways throughout the district, the length erected during the year being 13 miles.

On other highways maintained by the Board, ½ mile of preparation and sealing has been completed on the Nelson Aerodrome highway, and on the Murchison – Lewis Pass highway (Shenandoah Deviation), ½ mile of reconstruction has been carried out.

On the county highways the Waikato and Aorere Hall culverts in the Collingwood area have been completed. Between Spring Creek and Raranga 2 miles has been reconstructed and primed, a major deviation formed to eliminate bridges between Renwicktown and Branch River, and the 35 ft. Irongate Stream Bridge in the Takaka County erected.

Between Wakefield and Woodstock the 25 ft. Fowler's Creek Bridge and Gentle Annie Culvert have been completed.

On the Blenheim Aerodrome highway 1¼ miles has been sealed, and the 330 ft. Taylor River Bridge completed, eliminating a ford which frequently held up traffic between Blenheim and the Aerodrome.

Greymouth District.

State highways are being improved on a comprehensive plan radiating from the main centres of Westport, Greymouth, and Hokitika, and the work is beginning to link up into continuous lengths of improved road.

On the Nelson–Westport highway a footway has been constructed on the Buller River Bridge, the 4-mile section between this bridge and the junction with the Westport–Greymouth coast highway widened and improved, and 3 miles 12 chains of this have been sealed. Work is being continued eastward through the Buller Gorge, this involving heavy rock excavation, the construction of a number of retaining-walls, widening of bridges, and extension of culverts. Between Westport and the mouth of the Gorge (8½ miles), only a few short lengths now require improvement, while 3¾ miles in the Gorge itself has been dealt with.

On the Inangahua–Greymouth highway work is proceeding north and south of Reefton, as well as northward from Greymouth. North of Reefton, 3½ miles from the Reefton Railway-station to Waitahu is in hand, and 1 mile 70 chains of this has been reconstructed ready for sealing next season. South of Reefton the approach to the Inangahua River Bridge has been improved and ½ mile realigned and regraded.

Northward from Greymouth good progress has been made, and the highway is now up to standard, except for 35 chains in three short sections between Greymouth and Ikamatua, which are in hand. At Callaghans Creek, south of Ahaura, a bridge of two 30 ft. spans has been constructed. A major

deviation 1½ miles in length, involving the construction of a bridge of five 40 ft. spans over Nelson Creek, was completed above Ngahere, reducing the distance between Greymouth and Reefton by 1 mile. The improved sections have been sealed as far as possible on completion, and a length of 9¾ miles was surfaced up to 31st March, while a further 5 miles has since been accounted for.

On the Greymouth–Waiho highway improvements have been carried southward from Hokitika over a length of 11 miles, involving a considerable amount of regrading, minor deviations, and four large concrete culverts. Two miles has been sealed, and a further 8 miles is being prepared for sealing.

Farther south a length of 2¼ miles through the Township of Hari Hari received a dust-laying seal-coat, a 70-chain deviation near the Wataroa River Bridge, to by-pass a river erosion, was completed, and ¾ mile through the Township of Wataroa was widened, regraded, and sealed.

Severe flood damage on the southern end of this highway occurred in November and again in February.

On the Christchurch–Kumara Junction highway work has centred on the construction of culverts and bridges. The approaches to O'Neill's Creek and Nelly's Creek Culverts, which were constructed last year, were completed, and a further large culvert was constructed. The replacement of an old bridge over Harley's Creek by a concrete bridge of three 30 ft. spans on improved alignment is in progress. The widening of a narrow length between Kelly's and Aickens is in hand. A sealing-coat was applied over the remaining length of 73 chains between Kumara and Kumara Junction.

Serious flood damage occurred on this highway in February, and repairs are still in hand.

On the Westport-Karamea highway the Buller County has widened and reconstructed 9 miles in sections over a length of 23¾ miles north of Westport, in preparation for sealing, and has sealed 4¼ miles. At Ngakawau the elimination of a combined road and railway bridge has been effected by the completion of a new bridge of nine 40 ft. spans on a deviation. Farther north concrete culverts to replace timber bridges at Falls Creek, Caliari's Creek, and Tidal Creek have been erected, and the formation and metalling of the Kongahu Deviation were completed.

On the Westport–Greymouth coast highway a new bridge of five 40 ft. spans on improved alignment was put in hand over the Nile River, and three spans have been completed. The approaches involve a ¾ mile deviation, of which 42 chains has been completed.

On the Charleston–Punakaiki section widening and improvements have been continued, and a total length of 2 miles has been carried out during the year. Considerable trouble has been experienced with slips, particularly on Red Jacket Hill.

At Barrytown severe erosion of the highway along the beach continued, and a 2½-mile deviation to avoid this length was put in hand. To date 1¼ miles of formation has been completed. The beach road was completely eroded in March, and a temporary access to the new formation, with a temporary bridge over Fagan's Creek, had to be constructed.

On the Reefton – Hanmer Junction highway good progress was made during the year. The improved sections have been linked up to form a continuous length from Crushington to near the lower crossing of the Inangahua River, and from Cliff Creek to Black Creek, leaving an unimproved length of 6¼ miles over the Rahu Saddle and ½ mile near Springlands Junction. Seven single-span bridges and two large concrete culverts were erected, and one bridge was widened. This highway is now becoming the main route between Canterbury and the West Coast.

Canterbury District.

Improvements to the State highway in the northern area are continuing, in conjunction with the construction of the South Island Main Trunk Railway. North of Kaikoura two deviations of 6 chains and 8 chains have been completed. South of Kaikoura the highway is being deviated to allow the railway to follow the old road line. At Goose Bay a new bridge has been completed, but is not yet available to traffic. Between Oara and Parnassus further widening and re-alignment were carried out for ½ mile to give an improved approach to the railway overbridge at Hundalee.

Contracts have been arranged for sealing the 5-mile section from Kahautara to Kaikoura, 6¾ miles from Hurunui to Domett, and 50 chains in Cheviot Township.

In the Cheviot and Waipara Counties improvement-work has been completed on the 7-mile section from Hurunui to Domett, except for a bridge replacement and deviation at Benmore. On the 9-mile section between Omihi Saddle and Hurunui similar widening and re-aligning work is well forward.

The deviation at Weka Pass on the inland route between Waipara and Kaikoura was opened for traffic, but heavy slips caused considerable damage. The 80 ft. concrete bridge in the pass is nearly completed. Further on a 60-chain section round Pigeon Rock has been widened.

In the Waipara County sealing has been carried out for the full length of the Waikari–Waitohi highway, thus completing the sealing of a triangle of highway from Waikari–Hawarden–Waitohi, connecting with the inland route to Kaikoura.

On the Lewis Pass highway four spans of the Hope River Bridge were washed away during floods. The bridge has now been repaired, and a contract let for a 90 ft. bridge over the Kakapo Creek.

On the West Coast State highway a contract was arranged to continue the sealing 8 miles from Kirwee, and the preparatory work has been done. Round Lake Pearson the highway has been widened for another 25 chains and a bridge has been constructed over the Little Craigieburn Stream. Between Cass and Waimakariri widening has been continued for 2½ miles, and the approach to the Waimakariri River Bridge on the Christchurch side has been widened and re-aligned over a 40-chain length, eliminating a narrow and dangerous piece of road.

On the scenic highway along the crest of the Port Hills at Christchurch the newly-declared portion from Dyer's Pass to Gebbie's Pass was sealed, and from Evans Pass to Dyer's Pass plant-mix paving completed for 9 miles. A smoothing-coat was laid from the " Takahe " to the " Kiwi " on the Christchurch – Governor's Bay highway.

A smoothing-coat was also applied from the Ferrymead Bridge to Sumner and from Evans Pass to Lyttelton on the State highway. The newly-reconstructed section from Sumner to Evans Pass was sealed. The special feature on this highway was the opening of the 55-chain causeway across McCormack's Bay.

The sealing of the reconstructed section of 3 miles from Lyttelton to Governor's Bay has been commenced. When completed this will give a sealed route throughout on the popular drive from Christchurch to Governor's Bay, returning via Lyttelton and Sumner. A considerable improvement in the alignment has been effected on a section from Teddington to Allandale.

Reconstruction of the highway to Akaroa is proceeding, work being concentrated on the length between Duvauchelles and Takamatua Bay, where considerable re-alignment has been carried out. This work has been of a heavy nature and has resulted in a marked improvement. The sealing has been extended by 5 miles from Motukarara to Kaituna, and preparation is being carried out on 2 miles in Little River Township.

The highway from Christchurch to Southbridge and Rakaia Huts has been sealed to Southbridge Township.

From Rangiora to Cust 8 miles has been sealed and a further 2 miles prepared for sealing. In the Sefton Township 1 mile of sealing has also been completed.

On the highway to the beach resort of Waikuku, a 47-chain deviation has eliminated a winding section of road, and the full length of the highway has been sealed.

The uneven surface of the Marshland Road (on which traffic is very heavy) from Christchurch to the State highway at Chaney's Corner, a length of 3 miles, has been corrected by the application of a plant-mix smoothing-course.

On the State highway to Timaru work completed includes the 180 ft. overbridge and approaches at Rakaia, and the sealing of the final 16 miles of the Rangitata Deviation. 4 miles of preparation work has been completed on the new highway giving access to Geraldine from the deviation.

Plant-mix paving was advanced for 8 miles on the recently-constructed 13-mile section of the highway from Ashburton to Methven, and 2 miles completed on the highway to Wakanui.

In the Geraldine County contracts have been arranged for three small bridges, and 6½ miles of sealing was completed. This includes 30 chains in Peel Forest Township. The Manse Bridge of ten 40-ft. spans, on the highway from Temuka to Pleasant Point, was completed and opened for traffic.

At Albury a deviation, consisting of one 40 ft. and two 80 ft. bridges and 34 chains of approaches, eliminates three narrow and dangerous wooden bridges. Near Lake Pukaki a 1-mile deviation has been constructed towards the Ohau River.

On the Pukaki – Hermitage – Tasman Glacier highway a 60-chain deviation was constructed at Birch Hill and an old bridge re-erected thereon.

In the Levels County at Blakemore's Hill on the Timaru–Cave highway a deviation eliminates three sharp curves, and at Frasers, on the Main Otipua route, a sharp curve has been eased.

From Pareora the sealing has been continued for 5½ miles to Southburn.

The reconditioning of the old wooden bridges on the State highway to Dunedin has been completed. This included extensive work on the bridge over the Otaio River, and the shortening of the bridge over the north branch of the Waihao River. The new Dog Kennel Creek bridge of three 32 ft. spans was completed, and approaches are being formed.

Altogether, during the year 75 miles 34 chains of sealing and 35 miles 25 chains of plant-mix paving were completed in the three highways districts in Canterbury, and 1,456 ft. of bridging erected.

Otago District.

Reconstruction and sealing work on the Timaru–Dunedin State highway is completed, and attention is being given to the erection of highway guard-fencing and road-marker posts. Two bridges were renewed during the year—namely, the 100 ft. Kakaho Stream Bridge and the Kuri-iti Stream Bridge, which is 95 ft. in length.

A 7 miles 10 chains deviation at Lindis Downs on the Timaru–Cromwell highway is complete, and work is in progress over a length of 25 miles over Lindis Pass to improve alignment, grades, and width, 21 miles being completed.

On the Milton–Queenstown highway, which provides the principal access to Central Otago, extensive reconstruction work is being carried out. On the section between Coal Creek and Alexandra heavy formation work and bridge renewals are in progress, and from Alexandra to Cromwell the work including sealing, is nearing completion. From Cromwell to Queenstown (36¾ miles), one third of the work is completed, and guard-fencing has been erected in the Kawarau Gorge.

A length of 5¾ miles skirting Lake Wakatipu, on the Queenstown–Invercargill highway, has been improved during the year, together with culverts, stone walls, and guard-fencing.

On the Pukeuri–Kurow–Omarama highway contracts for the reconstruction and sealing of 17 miles 66 chains have been let. Progress has been good, and 8 miles 26 chains has been sealed. This work has been undertaken on account of increased traffic density.

On the Waiareka–Duntroon via Ngapara highway an old narrow wooden structure has been replaced by a 60 ft. concrete bridge at Pig Island.

Formation work on the relocation of the Dunedin–Waitati via Leith Valley highway is 75 per cent. completed, the heaviest portion of the formation being now in hand, and a contract has been let for the 135 ft. Waitati Stream Bridge. This work is undertaken to give an alternative northern route to Dunedin constructed to modern standards, and when completed will be greatly superior to the present highway via Mount Cargill.

The reconstruction of 5¾ miles of the Port Chalmers – Aramoana highway was continued, and the work, including 2½ miles of sea-wall, is practically completed.

On the Pembroke–Haast highway widening of formation and bridges has been continued during the year, a length of 1 mile 37 chains having been completed. With the advent of increased tourist traffic to the Haast Pass region, the existing highway has proved to be inadequate.

A deviation 35 chains in length, which is being constructed on the Kyeburn–Middlemarch highway, will eliminate two railway-crossings.

On the Dunedin–Gore State highway further progress has been made with the reconstruction between Balclutha and Clinton, bringing the completed formation close to the latter township. The Waipahi Deviation, which will eliminate two railway-crossings and avoid the sections subject to flooding, has been formed for 2 miles 30 chains.

Reconstruction has been completed northward from the Southland County Boundary for 4¼ miles.

A 72 ft. concrete bridge has been completed at Paiawata Stream, as well as three short flood-channel bridges near Kaihiku.

Sealing carried out during the year comprised 10 miles between Balclutha and the Southland County, and an additional 2 miles has received a priming coat. Thirteen miles of reconstruction and 22 miles of sealing remain to complete this highway.

On the Milton–Queenstown highway 5 miles of formation and 9 miles of base-course metalling have been carried out, bringing the metalled length to near Waitahuna. This section includes the Round Hill Deviation, which eliminates a bad railway-crossing.

A 70 ft. concrete bridge has been completed over the Bengerburn near Ettrick, to replace a dangerous 8-ft.-wide timber structure.

Beyond Roxburgh on Coal Creek Flat approximately 2½ miles has been shaped, metalled, and primed ready for sealing.

On the Dunedin – Harrington Point highway a start has been made on the reconstruction to give greater width and better visibility. Work is well advanced on the replacement of the decayed timber bridge at Anderson's Bay with a concrete structure of three spans.

Reconstruction of the Dunedin – Duke's Road highway was completed during the year, and the whole length of 5½ miles received a priming coat. This highway gives greatly improved access from Dunedin to the R.N.Z.A.F. Station at Taieri.

Short lengths of the lesser highways were prepared and sealed, and 2 miles of the Gladstone highway serving the Wingatui Racecourse was reshaped and given a priming coat.

Southland District.

On the State highway through Gore to Invercargill all recently improved sections have now been sealed except for 35 chains at the Otikerama Overbridge, the length surfaced aggregating 18½ miles.

Between Invercargill and Greenhills 4¾ miles of reconstruction and 1¼ miles of sealing were carried out, and the Greenhills Overbridge completed, though not yet under traffic.

On the Queenstown highway reconstruction is in hand between Branxholm and Buxton's Corner, and 3 miles of deviation has been commenced farther north. A length of 1¾ miles between Dipton and Benmore was re-aligned and raised above flood-level.

Flood-alleviation works were carried out at Mandeville on the Gore–Lumsden highway, including a 150 ft. bridge and the straightening of the Waimea Stream.

On the Lorne–Riverton State highway reconstruction in preparation for sealing is well advanced in both the Southland and Wallace Counties, and the widening or replacement of narrow bridges is in progress.

The Homer Tunnel, on the Milford Sound highway, was holed through on the bottom heading towards the end of the year, and a contract let for the enlargement to full size. At the Homer end 240 ft. of concrete avalanche-protection was erected. Road-construction is well forward at the Milford Sound end, 9 miles of formation and 8 miles of metalling being completed, and a track made over the short remaining length to the tunnel-portal.

Sealing was carried out on a number of the subsidiary highways, principally in townships, and at Mataura a new bridge comprising a 142-ft.-concrete arch was erected over the Mataura River.

Elimination of Level Railway-crossings.

During the year the expenditure on this item was £145,001, bringing the total since the inception of the programme to £799,700.

Eighteen crossings were accounted for, making 108 in all, and work is in progress on a further 13, while proposals are in hand for 37.

Surveys and preliminary plans have been undertaken in connection with 21 additional crossings, and 41 have been investigated and deferred, the total number which has come under review being 220.

As the majority of the more dangerous crossings have now been eliminated and as difficulty is being experienced in obtaining materials, particularly reinforcing steel, the work in the coming year will be principally confined to completing those crossings at present in hand.

State Highways.

As in the previous year, the major reconstruction works were carried out on the State highways, the natural result of these main arteries carrying the densest traffic and requiring on that account to be brought up to the required standard with as little delay as possible.

The Board fully appreciates the fact that, as the State highways system improves, the demands of traffic on the ordinary or feeder highways increase accordingly, and, wherever the conditions warranted, sympathetic consideration has been given to all applications made by local authorities in connection with improvements on ordinary highways.

Contact with Local Bodies and Automobile Associations.

Under normal conditions the Board would have made tours of inspection covering the whole of the North Island during the year, but immediately following the outbreak of war the Board decided to postpone its proposals in this respect meantime. It is probable that no tours will be made during the continuance of the present conflict. Although it has not been possible to make personal contact with the local bodies and motor organizations during the year, the usual general spirit of goodwill and co-operation has been maintained, and the Board would like to express its deep appreciation to all concerned for the manner in which they have accepted the recent reduction in highways allocations necessitating a deferring of various undertakings which under normal conditions would have proceeded.

Measures to promote Road Safety.

Measures which claim to make the highways safer have continued to engage the attention of the Board. Close contact has been maintained with the New Zealand Road Safety Council at all times.

With a view to providing safer driving conditions, the alignment, sight distance, superelevation, width of paving, shoulder width, and other relevant features are all carefully considered before approval is given to proposals for reconstruction work.

During the year the erection of guard-fencing has been continued, although more recently the progress in this direction has had to be curtailed owing to the difficulty in obtaining materials.

The painting of white lines on pavements to demarcate the traffic lanes has been continued, and quite an advance has been made in the length now marked, particularly in districts which have a mechanically-operated line-marker. Several of these machines are in operation and they are capable of painting up to 5 miles of line per day.

In last year's report mention was made of the new type of reflector which had been tried out to give indication to drivers of the edge of the road and also of the alignment ahead. These reflectors have proved to be very effective, apart from the liability to damage from cattle driven along the road colliding with the reflectors and bending the metal supporting-posts. There have also been cases of wanton destruction by individuals whose mentality it is difficult to understand, and every effort is being made to stop this practice.

Footpaths and cycle-track construction have continued to feature in the Board's activities.

Lighting on Main Highways.

The advance which was anticipated in this direction has, unfortunately, not materialized, owing to the difficulty in obtaining equipment. Current indications are that the programme for the immediate future is likely to be limited until such time as materials and fittings can be obtained.

Signposting, Centre-line Marking, etc.

As in previous years, the Board provided a £3 for £1 subsidy on the cost of signposting carried out on main highways by automobile associations. The amount thus expended from the Main Highways Account for the year ended 31st March, 1940, was £3,866. Since its inception the Board has contributed a total of £26,762 towards this work. The work done by the associations in their signposting programme has been very effective, and many appreciative references to same have been made by visitors to the Dominion.

Residential Accommodation for Regular Maintenance-men.

During the past year the Board has continued with the construction of residential accommodation for maintenance-men employed on State highways under its direct control. The provision of such accommodation is much appreciated by the men, who willingly pay the rent for their cottages in preference to occupying the standard Public Works type of accommodation without rent.

State Highway Depots.

A further number of depots has been established at suitable locations on the highway system for housing of road-graders, lorries, sealing-plant, and other machinery. The selection of sites upon which these depots are erected requires careful consideration, particularly in respect to when the length of the highways served by the depot is likely to be sealed, as when this is effected grading is restricted to shoulder work only. Similarly, the use of lorries also becomes much reduced on a highway once it is sealed, and these factors have to be considered in locating the depots at suitable intervals.

Advances to Local Authorities.

As in previous years, though to a much less extent, loans have been granted to local authorities for highways works. The number of loan agreements entered into during the year was seven, involving an amount of £5,531, compared with fifteen agreements totalling £26,497 for the previous year.

The total amount advanced to 31st March, 1940, was £301,620 6s. 8d., the amount outstanding at that date being £83,167.

Plant.

Once again there has to be recorded a considerable increase in the use by local authorities of the facilities provided to acquire plant through the Board under hire purchase. The total purchases in this respect for the year 1939–40 amounted to £56,122, which is the highest yearly figure yet recorded.

Since the inception of this scheme, plant to the value of £344,290 has been purchased, of which amount £79,756 was outstanding at 31st March, 1940.

The items so purchased during the year were: Graders, 17; trucks, 13; tractors, 7; crushers, 4; roller, 1; shovel, 1; excavator, 1; planer, 1; loader, 1.

During the year, owing to the necessity of conserving overseas exchange, the Board adopted the policy of declining the purchase of any machine where such exchange was involved, and advocated the acquisition of plant of local manufacture.

Apart from the above, the Board purchased various items of plant for its own use as under: Graders, 23; spraying-machines, 22; portable huts, 12; pumps and engines, 10; tractors, 8; crushers, 6; compressors, 5; angle-dozers, 4; mowers, 4; road-sweepers, 4; electric motors, 3; welding-sets, 3; bitumen-containers, 2; engines, 2; generators, 2; concrete-mixers, 2; road-planers, 2; winches and engines, 2; degreasing-plant, 1; excavator, 1; lorry, 1; bending-machine, 1; shaft-grinding machine, 1; bitumen preheater, 1; road-marker, 1; sharpening-machine, 1; bull-dozer pump, 1; electric pump, 1; trailer, 1; concrete-vibrator, 1; power-control winch, 1.

Testing of Highway Materials.

This work has been carried out as usual on both petrological and bituminous materials.

In the petrological laboratory the newly-acquired Los Angeles abrasion testing-machine was installed late in the year, and brought into use. It is intended to carry out this test, which provides an indication of the combined abrasive and impact resistances of rocks and gravel, on representative samples of road-making materials from typical sources of supply in each district.

The results of the first few tests carried out are shown in Table 7.

Numerous tests of sub-grade clays, soils, and the softer rocks, in which tension, shrinkage, and the hydraulic properties are measured, were undertaken in the laboratory of the Public Works Office, Wellington.

A large number of samples of tar and bituminous materials were tested by the Dominion Analyst; the accentuated shortage due to war conditions, and the consequent necessity for making the greatest possible use of local materials, and in some cases existing stocks of bituminous products requiring modification to meet the requirements of modern highway specifications, have made this work particularly valuable at the present time.

Standard Specifications.

In last year's report reference was made to the five Standard Specifications which had been printed and formed in loose-leaf book form entitled "Book of Instructions and Standard Specifications." These five specifications covered "Construction of Formation," M.H.B. 42; "Construction of Base Course," M.H.B. 43; "Top Course Construction," M.H.B. 44; "Tar Priming Coat," M.H.B. 45; and "Road Oil Sealing Coat," M.H.B. 46. A pamphlet entitled "Notes on Formation" was also incorporated in the Book of Instructions.

During this year a standard specification for "Dust-Laying Seal Coat," together with an accompanying pamphlet of notes on same, was distributed for inclusion in the Book of Instructions and Standard Specifications.

The general use made of these specifications by engineers in the proposals which have been submitted to the Board for approval has resulted in reducing work both for the engineers who submit the proposals and for the Board's staff engaged upon their approval.

Operations of Magnetic Truck.

During the year the Board's magnetic truck, which is utilized for clearing highways of iron or steel puncture-producing articles, operated mainly in the North Island, although about three months were spent in the South Island also.

The length of road actually cleared during the year was 3,927 miles, nearly twice the length covered in the previous year (2,084 miles), when the truck was for a time off duty owing to overhaul, while the weight of material picked up was nearly three times that of the previous year, 12,257 lb., as compared with 4,742 lb.

The average yield per mile was 3·12 lb., the corresponding figure for 1938–39 being 2·28 lb.

Examination of Foremen and Overseers of Road-construction.

The fourteenth examination for Foreman and Overseers of Road-construction was held on the 1st November, 1939, when seventy-three candidates presented themselves.

Sixty-three papers on general road construction and maintenance and twenty-eight papers on tar, bituminous, and concrete road-construction were returned.

Twenty-five candidates were successful in passing Paper No. 1, while fourteen passed Paper No. 2.

Three candidates passed the full examination, and a further twelve, who had previously secured a partial pass, completed the examination. The twenty-one candidates who were successful in one paper only were credited with a partial pass.

Certificates of Competency have been awarded to all those candidates who passed or completed the examination, the recipients being Messrs. G. J. Beynon, G. W. Cookson, A. J. Doel, Q. D. Fraser, F. R. Hamer, H. C. Littlejohn, T. E. McLoughlin, C. V. O'Callaghan, W. R. Rose, N. A. Rush, R. T. Rutherford, L. B. Shaw, E. G. Spicer, C. J. Watson, and J. H. Wilson.

Declarations and Revocations of Main Highways.

For the annual review of main highways, District Highways Councils submitted recommendations covering the proposed declaration of 499 miles of roads as additional main highways and the revocation of 41 miles of existing main highways. Owing, however, to the heavy commitments against highway funds arising from the immediate requirements of the existing highways system, the Board was unable to recommend any general extension.

A number of adjustments were found necessary or desirable owing to changes in traffic conditions. These adjustments covered not only the revocation of an existing length of main highway in exchange for a more important road, but also the declaration of a short extension of highway or an important connecting-link between two highways, or of lengths of roads constructed by the Public Works Department in unsettled country mainly for tourist purposes.

In the table that follows it should be noted that the increase in mileage of highways is more apparent than real—*e.g.*, 51 miles of the Kaitaia–Motukaraka main highway has been declared, but this is more than offset by the revocation of 52 miles 24 chains of the Kaitaia–Kohukohu via Broadwood and Kaitaia–Motukaraka via Broadwood main highways. The latter two highways were revoked and redeclared under the title Kaitaia–Motukaraka. Again, the Inangahua Junction – Waiho, Waiho–Weheka, and Inangahua Junction – Weheka main highways (comprising a total of 201 miles 57 chains) were revoked and redeclared and extended to Karangarua under the title Inangahua Junction – Haast Pass, a length of 220 miles. The additional mileage declared was thus only 18 miles 23 chains. Furthermore, the lengths of several highways as originally gazetted were incorrect, the gazetted length being less than the actual length. The necessary adjustments have now been made, with the result that the total mileage of highways is greater, although in reality the highways themselves mainly remain as before.

The following list shows the lengths of main highways declared and revoked during the year ended 31st March, 1940, including formal adjustments :—

Main Highways declared.

	Miles.	ch.
No. 1 Highways District—		
Waimate North	2	36
Pakaraka–Awanui via Mangonui	51	15
Waimamaku–Ohaeawai	8	77
Kaitaia–Motukaraka	51	0
No. 2 Highways District—		
Tuakau–Pokeno via Whangarata	0	11
Drury–Waiuku–Kohekohe	30	61
Great South Road	2	45
Hobsonville	2	55
Brigham's Creek – Hobsonville	5	30
Waitakere Scenic Drive	8	0
Cockle Beach	1	48
Coroglen–Waihi via Whangamata	59	71
No. 3 Highways District—		
Paengaroa–Maketu	4	12
No. 4 Highways District—		
Manutuke–Wairoa via Mangapoike Valley	1	20
No. 9 Highways District—		
Wellington–Auckland via Taranaki	1	76
East Street	0	70
Western Hutt	1	40
No. 10 Highways District—		
Wellington–Napier via Wairarapa	0	31
Featherston – Pigeon Bush	0	6
No. 12 Highways District—		
Westport – Karamea	0	79
Reefton – Hanmer Junction	42	50
Inangahua Junction – Haast Pass	220	0
Ngahere–Blackball	3	6
No. 13 Highways District—		
Reefton – Hanmer Junction	10	4
Waipara–Kaikoura via Culverden	2	34
No. 14 Highways District—		
Summit	8	40
Christchurch–Lyttelton via Sumner	0	55
McCormack's Bay	1	0
Burwood–Marshlands	3	0
No. 15 Highways District—		
Christchurch–Dunedin	21	16
Rangitata–Geraldine	5	72
Lake Pukaki – Hermitage – Ball Hut	47	0
Hinds–Winchester via Arundel	29	72
Cooper's Creek – Peel Forest	13	31
No. 16 Highways District—		
Queensberry–Pembroke	16	1
Pembroke–Haast	38	65
Luggate–Hawea	10	66
No. 17 Highways District—		
Waiwera Railway-station – Clydevale	11	20
Dunedin – Duke's Road Railway-station	4	3
No. 18 Highways District—		
Dipton–Castlerock	13	32
Dunn's	2	4
	740	74

Main Highways Revoked.

	Miles.	ch.
No. 1 Highways District—		
Waimate–Kaeo–Mangonui	46	52
Pamapuria–Mangonui	2	55
Opononi Main Highway	1	60
Waimamaku–Ohaeawai	7	10
Kaitaia–Kohukohu via Broadwood	48	24
Kaitaia–Motukaraka via Broadwood	4	0
Pamapuria – Mangonui – Cooper's Beach	1	0
No. 2 Highways District—		
Great South Road	8	31
Drury–Waiuku via Pukekohe	21	38
Drury–Awhiti via Waiuku	9	12
Pukekohe–Bombay	0	11
Panmure–Otahuhu	0	55
Mangere–Otahuhu	0	66
Hobsonville Main Highway	4	59
No. 3 Highways District—		
Maketu Main Highway	4	0
No. 9 Highways District—		
Wellington–Auckland via Taranaki	2	38
West Street Main Highway	0	60
No. 10 Highways District—		
Wellington–Napier via Wairarapa	0	35
No. 12 Highways District—		
Westport–Karamea	1	3
Reefton–Maruia	27	72
Inangahua Junction – Waiho	172	15
Waiho–Weheka	16	29
Inangahua Junction – Weheka	13	13
No. 13 Highways District—		
Waipara–Kaikoura via Culverden	2	70
No. 14 Highways District—		
Christchurch–Lyttelton (via Sumner)	1	0
Summit Main Highway	8	40
No. 15 Highways District—		
Christchurch–Dunedin	5	12
Walnut Avenue Main Highway	0	52
Ashburton–Methven	1	53
Ashburton–Wakanui	0	71
Lake Pukaki – Hermitage	36	0
Arundel – Peel Forest	10	76
Arundel – Cooper's Creek	3	0
No. 16 Highways District—		
Cromwell–Luggate	10	34
Timaru–Queenstown via Tekapo and Lindis Pass	23	42
Hawea–Haast Pass	33	0
No. 17 Highways District—		
Waiwera–Clydevale	8	60
Waiwera Railway – Station Road	1	20
	542	68

The Board acknowledges the continued co-operation of the Public Works Department in matters relating to main highways administration and records its appreciation of the valuable services rendered by officers of the Department in carrying out an extended programme during the period under review.

The accompanying tables contain statistical information relative to finance, lengths of highways, and results of stone testing carried out during the year.

Signed on behalf of the Main Highways Board,

J. Wood, M.Inst.C.E.,

Chairman.

TABLE 5.—MAIN HIGHWAYS ACCOUNT.

STATEMENT SHOWING PARTICULARS OF NET EXPENDITURE ON CONSTRUCTION, RENEWALS, MAINTENANCE, &C., FOR THE YEAR ENDED 31ST MARCH, 1940, AND TOTAL TO DATE.

	Construction and Improvement of Main Highways.		Renewals of Main Highways.		Maintenance, Repairs, &c. of Main Highways.		Totals.	
	Total for Year 1939-40.	Total since Inception of Main Highways Act, 1922, to 31/3/40.	Total for Year 1939-40.	Total since 1/4/36 to 31/3/40.	Total for Year 1939-40.	Total since Inception of Main Highways Act, 1922, to 31/3/40.	Total for Year 1939-40.	Total since Inception of Main Highways Act, 1922, to 31/3/40.
Highway District—	£	£	£	£	£	£	£	£
No. 1	200,751	*1,306,406*	38,119	*94,565*	82,234	*903,776*	321,104	*2,304,747*
No. 2	493,054	*2,487,107*	23,869	*117,044*	158,521	*1,638,454*	675,444	*4,242,605*
No. 3	234,622	*823,363*	26,964	*42,657*	150,882	*873,186*	412,468	*1,739,206*
No. 4	59,879	*598,935*	11,418	*70,836*	78,945	*670,636*	150,242	*1,340,407*
No. 5	160,765	*717,019*	18,443	*37,702*	98,410	*1,032,236*	277,618	*1,786,957*
No. 6	140,242	*703,723*	2,510	*17,889*	84,835	*654,666*	227,587	*1,376,278*
No. 7	181,510	*840,344*	6,638	*21,707*	51,739	*633,453*	239,887	*1,495,504*
No. 8	194,679	*739,977*	7,457	*19,271*	71,510	*650,223*	273,646	*1,409,471*
No. 9	260,571	*1,324,229*	15,463	*24,599*	69,419	*754,486*	345,453	*2,103,314*
No. 10	40,040	*406,651*	15,597	*37,058*	42,405	*623,009*	98,042	*1,066,718*
Totals for North Island ..	1,966,113	*9,947,754*	166,478	*483,328*	888,900	*8,434,125*	3,021,491	*18,865,207*
No. 11	221,728	*871,953*	1,968	*7,632*	73,935	*703,267*	297,631	*1,582,852*
No. 12	215,837	*903,355*	9,111	*75,319*	93,372	*1,124,628*	318,320	*2,103,302*
No. 13	42,916	*266,727*	..	*192*	30,454	*305,048*	73,370	*571,967*
No. 14	138,257	*756,127*	267	*3,577*	43,904	*490,770*	182,428	*1,250,474*
No. 15	85,960	*474,929*	3,379	*5,923*	36,591	*563,675*	125,930	*1,044,527*
No. 16	134,008	*710,041*	2,618	*10,157*	48,441	*434,443*	185,067	*1,154,641*
No. 17	103,044	*755,631*	3,304	*7,161*	27,371	*403,593*	133,719	*1,166,385*
No. 18	198,608	*851,942*	3,514	*22,066*	58,944	*504,309*	261,066	*1,378,317*
Totals for South Island ..	1,140,358	*5,590,705*	24,161	*132,027*	413,012	*4,529,733*	1,577,531	*10,252,465*
Totals for Dominion	3,106,471	*15,538,459*	190,639	*615,355*	1,301,912	*12,963,858*	4,599,022	*29,117,672*

TABLE 5.—MAIN HIGHWAYS ACCOUNT—*continued.*

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1940, AND TOTAL TO DATE.

EXPENDITURE.		Total for Year 1939–40.	Total since Inception of Main Highways Act, 1922, to 31/3/40.
		£	£
Net expenditure on construction, renewals, maintenance, &c. (see separate statement)		4,599,022	*29,117,672*
Administration—			
Administration expenses (including salaries, travelling-expenses, office rents, printing, stationery, postages, and miscellaneous expenses)	£ 183,999	..	*972,386*
Fees and travelling-expenses of members of the Main Highways Board other than Government members	1,143	..	*19,405*
Miscellaneous expenses—			
Advertising, maps, rent of halls, traffic tallies, transport of samples, depreciation of furniture, &c.	73	..	*6,116*
Compassionate grants to widows and relatives of deceased employees	..	..	*4,000*
Compensation under section 3, Public Works Amendment Act, 1925	..	..	*1,015*
Exchange on remittances	230	..	*8,090*
Grant to Transport Department towards Traffic inspection	10,000	..	*32,906*
Petrological laboratory and other experimental work, Expenses of	1,833	..	*12,998*
Total administration		197,278	*1,056,916*
Loan charges—			
Charges and expenses of raising loans, management charges of Consolidated Stock on account of Construction Fund, &c.	3,031	..	*72,666*
Interest on amount appropriated out of Public Works Fund and paid into Main Highways Account Construction Fund	61,300	..	*613,000*
Interest on loans, recoupment to Consolidated Fund (section 4, Finance Act, 1919)	282,195	..	*1,594,448*
Transfer to reserve for redemption of main highway securities	299,615	..	*1,143,410**
Payment to local authorities in commutation of toll-gate charges (Finance Act, 1925, section 20)	1,510	..	*30,202*
Payment to Wellington City Council in commutation of fees chargeable in respect of motor-vehicles using Hutt Road (Finance Act, 1927 (No. 2), section 33)	23,503	..	*278,625*
Total loan charges		671,154	*3,732,351*
Subsidies, &c., in respect of other than main highways—			
Municipal Corporations (Municipal Corporations Act, 1933, section 71)	29,635	..	*273,445*
County Councils and other local authorities (Finance Act, 1930, section 37)	176,951	..	*1,659,357*
Subsidies to County Councils for rebate to ratepayers (Finance Act (No. 4), 1931, section 45)	..	..	*253,893*
Subsidy on rates levied on farming land (Finance Act (No. 3), 1934, section 28)	*Cr.* 72	..	*364,431*
Maintenance and construction of roads giving access to outlying areas (Finance Act (No. 3), 1931)	..	..	*45,918*
Total subsidies		206,514	*2,597,044*
Balance, being excess of income over expenditure, carried to general balance-sheet		*Cr.* 97,133	*536,188*
		5,576,835	*37,040,171*

INCOME.			Total for Year 1939–40.	Total since Inception of Main Highways Act, 1922 to 31/3/40.
			£	£
Loans raised under Main Highways Act, 1922—				
Stock and Debentures issued—				
At 3 per cent. interest			101,500	*3,745,725*
At 3½ per cent. interest			250	*684,040*
At 3¾ per cent. interest			..	*190,895*
At 4 per cent. interest			658,477	*1,942,937*
At 4½ per cent. interest			..	*542,005*
Treasury bills—				
At various rates of interest			1,925,000	*1,875,000*
At 2 per cent. interest			..	*100,000*
At 4 per cent. interest			..	*925,000*
At 4½ per cent. interest			500	*500*
Securities redeemed, Loans Redemption Account			..	*984,420*
Consolidated Fund—Public Debt Repayment Account			..	*55,720*
			2,685,727	*11,046,242*
Finance Act, 1932, section 55—Premium on exchange			121,875	*121,875*
Receipts under section 15, Finance Act, 1923, from Public Works Fund, General Purposes Account (at 5 per cent. interest)			..	*1,226,000*
Income from—				
Motor-registration licenses, fees, and fines (section 24, Motor-vehicles Act, 1924)		£ 620,773		
Less Commission on collection by Post and Telegraph Department—	£			
Motor-registration fees and licenses	23,505			
Fees for registration of change of ownership	8,882			
		32,387		
			588,386	*5,965,920*
Interest from investments			1,462	*217,969*
Interest from local authorities on plant purchased on their behalf			3,679	*30,845*
Interest on advances to local authorities			3,424	*37,096*
Mileage Tax (Finance Act, 1931–32 (No. 2), section 19)			10,715	*31,674*
Miscellaneous receipts			1,860	*5,096*
Motor-spirits tax (section 9, Motor-spirits Taxation Act, 1927)			2,057,001	*15,674,987*
Tire-duty (sections 13 and 14, Main Highways Act, 1922)			102,706	*2,470,385*
Transfer from Consolidated Fund (section 14, Main Highways Act, 1922)			..	*210,000*
Rent of and tolls from ferries			..	*2,082*
			5,576,835	*37,040,171*

* Excludes £60,408 10s. 7d. interest credited.

NOTE.—No charge for the cost of exchange on interest payments made in London is included in the accounts.

TABLE 5.—MAIN HIGHWAYS ACCOUNT—*continued.*

GENERAL BALANCE-SHEET AS AT 31ST MARCH, 1940.

LIABILITIES.	—	Total.	ASSETS.	—	Total.
	£	£		£	£
Balance at 31/3/39	633,321		Cash in Public Account—		
Less excess of expenditure over income for 1939–40	97,133		At call		80,173
		536,188	Sundry debtors—		
Sundry creditors—			Public Works Department	24,090	
Public Works Department	70,561		Other Government Departments	2,756	
Other Government Departments	17,953		Non-departmental	17,232	
Non-departmental	325,320				44,078
		413,834	Advances to local authorities (Main Highways Amendment Act, 1926, section 2)		83,167
Interest accrued on loans		66,795	Motor-registration fees in hands of Postal Department		1,562
Reserves for redemption of securities		219,399	Interest due and accrued		2,664
Writings-off in Suspense		3,030	Interest paid in advance		7,671
			Buildings and land		72,185
			Stocks of materials, tools, &c.		247,606
			Furniture, fittings, &c.—		
			Expenditure to 31/3/40	935	
			Less depreciation to 31/3/40	569	
					366
			Plant and equipment—		
			For Main Highways Board—		
			Expenditure to 31/3/40	615,428	
			Less depreciation charged to works	215,643	
					399,785
			Purchased for local authorities—		
			Expenditure to 31/3/40	108,615	
			Less repayments of principal	31,055	
					77,560
			Amount transferred to Loans Redemption Account	1,128,064	
			Less amount utilized for redemption of securities	908,665	
					219,399
			Stocks Deficits Account		3,030
		£1,239,246			£1,239,246

NOTES.—(*a*) No liability is included for interest on loans redeemed out of Public Debt Repayment Account. (*b*) The two funds, previously known as "Construction" and "Revenue," were amalgamated as from 1st April, 1936, and are now termed the "Main Highways Account," in accordance with section 3, Finance Act (No. 2), 1935.

J. W. SCOTT, A.R.A.N.Z., Chief Accountant, Public Works Department.
J. WOOD, Chairman, Main Highways Board.

I hereby certify that the Income and Expenditure Account and Balance-sheet have been duly examined and compared with the relative books and documents submitted for audit and correctly state the position as disclosed thereby, subject to the departmental notes enfaced thereon.—CYRIL G. COLLINS, Controller and Auditor-General.

TABLE 6.—LENGTHS OF HIGHWAYS AT 31ST MARCH, 1940.

Number and Name of Highway District.	Type of Surface.			Total.
	Dustless.	Gravel or Macadam.	Pumice or Clay.	
	Miles ch.	Miles ch.	Miles ch.	Miles ch.
1. Auckland North	82 2	755 61	..	837 63
2. Auckland South	661 23	849 76	3 0	1,514 19
3. Tauranga	125 28	355 79	229 40	710 67
4. Gisborne	100 62	294 55	..	395 37
5. Napier	252 13	490 65	..	742 78
6. King-country	45 64	549 46	6 75	602 25
7. Taranaki	347 72	121 65	4 40	474 17
8. Wanganui	181 68	350 78	0 63	533 49
9. Wellington West ..	271 37	233 42	..	504 79
10. Wellington East	169 36	335 5	..	504 41
Totals, North Island ..	2,238 5	4,338 12	244 58	6,820 75
11. Nelson	101 74	586 15	6 41	694 50
12. West Coast	81 2	495 55	..	576 57
13. Canterbury North ..	64 44	309 14	..	373 58
14. Canterbury Central ..	228 79	533 2	..	762 1
15. Canterbury South ..	184 43	649 52	..	834 15
16. Otago Central	139 37	702 62	..	842 19
17. Otago South	105 29	423 68	..	529 17
18. Southland	89 26	831 57	..	921 3
Totals, South Island ..	995 14	4,532 5	6 41	5,533 60
Totals, Dominion ..	3,233 19	8,870 17	251 19	12,354 55
Summary.				
State highways	1,898 47	1,933 18	155 51	3,987 36
Main highways	1,334 52	6,936 79	95 48	8,367 19
Total	3,233 19	8,870 17	251 19	12,354 55

TABLE 7.—TESTS OF STONE COMPLETED DURING THE YEAR ENDED 31ST MARCH, 1940.

No.	Locality.	Weight in Pounds per Cubic Foot.	Absorption of Water in Pounds per Cubic Foot.	Abrasion.		Hardness.	Toughness.	Geological Classification.
				Percentage of Wear.	French Co-efficient.			
347	Oamaru Borough Quarry ..	179·3	0·25	5·28	7·58	16·37	9·5	Diabase.
348	Paeroa Hills, Rotorua, No. 1 ..	149·5	0·85	5·76	6·94	17·90	7·0	Hornblende dacite.
349	Paeroa Hills, Rotorua, No. 3 ..	149·6	1·85	8·10	4·94	18·20	10·0	,,
350	Te Kawa, Te Awamutu ..	193·0	0·44	4·93	8·11	18·18	18·0	Basalt, coarse-grained.
351	Whakatane Quarry, No. 1 ..	164·9	0·06	2·88	13·88	18·26	26·0	Greywacke.
352	Whakatane Quarry, No. 2 ..	164·2	0·11	3·35	11·94	17·80	20·0	,,
353	Whakatane Quarry, No. 3 ..	172·1	0·12	3·45	11·60	16·86	18·0	,,

Abrasion Tests by Los Angeles Machine (to 30th June, 1940).

Material.	Grading.	Percentage of Loss.
Hutt River at Melling (gravel)	A (1½ in. to ½ in.)	22·65
Otaki River at railway-bridge (gravel) ..	A	15·60
Manawatu River at Palmerston North (gravel)	A	15·50
Oroua River, ½ mile above Aorangi Bridge (gravel)	A	15·30
Rangitikei River at Bulls (gravel)	A	14·70
Rangitikei River at Bulls (chips)	B (¾ in. to ⅜ in.)	14·90
Hutt River at Melling (gravel), (second test)	A	19·92
Hutt River at Melling (chips)	B	15·34
Waerenga-o-kuri Quarry, Gisborne (marly limestone)	A	32·30
Hardie's Tikipunga Quarry, Whangarei (greywacke)	A	21·14
Hardie's Tikipunga Quarry, Whangarei (greywacke, chips)	B	20·08
Hardie's New Quarry, Whangarei (greywacke)	A	13·82
Hardie's New Quarry, Whangarei (greywacke, chips)	B	13·30
Waldron's Quarry, Whangarei (greywacke) ..	A	20·42
Miller's Quarry, Naumai, Otamatea County (trachyte)	A	23·14
Otonga Quarry, Whangarei (greywacke) ..	A	15·45
Otonga Quarry, Whangarei (chips)	B	15·38
Bay of Islands County Quarry, Kaikohe (fine-grained basalt)	A	20·32
Bay of Islands County Quarry, Kaikohe (fine-grained basalt, chips)	B	21·24
Reefton (quartzite)	A	27·98
Reefton (greywacke, slightly schistose) ..	A	26·96

Other tests were made by sieve analysis, gravitation, microscopic examination, tension and lineal shrinkage of top-course materials, and soil constants of subgrades.

By Authority: E. V. PAUL, Government Printer, Wellington.—1940.

Price 2s. 9d.