1949

NEW ZEALAND

MINISTRY OF WORKS STATEMENT

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

MR. SPEAKER,—

I submit my report for the year ended 31st March, 1949, together with a statement of expenditure (Appendix A) certified by the Controller and Auditor-General as provided under section 8 of the Public Works Act, 1928.

Unprecedented demands are still being made on the building and construction industry, and, as was anticipated, this excess of demand over supply has necessitated continuance of the Building Control Emergency Regulations. I am satisfied, despite criticism from some quarters, that the Government's policy in this matter is in the best interests of both the industry and the nation as a whole. To have permitted unrestricted competition in the industry would have created a very undesirable situation, in that the man-power and materials available would have been used regardless of the importance or desirability of any particular work from a national or local viewpoint. The unrestricted competition which would have resulted from complete relaxation of control as advocated by some people and organizations would have also resulted in construction costs taking a further upward trend, a factor which the Government is most anxious to prevent.

However, as stated in my annual statement presented to Parliament last year, it is not the desire of the Government to continue control any longer than necessary or to any greater extent than is clearly essential, and for this reason during the past year building-control policy was kept under constant review. In conformity with this policy, controls were relaxed to the extent that authority was decentralized by delegating to local bodies wider powers to authorize building permits of various classes without reference to District Building Controllers. Wider powers were also given to District Building Controllers to facilitate decisions on applications for certain classes of work which hitherto it was necessary to forward to the Building Controller in Wellington. Local bodies are now authorized to issue permits for houses up to 1,300 square feet, while private garages and sheds of limited floor areas are permitted provided only certain classes of materials are used, and permits for these buildings are issued by local bodies without reference to District Building Controllers. During the coming year building-control policy will be

kept under review, and members of this House and the public may rest assured that controls will be further relaxed as soon as the general position within the industry and its associated industries shows sufficient improvement to warrant that course.

Man-power available to the building and construction industry for both State and private works has increased by 7·1 per cent. during the past year, and it is also pleasing to report that the supply position in so far as most items are concerned has considerably improved. Cement and steel still remain in short supply. However, according to the latest information to hand from overseas the steel position is easing in the United Kingdom and the United States, but unfortunately the same cannot be said of Australia, our nearest source of supply. No effort has been spared by our representatives overseas in making known our requirements and also to have firm orders accepted for early delivery. There is a great disparity between the demand for and supply of cement from our local cement-works, and as an effort to bridge the gap to some considerable extent the Government has approved import licences for bulk supplies.

Following discussions with the Government the three local cement-manufacturing companies decided to increase the production capacity of their works. These works at present have a production potential of 275,000 tons per annum, and when the proposed extensions are completed the works will be capable of producing 450,000 tons per annum. Owing to the extreme difficulty of procuring the necessary plant from overseas and the amount of work involved it is not anticipated that there will be any increase in supply from the local works until the latter half of 1951 or early 1952. Until such time it will be necessary to continue importation of bulk supplies of cement, as only by this means will it be possible to make the tonnage available for consumption more comparable with the demand.

I am very gratified with the achievements under the State and State-subsidized works programme approved for the 1948–49 financial year. The necessity to ensure that works of the greatest urgency are undertaken in preference to those of a lower priority requires that the demands for works by all Departments are carefully investigated before being approved for inclusion in the works programme. The total expenditure on works of all classes, both capital and maintenance, during the past financial year was in the vicinity of 31·5 million pounds, the greatest expenditure being on housing, hydro-electric works, educational buildings, land-development, and highways, which, in accordance with Government policy, are given highest priority.

Many major works of national and local importance which as yet have not been commenced have received the Government's attention and at present are being investigated with a view to having them started immediately conditions permit.

During the year the Commissioner of Works, Mr. E. R. McKillop, was sent abroad by the Government for the purpose of obtaining assistance in regard to technical staff, man-power, and materials required to prosecute the Government's development programme. Mr. McKillop worked in conjunction with our High Commissioner's Office in London and with our Trade Commissioners in Washington and Montreal respectively.

The initial contacts made by him have since been followed up and have resulted in improvements in the material position, the supply of man-power by immigration, and additions to our technical staff.

Following the adoption by the Government of the Royal Commission's report on the Auckland Harbour Bridge proposal, Mr. McKillop was instructed to secure the services of an eminent firm of specialist bridge designers to proceed with the design of this bridge. The Government has been fortunate in securing the services of Messrs. Freeman, Fox, and Partners, of Westminster, the senior partner of the firm being Sir Ralph Freeman, who has had a life-long experience in the design of large bridges and

was responsible for the design and supervision of the construction of the Sydney Harbour Bridge. It is hoped that by the time site investigations are complete and the plans and specifications are prepared the steel position will have eased to such an extent as to enable the Government to consider the actual construction of this bridge. Following Mr. McKillop's visit the Government has sent Mr. R. H. Packwood, a member of the Bridge Commission, to England to confer with Sir Ralph Freeman and to supply him with full information of local conditions bearing on the design.

The Government desires to put in hand as soon as possible the provision of additional transport facilities to serve the Auckland metropolitan area, and in an analysis of these considerable divergence of opinion as to the location of these facilities became apparent. Because of the magnitude of the work envisaged and of the importance of a correct decision to the Auckland area, the Government has considered it advisable again to obtain competent outside advice, and following inquiries made in Great Britain the Government has invited Sir William Halcrow, Past President of the Institute of Civil Engineers, and Mr. J. P. Thomas, late Chairman of the Transport Advisory Committee of the London Passenger Transport Board, to come to New Zealand and report on the question. These gentlemen are expected in New Zealand early in September, and it is hoped that as a result of their report an early start can be made upon the actual construction in the city and in the suburban areas.

Mr. McKillop also visited many of the largest construction works being carried out in the United Kingdom, in Europe, and in the United States and Canada, paying special attention to large housing developments, roading, aerodrome and hydro-electric construction, and discussed with the various constructing authorities and contractors methods of speeding up some of the larger projects which our own Government has in view.

Since the end of the war there has been a general realization of the need for planning both in urban and rural areas. Following upon the publication of the ten-year schedules of works covering the whole Dominion, a considerable amount of detailed work has been carried out in association with local authorities, and close co-ordination of Government development proposals with local-body plans has been secured in this way. Local authorities have been anxious to advance their town and extra-urban planning schemes, but the powers in the Town Planning Act, 1926, were not considered adequate to ensure that orderly development would take place in accordance with their schemes. At the instance of the Municipal Association, therefore, the Town Planning Amendment Act, 1948, was passed clarifying certain provisions of the principal Act and providing additional powers for acquisition of land and other necessary development. The Acts now provide a code which ensures that planning schemes will be effective, and local authorities can proceed with confidence.

Legislation enacted during the 1948 session which directly affected the Department comprises the Public Works Amendment Act, 1948, the Town Planning Amendment Act, 1948, and the Soil Conservation and Rivers Control Amendment Act, 1948. The Public Works Amendment Act extended the scope of legislation dealing with accessways and service-lanes, and contained a number of machinery clauses designed to facilitate the work of the Department to ensure greater safety on roads and to protect the public rights on roads and streets. The Town Planning Amendment Act, referred to in the immediate preceding paragraph, brought the administration of the Town Planning Act, 1926, under the Ministry of Works. The Soil Conservation and Rivers Control Amendment Act contained a number of important sections aimed at the more efficient administration of the original Act. These amendments should be of considerable assistance to Catchment Boards.

Section 68 of the Licensing Amendment Act, 1948, authorizes the holder of a works canteen licence to sell liquor in any canteen established on any public work, but no application for a licence may be made without my prior written approval.

FINANCE

The payments and receipts in connection with the Public Works Account and other associated votes and accounts for the year 1948–49 are shown in the tabulation following.

The expenditure administered through the Ministry of Works for the year reached a total of £27,026,932. In addition, a sum of £4,449,234 was expended from the Public Works Account—*i.e.*, £1,650,395 on education buildings, £1,423,839 on forest development, and £1,375,000 on Christmas Island phosphate rights. The miscellaneous receipts and recoveries for the Ministry of Works totalled £7,258,501.

Class of Work.	Expenditure 1948–49.
EXPENDITURE, PUBLIC WORKS ACCOUNT	£
Railway construction	128,725
Housing construction	8,886,322
Public buildings	1,080,463
Education buildings	1,650,395
Lighthouses and harbour-works	8,111
Roads, &c.	405,654
Soil conservation and rivers control	464,942
Irrigation, water-supply, and drainage	286,110
Highways construction	2,005,569
Forest development	1,423,839
Christmas Island phosphate rights	1,375,000
	17,715,130
Electric Supply Account: Construction (Ministry of Works)	2,935,953
	20,651,083
EXPENDITURE, OTHER VOTES AND ACCOUNTS	
Consolidated Fund—	
Highways—	
Maintenance, repairs, and renewals	3,174,651
Administration, plant, and miscellaneous expenditure	410,766
Permanent appropriations (rate subsidies, &c.)	335,355
Salaries and expenses, Ministry of Works	1,027,548
Maintenance, public buildings, roads, &c.	659,577
Plant, material, and miscellaneous services	5,072,350
Other accounts (expenditure by Ministry of Works): Amounts not included above	144,836
Total, other votes and accounts	10,825,083
Grand total of expenditure, Public Works Account and other votes and accounts, for the year ended 31st March, 1949	31,476,166

Class of Work.	Receipts.
RECEIPTS,* MINISTRY OF WORKS	
Ordinary Revenue Account—	£
Departmental receipts, vote "Maintenance of Public Works and Services"	4,901,659
Irrigation receipts for year	47,547
Miscellaneous receipts for year	164,707
Housing	15,002
Electric Supply Account: Miscellaneous receipts (Ministry of Works)	291,434
Main highways maintenance: Miscellaneous receipts	254,452
Public Works Account—	
Sale linen-flax assets, &c.	142,583
Miscellaneous receipts	1,604,771
	7,422,155

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

Summary

——	Ministry of Works.	Other Departments.	Total.
	£	£	£
Expenditure	27,026,932	4,449,234	31,476,166
Recoveries and receipts	7,258,501	163,654*	7,422,155

* Sale of linen-flax assets, £142,583, and education buildings, £21,071.

The ratio which Ministry of Works receipts and expenditure bear to the whole is shown below—

	£	Per Cent.
Roads, including construction and maintenance of main and State highways	6,331,995	18·47
Hydro-electric (construction by Ministry of Works) ..	2,935,953	8·56
Railway construction and improvements to open lines ..	150,857	0·44
Housing construction	8,886,322	25·92
Public buildings, including purchase of land	1,080,463	3·15
Soil conservation and rivers control	464,942	1·36
Irrigation, water-supply, and drainage	286,110	0·83
Public buildings and roads, &c., maintenance	659,577	1·92
Plant, materials, and services, other Departments ..	5,072,350	14·79
Miscellaneous, including war expenses	1,158,363	3·38
Miscellaneous receipts, &c. (Ministry of Works) ..	7,258,501	21·18
	£34,285,433	100·00

Summary of Votes Under the Control of the Ministry of Works and Proposed Ways and Means of Raising the Necessary Funds, Year Ending 31st March, 1950

Vote.	Public Works Account (Loans.)	Consolidated Fund.	Total.
	£	£	£
Railway Construction	375,000	..	375,000
Housing Construction	9,250,000	..	9,250,000
Public Buildings	1,040,000	10,000	1,050,000
Lighthouses and Harbour-works ..	65,000	..	65,000
Roads, &c.	475,000	..	475,000
Soil Conservation and Rivers Control ..	475,000	5,000	480,000
Irrigation, Water-supply, and Drainage ..	300,000	..	300,000
Highways Construction	2,500,000	..	2,500,000
Highways Maintenance	..	4,533,430	4,533,430
Maintenance of Public Works and Services	..	7,864,380	7,864,380
	14,480,000	12,412,810	26,892,810

It is estimated that a sum of £5,258,000 will be recovered on account of vote "Maintenance of Public Works and Services" and £260,000 on account of vote "Highways Maintenance" for the year ending 31st March, 1950.

HOUSING

The Government has continued and will continue its policy of giving priority to housing, and its efforts in this direction, together with its policy of building control, have resulted in a record number of houses being completed during the year ended 31st March, 1949. The official figures for State rental, departmental, and Maori housing were 3,414, 1,010, and 337 respectively, making a total of 4,761. Data concerning private housing has been more difficult to obtain. However, according to returns furnished by the Power Supply Authorities at the request of the Building Controller, the total number of new dwelling units completed during the year, including both Government and private, is more than 16,000, an increase of nearly 3,300 houses, or 26 per cent., over the previous year.

This is a most creditable performance, and I wish to thank all those in the building and associated industries, including the 2,071 rehabilitation trainees employed by the Housing Division, who have contributed to this record achievement.

Although the past year has seen another record set for house-building, the demand for certain materials continues to exceed supply and attention is constantly being given to the use of satisfactory substitutes. *Pinus insignus* timber has alleviated the shortage of framing timber, but its use for weatherboard framing has not proved entirely successful as a satisfactory protective paint is not available. Tests are being continued in an effort to overcome this problem.

A contract was let for two experimental sun-dried brick houses, but the labour cost has proved heavy and it is unlikely that this method of construction will be adopted to any great extent. Everything possible is being done to speed up the erection of

rural houses and farm buildings for the settlement of ex-servicemen and timber-workers, but difficulties still exist due to the reluctance of contractors to take work in country districts.

The prefabricated house imported from Sweden has proved satisfactory for New Zealand conditions, but as an economic proposition the use of such houses cannot be recommended. Further investigations of the prefabricated method of construction are being continued and have been the subject of a report from the Commissioner of Works following his visit overseas.

To provide facilities to State tenants comparable to those available in established residential areas, blocks of shops were opened for business in several localities. Contracts have been let for others, and plans are being prepared for still more.

Plans for 2 blocks of pensioners' flats, 1 nine-unit and 1 thirty-six unit, both in Auckland, have been prepared, and the Government hopes soon to have the erection of these buildings under way. These flats will be of the one-bedroom type and every consideration has been given to the comfort of the tenants. Sites for this purpose are held in a number of the larger towns and a number of building schemes for the housing of elderly people will be undertaken during the coming year.

Additional land in 62 towns, enough to provide 3,816 State rental houses, was acquired. To assist ex-servicemen desiring to build their own homes, 54 building sections were made available to the Lands and Survey Department, which completes the sale on behalf of the Government.

Detailed scheme plans covering over 10,000 units in various localities have been completed or are nearing completion. The operations of the Housing Construction Division for the year ended 31st March, 1949, are fully recorded by the Director of Housing Construction in his annual report (Appendix G).

PUBLIC BUILDINGS

Continuance of the Government's policy of according highest priority to housing construction has again necessitated a sacrifice of other building-works, but of necessity urgency has been accorded to education buildings and hospitals. In other categories, such as post-offices, telephone-exchange buildings, police buildings, departmental offices, &c., only work of the utmost urgency has been undertaken. The Government realizes, however, that the time is approaching when the erection of many of these buildings will have to proceed, and it is hoped, with gradual improvement in the supply of both labour and materials, that it will not be long before some of those for which the need is most pressing will be put in hand. At present, however, the building programme must continue to receive careful study to ensure that limited available resources are used to the very best advantage and to avoid commencing any projects which might later be delayed through lack of supplies.

There is still considerable leeway to be made up in the construction of school buildings, and the programme here will have to be accelerated if the expected demand for accommodation due to increasing attendance rolls is to be met. During the year much has been done, but still more will be required in the next few years. The position is being carefully watched and everything possible will be done to ensure that the necessary buildings are available in time. Among the many education buildings completed during the year, those worthy of mention were the domestic science block at King Edward Technical College, Dunedin, and the assembly hall at Pasadena Intermediate School. The new Southland Technical College building is under construction, but has been retarded through lack of materials.

Important buildings were also completed or in course of construction for other Departments, including Health, Police, Post and Telegraph, Labour and Employment, and Maori Affairs.

A heavy programme of maintenance work on departmental buildings, together with renovations, provision of heating, air-conditioning, refrigeration, fire-protection services, and electrical services, was also carried out by the workshops staffs. Emergency repairs to houses and commercial buildings in Hamilton and Frankton damaged by the tornado were undertaken and completed rapidly and most efficiently. The expected visit of Their Majesties, which, unfortunately, did not eventuate, involved a considerable amount of preparatory work in connection with Government Houses at Auckland and Wellington and on other premises throughout the country. Planning for the eventual establishment of Government and civic centres in various major towns throughout the country has continued during the year in collaboration with the local authorities concerned.

HYDRO-ELECTRIC DEVELOPMENT

The high priority accorded to hydro-electric development has again resulted in good progress being made and some substantial increases have been made to generating capacity during the year.

In order to present a clear picture of the position, I am incorporating in my report as Minister in Charge of the State Hydro-electric Department a general review of the construction programme that is being carried out by the Works Department as well as that executed by the State Hydro-electric Department.

A more detailed reference to the civil engineering work will be found in the report addressed to me by the Engineer-in-Chief and attached to this statement (Appendix C).

MAIN HIGHWAYS

In common with other roading authorities throughout the world, the Main Highways Board is most concerned at the deterioration of the road surfaces over recent years as a result of the operation of totally different post-war traffic. Long trucks and buses when operated on the many narrow highways of this country are most destructive to the verges of the carriage-way and cause the bituminous pavement on sealed roads to break away badly at the edges. While the longer and wider trucks and buses have involved the Board in more costly construction and greater expenditure on maintenance, it is the increase in numbers and weight that is causing the most serious damage to our roads and bridges. Until the roads can be strengthened to carry this wider and heavier traffic, pot-holeing and surface failures must occur despite intensive maintenance. The Main Highways Board is fully aware of the importance of road transport to the economy of the country, and will do everything that is humanly possible with the finance available to provide roads that will allow safe and economic transport.

I mentioned in last year's report that there was need for greater co-operation between the roading authorities and the transport authorities, and I am glad to say that some progress has been made in this direction. It is in the interests of the over-all economy of the country and the preservation of our roads and bridges that the axle-loading issues be determined on a reasonably balanced basis and then strictly enforced.

The activities of the Main Highways Board for the last financial year are described in its annual report, which is attached to this statement (Appendix D).

It is pleasing to be able to record that the net increase in dustless surfacing amounted to 263 miles, and that the Dominion total is now 4,186 miles, or 33 per cent. of the highways system. In addition to the extension of sealed surfaces, a length of 314 miles of existing sealed surfaces received a maintenance coat.

The length of new bridging completed during the year was 3,107 lineal feet, and represented an increase of 443 lineal feet over the figures for the previous year. It is anticipated that construction this year will be maintained at about the same level.

Bitumen-supplies have improved and should allow the normal sealing programme to proceed.

ROAD-CONSTRUCTION

Road-construction has been undertaken on a slightly increased scale this year, 151 miles of new formation and 274 miles of new metalling being undertaken, as compared with 83 and 154 miles respectively for the previous year. In addition, good progress has been made in overtaking maintenance deferred in the past due to shortages of plant and man-power.

The roading programme in the Chatham Islands was completed with the exception of a sea wall and a small amount of metalling.

RAILWAY CONSTRUCTION AND SURVEY

Investigations into improved rail access in the metropolitan areas have continued, particularly in the Auckland Metropolitan area. In Wellington, investigation and survey has proceeded chiefly in connection with the Hutt Valley extension and the Rimutaka Deviation and Tunnel. A specification has been prepared for a contract for the Rimutaka Tunnel and a commencement has been made in opening up the access roads and approach cuttings and erecting works and camp buildings. It is proposed to concrete the portal and commence tunnelling at the west end almost immediately.

The final survey and other investigations for a railway between Edgecumbe and Murupara were completed and a start has been made on the permanent-line survey.

The first 19 miles of the Putaruru to Tokoroa railway, taken over last year from the Taupo-Totara Timber Co., has been authorized for reconstruction to Railway standards, and work is in progress.

AERODROMES

The Aerodromes Committee set up by Government to recommend on policy matters affecting aerodrome-development within the Dominion has not yet finalized its report to Government, but has continued to establish priorities for the immediate programme of aerodrome-works.

Although the desirability of major extensions to a number of airfields is appreciated, these must take second place to such vital work as hydro-electric development, land-improvement, and highways. For this reason no major works were commenced during the year, but in anticipation of the Royal visit early in 1949 urgent steps were taken to extend and improve a number of aerodromes at main centres to provide at each field at least one landing-strip or runway of a minimum length of 5,000 ft. This construction will form a first stage in the ultimate development of these aerodromes to accepted international standard for internal air services. In keeping with this policy, extensions and improvements were undertaken at the following aerodromes: Gisborne, Napier, New Plymouth, Paraparaumu, Nelson, Westport, Waitaki, and Taieri. Improvements to other aerodromes are scheduled for commencement in the near future.

The disastrous flood in the Gisborne area in May, 1948, covered the entire surface of the Gisborne Aerodrome with silt varying from 1 in. to 9 in. in depth. This aerodrome was therefore out of commission until December, 1948, and the greater part of the surface had to be worked over and a new turf established.

The Government, realizing the importance of a high standard in safety facilities and navigational aids, has put in hand appropriate installations in a number of localities. At the same time some attention has been given to improving facilities for the convenience of passengers and the more efficient handling of air freight.

Surveys and investigations for new aerodromes or comprehensive extensions and improvements to existing aerodromes with a view to construction have been undertaken at a number of aerodrome sites, the more important of which are Auckland, Rotorua, Milson, Harewood, and Invercargill.

As a further contribution to the housing programme, residential accommodation for airport staff has been provided at a number of the busier aerodromes.

There has been little major development work undertaken at R.N.Z.A.F. stations. Work has mostly been confined to converting existing technical accommodation facilities and services from war to peace time requirements and in converting surplus buildings into residential quarters.

In accordance with an existing agreement, the Ministry of Works has continued to undertake all works maintenance at R.N.Z.A.F. establishments, and in the main a high standard of work has been achieved. My Department also continues to be responsible for and undertakes the maintenance on all civil aerodromes except a very few of the minor fields.

In the Pacific islands the Ministry of Works carries out all works, both developmental and maintenance, covering New Zealand's responsibilities for aviation in the South Pacific. These include an R.N.Z.A.F. marine aviation base in Suva, the International Civil Airport of Nandi in Fiji, the regional civil aerodromes at Nausori in Fiji, Tonga, British Samoa, Aitutaki, and Rarotonga, and a number of meteorological reporting-stations. Other than the work of converting the former Service air base at Nandi, Fiji, to a civil establishment, little developmental work of consequence has been undertaken in the area. Preparations have been made, however, to carry out at Nandi Civil Airport the reconstruction and improvement of the existing runways, which have failed to stand up to the heavier aircraft loads and increased traffic to which they have been subjected.

The recommendation of the Commission which, last year, reported on the establishment of an international airport in Fiji was considered in November, 1948, by the South Pacific Air Transport Council. The representatives of the three contributing Governments—United Kingdom, Australia, and New Zealand—agreed on a location at Suva Point and to share the cost equally. The Government of Fiji, although not a contributing party, facilitated this decision by an offer to contribute the necessary land. My Government has accepted responsibility for the planning and construction of this airfield, and investigation and survey will be put in hand immediately.

IRRIGATION AND WATER-SUPPLY

In Central Otago, rainfall conditions varied considerably during the year and in some places were below average. This resulted, at Manorburn and Poolburn Dams, in depletion of irrigation supplies early in the season, but beneficial rains fell in February and March and the areas which had been showing the effect of dry conditions made an excellent recovery. In other areas where rainfall was low there was not the same shortage of irrigation water.

In Canterbury the rainfall was generally below normal, resulting in an increased demand on all schemes and better financial results than were experienced over the previous two years, since ample water was available.

On the Wellington water-supply scheme good progress has been made with tunnelling. The two longest tunnels, 2,226 ft. and 9,102 ft., were pierced towards the end of the year, and arrangements are now in hand to line them with concrete.

During the year there was practically no improvement in the steel situation, consequently little progress can be reported on the manufacture of pipes for the main pipe-line. A small quantity of steel held in stock is being manufactured under contract into 1 mile

of pipe which it is proposed to lay through Upper Hutt. Every possible avenue is being explored to obtain further steel, of which over 9,000 tons is required for the 33 miles of pipe-line between the Hutt River and Karori. However, the supply position is now showing some improvement and it is hoped that better progress will be made during the coming year.

SOIL CONSERVATION AND RIVERS CONTROL

The steady progress recorded in soil conservation and river control work last year has been maintained during this year. Since no new catchment districts have been constituted, this can be attributed to the increasing efficiency of the organizations built up by existing Boards. The major portion of the expenditure comprises smaller river control and drainage works, with the latter occupying an increasingly important place. In these works the procedure whereby the control of minor works has been decentralized has proved most effective and Catchment Boards have been quick to take advantage of this concession. Moreover, they have responded in a most encouraging manner to the maintenance subsidies offered, and it is believed that the better standard of work will ultimately result in a reduction of the expenditure required on capital works.

The only major river control project completed during the year was the channel improvement and banking on the lower reaches of the Otaki. At the same time proposals have been approved for a number of other major river-works, including the Motueka, Tauherenikau, and Waipaoa, and the Oxford-to-the-sea control scheme and drainage. Investigations for further similar works are well advanced.

Soil conservation work, particularly in the upper catchments of many of our larger rivers and streams, is a vital responsibility of the Council to which the highest possible priority must be accorded. Several Catchment Boards are taking advantage of subsidies for tree-planting and gully-control work and at the same time assisting farmers with advice on their individual problems. The Council itself has carried out experimental and demonstration work on its own reserves and has been instrumental in having several problem areas retired from farming for afforestation or natural regeneration. Nevertheless, progress in general has been somewhat disappointing, and cannot be expected to improve until sufficient staff has been trained to handle this work effectively. Facilities are available at Lincoln College, but the number offering is too small to appreciably affect the situation for some years. As considerable areas of the upper catchments are under the control of the Lands Department, the State Forest Service, and the Department of Maori Affairs, a major contribution could result from their active participation in overcoming this major problem.

Negotiations for the constitution of additional catchment districts are proceeding there being hearings before the Local Government Commission concerning the Wellington, Waikato, and Bay of Plenty districts. In the cases of Wellington and the Bay of Plenty, objections received to the provisional schemes are under consideration; and the Waikato hearing has been adjourned at the request of the Commission to enable them to consider the submissions for the Auckland and North Auckland districts in conjunction with those for Waikato. The Otago Catchment Board, which was constituted last year, was elected during this year, and held its first meeting in November, 1948. This brings the number of constituted districts to a total of twelve, together with one soil conservation district, and covers 58 per cent. of the area of the country. The greatest credit is due to the Boards in operation for the manner in which they have surmounted their initial difficulties.

COAL-PRODUCTION

An appreciable contribution to coal-production has been made by the use of the Department's heavy plant on opencast mining. Work was continued at Waitawhenua, Glen Massey, Ohai, and Wangaloa, and new workings have been opened up at Hillcrest and Rotowaro.

LIGHTHOUSES AND HARBOUR-WORKS

In addition to the usual maintenance of lighthouses and beacons, an extensive programme of conversion to electric power has been pursued. This work has been completed at Nugget Point, Waipapa, and Moeraki Lighthouses, and is well in hand at North Cape and Chicken Island. Preliminary work is in hand at a number of lighthouses and beacons.

By arrangement with the Wanganui Harbour Board, remedial work was carried out where erosion threatened the safety of the South Spit.

Repairs were made to wharves at Tairua and Onekaka. Investigations were made into extensions of the tidal compartment at Westport by dredging, and into the development of Tauranga Harbour and wharves for the shipping of exotic timbers from State and other forests in the Murupara and Putaruru areas.

PLANT AND MACHINERY

The Department's construction plant was fully employed on hydro-electric construction, highways and roads, and opencast mining. The plant has been increased during the year and a number of additional new units has been coming to hand from overseas.

A very large number of machines of all types has been reconditioned during the year in the Department's workshops at Mangere, Gracefield, and Sockburn, despite difficulties due to shortage of suitable replacement parts.

Numerous plant items for special work such as tunnelling equipment, concreting plant, crushing plant, and hauling and hoisting equipment have been designed by the mechanical staff in Head Office, and designs have been carried out where necessary for other Departments.

LAND-IMPROVEMENTS

Sand-dune reclamation has been continued in the North Auckland and Manawatu areas and at the Waikato Heads.

In Southland the output of land-clearing by machinery was somewhat reduced by diversion of plant to coal-stripping, but, nevertheless, appreciable progress was made both in that district and at Ohakune.

SERVICES TO OTHER GOVERNMENT DEPARTMENTS AND LOCAL BODIES

There is still a large accumulation of work which Government Departments and local bodies wish to overtake, and investigations have therefore been numerous. Many of these investigations are undertaken at the request of Treasury, and the preparation of reports has involved considerable work. Maintenance of Government buildings throughout the country continues to be carried out by my Department, and this work is causing an increasingly heavy demand on the staff concerned.

PUBLIC WORKS WORKERS' AGREEMENT

The Public Works Workers' Agreement and the Highways and Road Maintenance Workers' Agreement expired on 31st March, 1949, and will not be renewed. The New Zealand Workers' Union, which represents nearly all the Department's employees, has been declared a " Service organization " under the Government Services Tribunal Act, 1948. Agreements will therefore be superseded by a principal order of the Government Services Tribunal. Conciliation proceedings already taken have led to a substantial measure of agreement on the terms which may be incorporated in the order. This is most gratifying, and I would like once again to record my appreciation of the co-operative spirit in which the executive officers of the union have approached me on matters affecting their members. In so far as relations with the workers are concerned, the Government has experienced one of its best years since taking office in 1935 in that so little working-time was lost through disputes.

STAFF

On 31st March, 1948, the total staff was 3,422, comprising 2,016 permanent and 1,406 temporary officers. Further temporary staff have been given permanent status and at 31st March, 1949, the corresponding total was 3,573, made up of permanent 3,124, temporary 449, an over-all increase of 151 over the previous year. This is partly accounted for by the transfer of the Civil Design Section of the State Hydro-electric Department to the Ministry of Works under the immediate control of Mr. C. W. O. Turner, who was appointed Assistant Engineer-in-Chief in charge of hydro-electric design and construction. Seventy officers were involved in this transfer.

To alleviate the shortage of technical staff, engineers, architects, and draughtsmen have been recruited from the United Kingdom. Several have already commenced duty and others are on the way.

Following the merger of the Ministry and the Public Works Department, Mr. S. Roberts was appointed to the newly created position of Chief Administrative Officer. While Mr. McKillop was overseas, Mr. F. Langbein, Engineer-in-Chief, acted as Commissioner of Works.

Mr. R. B. Hammond was appointed Director of Housing Construction, succeeding Mr. G. W. Albertson, who had retired during the previous year.

Mr. R. H. Packwood, District Commissioner of Works, Auckland, Mr. E. F. Evans, District Engineer, Christchurch, Mr. L. May, Resident Engineer, Whangarei, Mr. R. H. P. Ronayne, Resident Engineer, Tauranga, and the Assistant Government Architect, Mr. G. F. Penlington, all retired on superannuation during the year. Senior clerical officers who retired were Mr. H. S. Hills, Chief Clerk, Head Office, and Mr. H. G. Priestly, Chief Clerk of the Housing Construction Division.

It is regretted that Mr. Evans was forced to relinquish his duties owing to ill health.

I desire to place on record my own and the Government's appreciation of the very loyal and efficient service rendered by these officers.

It is with regret that in this year's report is recorded the deaths of Mr. A. Dinnie and Mr. G. P. Anderson. The late Mr. Dinnie, who at the time of his retirement in April, 1947, was District Engineer, Napier, held during his long service several important posts, including Engineer in Charge of the Otira Tunnel and the Arapuni power scheme construction. Mr. Anderson was one of the first engineers to be posted to the Hydro-electric Branch of the Public Works Department and was for a long period responsible for numerous important investigations on which the design and construction of some of our major hydro-electric schemes were based. The Government records its deep appreciation of their valued services, and the deep sympathy already conveyed to their relatives is now recorded in this annual statement.

ORGANIZATION

The Government's decision to amalgamate the Ministry of Works and the Public Works Department under the Commissioner of Works as Permanent Head has been further implemented by the creation of a new position, that of Chief Administrative Officer charged with the direction and co-ordination of the administrative work of the Ministry. Since then steps have been taken to amalgamate or otherwise reorganize various branches of the Department to enable them to function more efficiently and to co-ordinate and facilitate their work. Examples are the placing of all engineering and architectural staffs of both the Public Works and Housing Divisions under the Engineer-in-Chief and Government Architect respectively, the amalgamation of the land-purchase staffs of both Divisions under the immediate control of the Chief Land Purchase Officer, and the transfer of the Civil Engineering Design Staff from the State Hydro-electric Department to the Ministry of Works.

CONCLUSION

I submit with my statement the annual report of the Commissioner of Works (Appendix B) and the annual reports of the Engineer-in-Chief (Appendix C), the Government Architect (Appendix F), and the Director of Housing Construction (Appendix G). In addition, as required by section 24 of the Main Highways Act, 1922, I submit the annual report of the Main Highways Board (Appendix D) and also, in accordance with section 33, subsection (2), of the Soil Conservation and Rivers Control Act, 1941, the annual report of the Soil Conservation and Rivers Control Council (Appendix E) for the year ended 31st March, 1949.

In conclusion, Mr. Speaker, I would like to make special mention of the work of Mr. McKillop during his overseas visit and results achieved, and of Mr. Langbein, who assumed the position of Commissioner of Works during Mr. McKillop's absence. I also extend to all the staff and workmen thanks for their co-operation and loyal service during the year.

The Government is well aware of the necessity for the greatest possible acceleration of work on numerous important State projects, and to achieve this objective will do everything within its power to ensure the use of all available resources in the best interests of the Dominion.

R. SEMPLE, Minister of Works.

APPENDICES

TO THE

MINISTRY OF WORKS STATEMENT, 1949

APPENDIX A

AUDITED STATEMENT OF EXPENDITURE ON PUBLIC WORKS OUT OF THE PUBLIC WORKS ACCOUNT FOR THE YEAR 1948–49

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

Ministry of Works, Wellington,
20th June, 1949.

SIR,—

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

I have, &c.,
R. SEMPLE,
Minister of Works.

The Controller and Auditor-General, Wellington.

STATEMENT OF EXPENDITURE ON ALL WORKS AND SERVICES CHARGEABLE TO THE PUBLIC WORKS ACCOUNT FOR THE YEAR 1948–49

	Appropriation.	Expenditure.		
	£	£	s.	d.
Railway construction	380,000	128,724	16	9
Housing construction	8,010,954	8,886,321	15	0
Public buildings	1,500,000	1,080,463	4	6
Education buildings	1,395,000	1,650,395	10	8
Lighthouses and harbour-works	25,000	8,111	1	4
Roads, &c.	460,000	405,653	14	7
Soil conservation and rivers control	450,000	464,941	14	5
Irrigation, water-supply, and drainage	370,000	286,110	4	11
Highways construction	1,900,000	2,005,569	4	6
Forest development	1,812,400	1,423,838	17	7
Christmas Island phosphate rights	1,500,000	1,375,000	0	0
Totals	17,803,354	17,715,130	4	3

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.
E. R. MCKILLOP, M.I.C.E., Permanent Head.

The Statement of Expenditure charged to the Public Works Account has been examined and found correct.—J. P. RUTHERFORD, Controller and Auditor-General.

APPENDIX B

ANNUAL REPORT OF COMMISSIONER OF WORKS

THE COMMISSIONER OF WORKS TO THE HON. MINISTER OF WORKS.

SIR,—

I have the honour to submit the annual report of the Ministry of Works for the year ended 31st March, 1949.

For six months of the year I was absent overseas, and during this time Mr. F. Langbein, Engineer-in-Chief, acted as Commissioner of Works.

The purpose of my visit overseas was—

(1) To select in the United Kingdom technical personnel—viz., engineers, architects, and draughtsmen—for staff positions in the Ministry of Works.

(2) To discuss with our immigration authorities in Great Britain the introduction of constructional labour seriously deficient in this country, as part of the Government's immigration scheme; and as an adjunct to this to ascertain the possibility of contracting firms undertaking the construction of such of our larger development works for which the Government might from time to time decide to call overseas tenders.

(3) To augment, by means of importation, supplies of materials the lack of which formed bottlenecks in our housing and constructional programme.

(4) To examine and report upon modern methods of road, aerodrome, and hydro-electric construction, with special reference to tunnelling and the construction of high dams.

(5) To inspect modern housing developments abroad, in particular where these are carried out by means of prefabrication or mass production.

(6) To investigate irrigation, conservation, and land-development projects, in particular in relation to their economics and to their control on completion.

Your separate direction to me to investigate such industries as were dependent upon the supply of cheap electric power resulted in the obtaining of a large amount of technical information in Sweden and Norway, in the United Kingdom itself, and in both Canada and the United States. Inspections were also made of pulp and paper mills in Sweden and in Canada in view of the Government's interest in instituting this form of development in New Zealand.

Specific instructions were received from you—

(*a*) To visit Lardarello, in Northern Italy, where a large block of power is being generated by steam from geo-thermal sources to service industries in Northern Italy and to supply power to the electrified railway system in that area.

(*b*) To institute inquiries for a suitable firm of English consulting engineers competent to undertake the design of the Auckland Harbour Bridge.

(*c*) To recommend to you an advisory panel competent to review the economic and engineering problems related to the improvements of the railway facilities in the Auckland metropolitan area.

Facilities were also made available to me to investigate the administrative machinery of such United Kingdom Departments of State whose problems bore some relation to those of the Ministry of Works in New Zealand. These were the Ministry of Town and Country Planning, the Ministry of Health, which, in the United Kingdom, controls housing developments, the Ministry of Transport, the Ministry of Civil Aviation, and the Ministry of Works.

In Great Britain I had every assistance from our High Commissioner's Office and from our High Commissioner himself, particularly in regard to the several conferences on the matter of supply which we had with the Board of Trade and the Ministry of Supply in Great Britain. I was also assisted in my various contacts by our Consulting Engineer, Mr. Ranald J. Harvey, and Sir Reginald Stradling, of the Ministry of Works, who, because of his recent visit to New Zealand, had considerable knowledge of our problems.

In Canada and the United States I was very ably assisted by our Trade Commissioners in Montreal and Washington respectively, particularly in discussions which took place with the Aluminium Corporation, the United States Steel Corporation, the Bethlehem Steel Corporation, and other suppliers of steel, both unfabricated and fabricated.

You have already had detailed progress reports in regard to the above matters on which some action has already been taken by the Government and on some of which action is still pending. These are further referred to in the report which follows.

ORGANIZATION

In my report for last year reference was made to the proposed merger of the Ministry of Works with the Public Works Department. The two offices commenced to function as one organization from 1st April, 1948. The merger has necessitated but little internal reorganization, as their functions were closely interwoven and remain to a great extent unchanged.

The Civil Engineering Design Office of the State Hydro-electric Department has been transferred to the Ministry of Works, thus bringing all the civil engineering design work under one Department. Responsibility for hydro-electric design and construction was centralized with the appointment of an Assistant Engineer-in-Chief in charge of both hydro-electric civil design and construction. The engineering and architectural staffs of the Engineering, Architectural, and Housing Construction Divisions have been amalgamated and placed under the control of the Engineer-in-Chief and the Government Architect respectively, with suitable secondments to the Director of Housing for the actual execution of housing work. The land-purchase staffs of all divisions were combined under the control of the Chief Land Purchase Officer and, with a view to facilitating investigations and settlement of claims, much of the combined work has been decentralized to districts under the control of District Land Purchase Officers.

BUILDING AND CONSTRUCTION INDUSTRY

MAN-POWER

The labour force available to the building and construction industry has maintained some increase over the previous year. Details are in accordance with the figures set out hereunder :—

	1948.	1949.	Increase.	Decrease.
			Per Cent.	Per Cent.
Works industry (excluding professional and clerical)—				
Housing	14,015	15,620	11·5	..
Other buildings	6,020	5,960	..	1·0
Other works	10,689	11,150	4·3	..
Maintenance (all classes)	5,007	5,540	10·6	..
	35,731	38,270	7·1	..
State and State-subsidized works (excluding professional and clerical)—				
Housing (State rental, departmental, ex-servicemen settlement and Maori housing)	6,047*	6,450*	6·7	..
Other buildings	1,992	2,140	7·4	..
Other works (including maintenance)	10,016	10,230	2·1	..
	18,055	18,820	4·2	..
*Includes rehabilitation trainees	2,431	2,133	..	..

Immigration is beginning to provide increased numbers of men for the building and construction industry, and following discussions which I had during my visit overseas some further improvement in the man-power figures for the coming year can be expected. For general construction work, however, there is still a grave over-all shortage, particularly emphasized in the field of State and State-subsidized works. Special inducements are required to attract suitable labour in sufficient numbers to carry out work to which even now the Government is committed.

MATERIAL SUPPLY

A summarized appreciation of the position as it affects the principal building-materials is as follows :—

Cement

During the year production was adversely affected by recurring coal shortages, shipping difficulties, and plant overhauls. The demand from hydro-electric development schemes increased, necessitating considerable tonnages being made available to allow reasonable progress on these important works. Even with assured coal-supplies, local production will be inadequate to meet the requirements of all cement-consuming interests for the next two years at least. Relief will be afforded by the arrival, at intervals during these years, of shipments of imported cement. Nevertheless, meantime it will be necessary to continue rationing through local end-use committees to ensure equity in distribution until the extensions to the local cement-works are operating in late 1951 or early 1952.

Bricks

The brick position has been difficult owing to the lack of adequate coal-supplies and suitable labour. In Wellington the situation has required control being exercised over the sale and distribution of bricks to ensure available supplies being used on the most essential works, mainly housing.

Timber

With production still increasing, mainly in exotics, the timber position is relatively satisfactory. The installation of kiln drying and treatment plants is proceeding rapidly, thereby permitting greater quantities of exotic timbers to be treated and used for construction, which formerly used indigenous timbers. Local shortages occurred from time to time in joinery and finishing lines. The building industry is of necessity adapting itself to the fuller use of exotic timbers, particularly in housing construction, and many of the difficulties and objections to their use are being overcome by up-to-date methods of grading and treatment.

Structural and Reinforcing Steel

While Australian deliveries have not improved, the situation generally is becoming easier because of shipments obtained from the United Kingdom and Belgium. Further supplies have been arranged from these sources, and from the United States to the extent of available dollar funds, and it is anticipated that it will be possible to maintain reasonable progress on most approved works. Demand, nevertheless, is greatly in excess of the quantities available and many projects involving the use of steel have had to be deferred pending a substantial improvement in the position. It is hoped that with a further easing of the supply of steel some of these deferred works can proceed.

Wallboards

Consequent upon increased deliveries of plaster, the supply position of plaster-based wallboards has improved considerably, manufacturers working to capacity. Locally produced softboard is in free supply, while hardboard output is reasonably satisfactory.

Sanitary Earthenware

Since the war lack of these supplies formed a serious bottleneck in all housing progress, and this matter was taken up immediately on my arrival in Great Britain. With the assistance of increased importations, general supply has now much improved.

Roofing-materials

(*a*) *Asbestos Cement: Corrugated and Flat Sheets.*—Reasonable supplies of asbestos fibre have come to hand and the production of both corrugated and flat sheets has improved considerably, although the current shortage of cement is a retarding factor. Quantities of imported manufactured sheets continue to arrive frequently, and the position should be satisfactory subject to adequate supplies of cement and asbestos fibre being maintained.

(*b*) *Galvanized Corrugated Iron.*—There has been little if any improvement in deliveries of galvanized corrugated iron and supplies that became available have been sufficient only to permit repairs to existing roofs. Prospects of increased deliveries are not encouraging.

(*c*) *Cement and Earthenware Roofing-tiles.*—The position generally is satisfactory, despite limited supplies of cement being available to concrete-tile manufacturers.

(*d*) *Fabric and Aluminium Corrugated Sheets.*—Ample stocks of fabric roofing are available and increasing quantities of aluminium sheets are coming forward regularly.

Builders' Hardware, Plumbers' Supplies, and Electrical Fittings

It is anticipated that the present satisfactory supply position will be maintained.

Enamel Baths

Material and labour difficulties continue to limit local manufacture, and deliveries lag considerably behind orders. The shortage is being overcome largely by increased importations, stocks being gradually built up. The improvization formerly adopted to enable houses to be occupied should no longer be necessary.

Galvanized Wrought-iron and Steel Tubes

There has been no improvement in the supply of these materials and progress on the reticulation of areas requiring the larger-sized pipes in particular has been delayed. An early improvement is not anticipated. However, no effort is being spared to make our requirements known, and it is hoped that the anticipated freer supply of steel will be beneficially reflected in the supply of iron and steel pipes.

BUILDING CONTROL

Government policy in giving greater emphasis to housing has resulted in a record number of houses being completed during the year. In part this achievement is due to the increase which took place in the available labour force during the previous year, but in the main to freer supplies of materials, notably timber.

The total number of building permits authorized during 1948-49 was 49,295, classified as follows:—

(*a*) State and other Government housing	4,652
(*b*) Private housing	11,878
(*c*) Housing additions	8,680
(*d*) Works and buildings other than housing	24,085
	49,295

The undermentioned table details applications dealt with during the year:—

Type of Work.	Permits Authorized.		Applications Deferred.	
	Number.	Value.	Number.	Value.
		£		£
Engineering	67	1,674,734	8	9,410
Hospitals	129	707,609	6	29,202
Schools	387	1,462,584	27	27,424
Other Government	641	1,275,605	12	139,548
Local bodies	302	371,944	22	148,823
Commercial	3,798	2,683,260	804	2,691,583
Factories	473	816,891	158	780,087
State housing	3,973	7,035,835	..	..
Other Government housing	679	1,034,324	..	..
Rehabilitation housing	248	409,889	..	..
Private housing	11,630	17,722,180	712	1,145,508
Housing additions	8,680	2,000,455	567	169,215
Community buildings	711	539,085	125	255,364
Farm buildings	3,433	748,029	20	5,006
Maintenance—				
Buildings	1,594	239,883	24	10,033
Other works	38	21,956	1	176
Miscellaneous	12,512	812,959	1,463	142,698
Total	49,295	39,557,222	3,949	5,554,077

The value of permits issued for housing and housing additions—viz., £28,202,603—represents 71·3 per cent. of the value of all permits authorized.

The total value of works completed during 1948–49 covered by permits and assessed on permit values amounted to £39 millions. The value of deferred applications has increased from £11·2 millions to £14·9 millions.

In keeping with Government policy to remove restrictions on building construction as soon as circumstances permit, building control policy was kept under constant review during the year. A measure of relaxation and decentralization was made effective from December last, delegating local bodies wider powers to authorize permits of various classes without reference to District Building Controllers. Additional authority was issued to District Building Controllers to authorize works without Head Office approval, thereby speeding up the procedure in dealing with applications. During the coming year further reviews will be carried out, with particular reference to outstanding applications which have been deferred.

CONTRACTS

The following statement shows the number and value of contracts let during the year by the respective Tenders Boards :—

	Buildings (Includes Alterations, &c.).		Engineering.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.
		£		£		£
District Tenders Board—						
Auckland	45	66,731	45	101,868	90	168,599
Hamilton	26	21,997	32	42,801	58	64,798
Napier	15	10,854	27	52,546	42	63,400
Wanganui	28	43,180	12	21,780	40	64,960
Wellington	103	85,660	39	55,786	142	141,446
Christchurch	50	67,657	41	78,134	91	145,791
Dunedin	48	47,535	35	48,870	83	96,405
Totals for district Boards	315	343,614	231	401,785	546	745,399
Tenders Board, Head Office ..	38	767,201	61	1,382,819	99	2,150,020
Grand totals ..	353	1,110,815	292	1,784,604	645	2,895,419

During the year, tendering has shown a tendency towards keener competition, particularly for civil engineering works.

HOUSING AND BUILDINGS

In Great Britain, Canada, the United States, and such parts of Europe as I visited a very serious housing shortage exists, and in every case this was receiving the urgent attention of the Government concerned. The methods by which this shortage was being overtaken varied from one country to another, but in all cases considerable Government assistance was supplied.

In Great Britain the responsibility for housing is vested in the local authorities. The proposals of these authorities carry a substantial Government subsidy, but, in part at least, are also financed from the rates. The responsibility for selecting tenants remains with the local authority. Control was very restrictive, and while local authorities were permitted to issue one permit for every three subsidized houses built, in effect little private building was being done.

The over-all shortage in some countries was due to destruction caused by the war, and in all countries to the cessation of building during the war years. This, however, is not the only reason for the shortage. There is a general realization that housing-conditions in the past have been very far from satisfactory, and the desire to improve the living-conditions of working-people has brought with it responsibility for heavy expenditure in connection with housing development.

In the countries visited I inspected a very large number of housing developments, but in general conception none equalled our own State housing in New Zealand. The problem, of course, is not entirely similar, as overseas the housing shortage is most acute close to large centres of population and has to be provided for more by tenements and flats than by individual housing units. The housing layouts, however, in Great Britain—many of which are of the semi-detached type—are good and furnish on completion amenities closely resembling those provided by our own schemes.

In England research facilities are provided on an extensive scale with a view to obtaining maximum economy and durability in building construction. This, I think, should be given more consideration in New Zealand. It is generally accepted that the timber used in house-construction in New Zealand is excessive, and with some minor alterations in design and more care in construction quite considerable savings could be made. This point was very forcibly brought to our notice in a report made during a recent visit to New Zealand by Sir Reginald Stradling, Chief Scientific Adviser of the Ministry of Works in Great Britain. Compared with New Zealand, in few other countries are materials so readily available for building either in brick or in concrete. Much greater consideration should therefore be given to their increased use here because of the better lasting qualities of these forms of construction.

Mass production is employed in many countries, but there was little evidence to show that any considerable savings had been obtained by this method. The chief benefits lay in quicker construction, but when mass-produced units were grouped in settlements there resulted a monotony of type which is a feature avoided by our State housing schemes.

The factory-produced aluminium units supplied in large quantities in Great Britain after the war provide quite comfortable living-accommodation. They are, however, relatively expensive, limited in floor area, and too stereotyped in appearance when grouped in settlements.

It is quite evident that a serious housing shortage still exists in this Dominion despite the efforts made in recent years to overtake this. On the basis of actual necessity it is difficult to assess this shortage and it is felt by this office that figures popularly quoted should be accepted with care. No doubt, in so far as State housing is concerned, the demand is partly created by the high standard of housing provided and by the comparatively low rentals charged.

In previous reports it was estimated that a target figure of 12,000 houses per annum should be aimed at to overtake the shortage within a reasonable period and without undue disturbance to other forms of construction. This year the target was exceeded by 33 per cent., and whilst no doubt this achievement, from the point of view of relief of the housing shortage, was extremely satisfactory, it must be pointed out that the results have only been achieved at the sacrifice of other types of building.

For practically a decade now in New Zealand severe restrictions have been placed upon construction of all types of buildings other than houses. Some priority has been given to schools, hospitals, and hydro-electric buildings, but in every field of Government building there is a pent-up demand which is of serious concern to the Government. In every centre the need for more accommodation is pressing, and it is hoped during the coming year to see some move made towards providing better accommodation for many of the State Departments. The construction of office accommodation in the major centres would have the very desirable effect of releasing to private people office accommodation which has been leased from them for State Departments since the commencement of the war.

To an equal extent commercial and industrial building is affected and it is becoming increasingly difficult to hold back applications in this field. It is realized that this problem can only be solved by the progressive lessening of control, and I am aware that the Government has this continuously in mind. Materials—cement perhaps excepted—are becoming more freely available, and it is hoped that during the year further relaxation of control will be possible to permit increased activity in this direction.

HYDRO-ELECTRIC CONSTRUCTION

At the close of hostilities the Department's organization was not adequate to undertake the increased programme of work desired by the Government. With considerable difficulty, and assisted by the appointment of technical staff from abroad, this organization has been built up as quickly as possible within the Ministry of Works. The programme being undertaken by the Government at present in this respect is not only greater, but many times greater than has ever before been undertaken in this Dominion. Five large projects—viz., Maraetai, Upper Waikaremoana, Cobb River, Lake Pukaki, and Lake Tekapo—are under active construction, and within the next few months a commencement will be made on two more—viz., Whakamaru and Roxburgh. The latter scheme will be the largest undertaking yet attempted in this country.

In addition, investigations are in hand for work at Atiamuri, on the Waikato River, and Benmore, on the Waitaki River, and on the Gowan scheme, in the Nelson area. These are all major projects, and, in addition, a number of minor ones are being investigated.

Associated with the construction of the main projects there is a large amount of subsidiary work required in regard to substations, transmission lines, &c., and this is being undertaken currently by the Ministry of Works in co-operation with the State Hydro-electric Department.

Considering the position the Government found itself in at the end of the war, and of the continued difficulties in obtaining technical staff, construction man-power, and materials, the progress which has been made can be considered satisfactory. Unless, however, additional man-power is brought into the country, other methods of carrying out construction by enlistment of overseas contracting firms will have to be considered in order to enable the targets aimed at to be realized and embarrassing power restrictions avoided.

Whilst abroad I paid particular attention to hydro-electric development in the several countries visited. Much information was obtained in regard to design and construction techniques. No project visited, however, presented quite the same problems as confront our engineers in New Zealand and in particular the foundation conditions at the various schemes on the Waikato River are almost unique. At Roxburgh the same foundation problems do not exist, the main difficulty there being the diversion of the Clutha River, but the scheme itself is considerably larger than any so far built in New Zealand and is comparable in size with any being attempted abroad at the present time.

In nearly all projects which I visited overseas plans and specifications for works of this magnitude were prepared well in advance of the actual construction and generally from information acquired after long-term investigations. This, unfortunately, is not the case in New Zealand, where, due to the war and the scarcity of technical assistance, it has not been possible to keep design as far ahead of construction as we would like. To a large extent this difficulty is now being overcome, but it has placed a very onerous responsibility on this Department's Engineer-in-Chief and the General Manager, State Hydro-electric Department, and on both their design and construction staffs.

Generally abroad, projects of this magnitude, even when carefully prepared by the most competent authorities, are subject to scrutiny by a panel of independent consulting engineers. In construction work of such a highly technical nature and of such importance this precaution is extremely advisable. The cost of obtaining an independent expression of opinion is, in relation to the cost of the schemes, quite negligible. Whilst we have the fullest confidence in our own technical officers, it is hoped that in future opportunities will be given for them to discuss their problems with engineers who in their particular field have world-wide recognition. We had discussions on this aspect of the matter with both the General Manager of the State Hydro-electric Department and the Engineer-in-Chief before I left for overseas, and it is now proposed to ask Mr. J. L. Savage, late of the United States Bureau of Reclamation, to come to New Zealand for the purpose of discussing with the Engineer-in-Chief, the General Manager, and their principal officers certain technical problems arising in regard to both the design and construction of the major projects proposed by the Government.

When I left we were very much embarrassed by lack of steel for our new transmission-line system. Inquiries were prosecuted in Great Britain, Europe, Canada, and the United States with only limited results. Since then, however, the position has considerably improved and it seems that for a period ahead supplies are assured.

In all countries I visited there were power restrictions some of them severe. Shortages were being overcome by several means, but in countries with a potential of water-power this form of development was being vigorously prosecuted. Particular attention was being given everywhere to the demands of industry, and in view of future developments in this country, I made special inquiries regarding industries related to or based upon the supply of cheap power. The examination of these was extremely interesting and much detailed and valuable information was obtained.

HIGHWAYS, ROADS, AND BRIDGES

Deterioration of the main highway system due to lack of maintenance during the war years is causing considerable concern and the Government is now faced with very heavy expenditure in maintaining running surfaces and progressively improving these to meet the ever-increasing demands of transport operators. Even with the utmost use of mechanized equipment, essential maintenance is much less than it should be, and during the years immediately ahead steps must be taken to overcome what otherwise would result in a heavy capital loss. Of particular concern is the number of bridges on main and secondary roads which are long past their useful life and the replacement of which by modern structures should be undertaken as soon as possible. A programme of essential bridge renewal has been prepared and a start made on the most urgent of these works. Some of the bridges required are major works requiring considerable quantities of steel and cement and the attention of specialist designing staff, who at present are not available to the Department in adequate numbers.

Whilst overseas I also gave attention to the operation of trucking companies, particularly in the United States. This form of road transport has advantages in regard to certain classes of goods and is highly competitive with rail transport. The topography of New Zealand, however, is such that a very heavy expenditure would be involved if we attempted to adapt the roading system generally to this form of transport. However, a substantial capital outlay in the immediate future on our main roading system is inevitable to meet the ever-increasing traffic demands, and this work cannot be deferred indefinitely.

SOIL CONSERVATION AND RIVERS CONTROL AND LAND-DEVELOPMENT GENERALLY

Under the control of the Soil Conservation and Rivers Control Council, twelve Catchment Boards are operating and very definite progress has been made in the implementation of the Government's policy of soil conservation and river control. It is recognized that the preservation of the country's topsoil and the protection of farming-lands from flooding is of prime importance to the Dominion's future development. For this reason alone, the greater part of the expenditure required must be found from State funds. Although good work has been done by the Soil Conservation and Rivers Control Council and the Catchment Boards, in view of the extent of the State's financial contribution, the administrative machinery set up by the principal Act is being examined with a view to possible amendments aimed at securing the very necessary results in the most economical way and in the shortest possible time.

The principal point of criticism is the association of soil conservation with river control. In the United States, where I had an opportunity of examining this problem, these two functions are disassociated, soil conservation being entrusted to the Department of Agriculture, whilst river control remains the responsibility of the United States Army Engineers. This is a generalization only, but the dissociation is considered desirable because of the great difference in the technique of soil conservation as against that required for dealing with river control. It must be remembered, however, that the upland areas forming the main catchments and the lower reaches where flooding usually occurs are much further apart there than they are in New Zealand, and for this reason alone it is not possible in the United States to have the close association which is being attempted by the empowering legislation in this country. There are definite advantages in maintaining this close association, and the fullest consideration must be given to the ultimate effects before any steps are taken to alter the existing administrative machinery. There is no doubt that in this country a serious problem in regard to erosion exists which must always remain of prime concern to the Government.

Apart from operations under the Soil Conservation and Rivers Control Council, there are several major schemes of land-development and irrigation in both Islands which have been held up mainly on account of lack of man-power and materials. It is hoped that in the near future sufficient labour, plant, and materials can be made available so that action in regard to several of these schemes may be initiated.

RAILWAYS

In view of the divergence of opinion which exists in Auckland as to the location of further railway facilities, and because of the importance of a correct decision to the future of the city, I was instructed to consult with Sir William Halcrow, formerly President of the British Institution of Engineers, and a recognized engineering authority on this subject. The Government has now arranged to bring to New Zealand both Sir William and Mr. J. P. Thomas, late General Manager of the London Transport Advisory Council. It is hoped that as a result of their recommendations some action in regard to the provision of further transport facilities in Auckland can be taken at an early date.

Work on the Rimutaka Tunnel has been held up on account of shortage of man-power and cement. Decisions to put diversion cuts at the hydro-electric works at Whakamaru and Roxburgh will make available more tunnellers than was originally expected, and these will be employed as they become available on opening up at both ends of the tunnel. The tunnel itself is a considerable undertaking. It is longer than the Otira Tunnel, which under better conditions took some fifteen years to complete. A close examination

of tunnelling operations in the countries I visited overseas would indicate that this work can be carried out in from four to five years by utilizing the most modern methods of construction. Plans and specifications have been prepared for the letting of this work by contract.

There are a number of railway works which should be undertaken, but there is one —the Paeroa–Pokeno Railway—which has been started and which should be completed as soon as the necessary man-power is available. The completion of this link will cut down the rail distance from Auckland to the Bay of Plenty by forty-seven miles.

STATE PULP AND PAPER PROJECT, MURUPARA

The Ministry of Works is interested in the whole of this project, but in particular in regard to the building of the town, the construction of thirty-eight miles of railway-line from Edgecumbe to Murupara, and the provision of improved harbour facilities at Mount Maunganui. Recommendations are now before the Government with a view to importing the necessary plant and skilled workmen to permit of this important undertaking proceeding as quickly as possible. It is expected that considerable Maori labour will be available from this area and other districts, but, in addition, a number of other workmen—mostly tradesmen—will be required to complete the scheme within a reasonable time.

DEVELOPMENT OF THERMAL AREAS

Inview of the limitations to development of hydro-electric power in the North Island, whilst abroad, on your instructions, I visited Lardarello, in Italy. The Government also sent the Government Geologist, Mr. Ongley, to Lardarello to report on the geological formation, on which the supply of steam is dependent. Shortly some 250,000 k.w of power will be continuously generated from the underground steam sources there and will be used principally for railway purposes and industrial development in Northern Italy. The geological structure at Lardarello is different from that which has already been proved at Rotorua, yet the size of our thermal areas in comparison is so vast that the Government Geologist has recommended that a full exploration of these should be immediately commenced. Apart from the main area in which Rotorua is located, there are possibilities of similar development in North Auckland also. This survey is now in hand.

AUCKLAND HARBOUR BRIDGE

In view of the Royal Commission's findings on the Auckland Harbour Bridge, you instructed me to get in touch with Sir Ralph Freeman, of Messrs. Freeman, Fox, and Partners, in London, with a view to this firm undertaking the design of this bridge. Arrangements have now been made to utilize the services of this firm. Sir Ralph Freeman was responsible, on behalf of the contractors, for the design and the supervision of the construction of the Sydney Harbour Bridge, and is recognized as a world-wide authority on major bridge construction.

The Government has sent Mr. R. H. Packwood, until recently District Commissioner of Works at Auckland, to England with site data and all information bearing on the design of this bridge. Mr. Packwood was a member of the Royal Commission. It is not considered that site investigations can be completed and the designs prepared within a period of three years, by which time it is hoped that the steel position will be considerably improved.

TOWN AND EXTRA-URBAN PLANNING

Following the merger of the Ministry of Works and the Public Works Department, the functions of the Town-planning Section were defined and provision made for the appointment of town-planning officers with professional qualifications in accordance with standards adopted in Great Britain. The work of the Section includes not only planning problems related to Government development works, but also the secondment to local authorities of qualified planning officers to undertake the preparation of planning schemes for these authorities. Secondment in this way is available only to those local authorities who have no qualified staff and who are otherwise unable to secure the services of an outside qualified consultant. The Section, in addition, has been called upon to advise other Departments, and a considerable amount of work was done during the year in connection with industrial areas, the co-ordination of housing proposals with local-body plans, and the development proposals for Departments such as State Forest Service and Maori Affairs.

From information gradually being accumulated the Section is also able to assess developmental trends and is called upon to assist in defining location of Government buildings and educational and other institutions. Considerable progress has been made also in co-ordinating, as a matter of future policy, the administrative activities of the Government in combined centres in the principal cities, and this is being done in the fullest consultation with the local authorities concerned.

The Town-planning Amendment Act, 1948, clarified a number of provisions of the principal Act which in the past has led to uncertainty in the preparation and administration of planning schemes. The Act also provided additional powers for the acquisition of land and other necessary development by local authorities. The Act has given local authorities confidence to proceed with their planning schemes. There is a general realization of the necessity for ordered development in even the smaller towns throughout New Zealand, and the services of the technical staff have been much in demand by these authorities throughout both Islands.

The staff has also undertaken considerable responsibility in preparing the co-ordinating evidence and planning information required for several hearings of the Local Government Commission. During the year these included the very extensive inquiry into the future local-Government administration in the Porirua Basin area.

REGIONAL PLANNING

Regional Councils were constituted by the Organization for National Development to embrace the whole of the country in conformity with the Government's policy of co-ordinated planning, with due regard to observance of all local interests. On taking over this responsibility from the Organization for National Development the Ministry of Works completed, at your direction, schedules of works envisaged by both the Government and local authorities which would require consideration in the period of some ten years ahead. These schedules were announced by yourself in the various regional centres throughout New Zealand. Although considerable interest was at first taken in this approach to a planned development, this interest has not been maintained generally in the rural areas. In one form or another, however, most of the metropolitan bodies have instituted planning authorities in conformity with the Government's intentions, and although many points of dispute have arisen, plans for the orderly development of the larger cities are now well advanced in conformity with accepted town-planning practice and on a much better basis than hitherto.

The lack of interest in the rural areas is attributed largely to conflict with the established procedure of the local bodies included in each region. Regional Councils were constituted on an advisory basis only and hence were divested of any authority to proceed without the concurrence of the local authorities concerned.

It must be admitted also that Regional Councils were hampered from the outset by lack of any information regarding the population capacity of their areas, information which is necessary before any forward development proposals can be properly assessed. Steps are being taken to obtain an assessment of the population capacity of New Zealand from an examination of its available resources and to determine in general terms the probable distribution of this population throughout the country.

The Select Parliamentary Committee on Local Government which investigated the subject of local-body administration fully endorsed the policy of regional planning and the setting-up of Regional Councils. While, however, there is much to be said for the principle of regional planning, I feel that further progress will be delayed until the existing structure of local-body administration throughout the country has been reviewed by the Local Government Commission.

ESTIMATING AND COSTS

Costs of construction work in all parts of the world have risen considerably over the last decade. A recent analysis made in the United States shows that in regard to concrete-dam construction the average rise has been 149 per cent. and on earth-dam construction 97 per cent. over 1940 values. Generally it can be said that costs have almost doubled on all construction works. Possibly in New Zealand these rises have not been reached, although it is estimated that costs generally have increased about 75 per cent. Estimating under these conditions, combined with the difficulty of maintaining construction schedules under existing supply and man-power conditions, is admittedly difficult, but every effort is being made to have more detailed estimates prepared and to see that these estimates, in practice, are not exceeded. To assist in the accumulation of the necessary data for detailed estimating and to ensure proper control over works under construction, preparations have been made for the mechanization of the costing system, and the machines, which have been ordered from Great Britain, are now arriving.

STAFF

There still exists the need for further recruitment of qualified technical officers. Efforts to remedy the position are being continued both here and overseas, but while the salary levels for such positions in the Service are low in comparison with outside positions requiring equivalent professional experience the Department will continue to experience difficulty in its endeavour to attract suitable applicants.

Senior officers who retired during the year were Mr. R. H. Packwood, District Commissioner of Works, Auckland; Mr. E. F. Evans, District Engineer, Christchurch; Mr. R. H. P. Ronayne, Resident Engineer, Tauranga; Mr. L. May, Resident Engineer, Whangarei; Mr. G. F. Penlington, Assistant Government Architect; Mr. H. S. Hills, Chief Clerk; and Mr. H. G. Priestley, Chief Clerk of the Housing Division. I wish to express my appreciation of the loyal and efficient service rendered by these officers.

CONCLUSION

In conclusion, I would again refer to the five-year forecast of constructional development prepared for Cabinet at the beginning of this year which supplies evidence of the necessity for raising the labour force in the building and constructional industry to at least its pre-war strength of approximately 47,000 men, of whom 30,000 were employed on State and State-subsidized works. Last year the totals were 38,270 and 18,820 respectively. In 1938-39 the number of men under the control of the then Public Works

Department (State housing excluded) was 22,150, whereas at the end of 1948 the number of men similarly employed had dropped to 10,900. It is in this field that the Government's building and civil engineering programme—housing apart—lies, and it is here that the man-power deficiency is most severely felt. The loss of man-power from State works of this description is principally due to the reluctance of many contractors and workmen to take up country work while remunerative employment is available to them in the metropolitan areas.

If any significant progress is to be made in overtaking arrears in the building and construction field it is essential that more men be brought into this country for constructional work, either by immigration or by opening up certain works to overseas tender.

Although the finance expended by the State during the post-war years is now in excess of that expended in the immediate pre-war period, because of the fact that costs have risen so much the actual volume of work now being accomplished does not exceed pre-war achievements without any allowance being made for the demand built up during the six years of war or the demand occasioned by the Dominion's expansion.

The responsibilities of this office during the post-war period have been considerable, and we are still faced with many difficulties. These can only be overcome gradually as our resources are more nearly equated to our commitments.

Throughout the year I have received every co-operation from all members of the staff of the Ministry of Works and from Government Departments with which this office is closely associated. Special thanks are due to the Engineer-in-Chief, Mr. F. Langbein, for the capable manner in which he carried out the duties of Acting Commissioner of Works during my absence overseas.

E. R. McKillop, M.I.C.E.,
Commissioner of Works.

APPENDIX C

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

THE ENGINEER-IN-CHIEF TO THE HON. THE MINISTER OF WORKS.

SIR,—

I have the honour to submit the following report upon the various works completed and in progress throughout the Dominion during the year ended 31st March, 1949.

RAILWAYS: CONSTRUCTION AND SURVEY

Auckland Metropolitan Railways.—Investigation into the Auckland Waterfront Railway was continued during the year. The line was amended to suit relocation of the proposed city station and the Auckland Harbour Board's port-development scheme in the upper harbour. A permanent survey between the existing Auckland Station and Te Atatu Peninsula has been completed, and the route between the latter point and Kumeu Station has been fixed from several trial lines. This railway, together with Auckland–Morningside, the Avondale–Southdown, and the Penrose–Glen Innes deviations, which have also been the subject of investigations, will be included in the review to be made by the two English authorities who have been invited to report on transportation problems in the Auckland metropolitan area.

Edgecumbe–Murupara Railway.—Following the completion of the first trial survey (37 miles 58 chains in length), several possibilities suggested themselves for deviations which might improve the ruling gradient of 1 in 45 against the load.

These were carefully investigated, and involved 48 miles of ground reconnaissance and 90 miles of air reconnaissance with 30 miles of trial grading. The main deviation proved that a better gradient could be obtained against the load, but only by traversing much heavy terrain, resulting in a considerably longer line and prohibitive cost. It had therefore to be abandoned. Adopted minor deviations for a distance of about 5 miles south of the proposed Te Teko Station Yard will reduce the gradient against south-bound traffic to 1 in 50 compensated. Close consultations were held with the Railways Department to decide the question of these deviations.

During the year a report and approximate estimate of cost based on the trial line survey was prepared.

Permanent-line location survey was commenced from Edgecumbe, 7 miles of field-work having been completed at the end of the year.

Putaruru–Reporoa Railway.—The 19-mile section, Putaruru to Wawa Road, has been authorized for reconstruction to New Zealand Railways standards and two contracts have been let for earthwork and culverting on the 5-mile section between Putaruru and Lichfield. Broken weather during the last three months of the year has considerably hampered operations, but the contracts are about 60 per cent. completed. Tenders have been called for a further 8 miles of earthwork and culverts.

Satisfactory progress has been made with surveying, and 8½ miles of permanent-line plans have been completed. Maintenance has been carried out in the Putaruru–Wawa Road section and 17,400 tons of freight were hauled during the year.

Rimutaka Deviation.—Following adoption of a suitable route, permanent pegging was commenced, but this has so far been confined to the approaches at each end of the main Rimutaka Tunnel and of the shorter Maoribank Tunnel. The preparation of the permanent-line plans is in hand.

The Lands and Survey Department is carrying out the precise levelling from Upper Hutt to Pigeon Bush, and will also shortly be setting out the tunnel lines at each portal preparatory to running a check survey over the hill.

Test bores have been sunk on centre-line at the west end of the tunnel and useful information obtained about the alluvial material to be driven through before rock is encountered.

Formation of work-yard sites at each end and excavation of the approaches to each portal have been completed. Preparations are now in hand to concrete the west portal and commence driving the Rimutaka Tunnel. This will be followed by similar work at the east portal when skilled man-power becomes available.

At the west end camp sites for single and married men have been prepared and some married quarters have been erected and occupied.

In the Featherston military camp, at the east end, 21 married quarters, including 4 for staff, have been erected and occupied, and in Featherston 2 State houses have been erected for staff.

A specification for a contract for the Rimutaka Tunnel suitable for advertising overseas has been prepared and a specification for an alternative contract on a "labour only" basis and suitable for advertising in New Zealand is in hand.

Hutt Valley Railway Extension.—Owing to the continued scarcity of labour and materials, very little construction has been carried out and work has been confined chiefly to survey and investigations.

At Petone level crossing a detailed engineering survey was made, and this was followed by a thorough investigation of the bridge-site by means of bores sunk to rock over the area to be covered by the proposed overbridge.

A subway has been completed at Epuni Station and 1,100 ft. of platform front (about 70 per cent. of total) has been completed at Nae Nae.

A contract has been let for trimming of formation and berms between Waterloo and Nae Nae, and the work is about half completed.

Six test piles have been driven on the site of the Hutt River Bridge at Taita and test bores have been sunk on the site of the bridge at Silverstream just below the highway bridge. A site plan of this bridge has been completed.

For the survey of the line between Taita and Silverstream field-work is practically completed and the preparation of plans is well in hand.

Haywards–Plimmerton Railway.—Investigation and survey work have been carried out on this line, which will connect the Hutt Valley with the Manawatu line. It will involve a tunnel at the Haywards end about 3 miles long, and almost 20 chains of this line has been pegged. Preliminary investigations of the route between the tunnel and Pahautanui have been made preparatory to carrying out a ground survey.

Turakina-Okoia Deviation.—The only remaining work in connection with the above deviation which could not be carried out before the lifting of the rails in the old Fordell Station yard was the widening and completion of the top end of the access road to the new station yard. This work has now been completed.

Except for a small area, all workshop and camp sites have been cleaned up and the land handed back to the owners.

South Island Main Trunk Railway.—The Oaro construction camp has been closed and clearing up is in hand.

Excavation for the foundations of a 200,000-gallon reservoir at Kaikoura has been completed.

Completed-line plans are well in hand and all should be finalized within a few weeks.

Sockburn–Styx Railway.—The permanent-line plans for this railway have been checked and revised in collaboration with the Railways Department and some minor deviations were investigated during the year.

HYDRO-ELECTRIC DEVELOPMENT: INVESTIGATION, DESIGN, AND CONSTRUCTION

The responsibility for investigation, design, and construction of civil engineering structures for the State Hydro-electric Department was taken over on 1st April, 1948, but close liaison with that Department is still maintained.

INVESTIGATION

During the year civil engineering investigations were carried out for hydro-electric development on the Waikato River, in the Bay of Plenty area, at Lakes Rotoiti and Rotoroa in the South Island, at Benmore on the Waitaki River, and on the Clutha River in Central Otago.

The most noteworthy of these investigations were those into the Roxburgh Gorge proposal on the Clutha River involving the production of an exhaustive and detailed preliminary report, and the site investigation at Whakamaru on the Waikato River.

A technical staff of 8 engineers and draughtsmen was employed in the Wellington Head Office, and the average field force of engineers, surveyors, geologists, drilling contractors, and associated labour was 160 men.

The total footage of borehole drilling was 24,211. 1,014 ft. of investigation tunnels were excavated, together with 591 ft. of vertical-shaft excavation.

Major and detailed reports were prepared in respect of the Roxburgh project and the proposed development at Whakamaru.

A brief account of the investigations carried out is as follows:—

Bay of Islands.—A hydrological study and reconnaissance of a site on the Punakitere River was made in connection with a local body scheme.

Waikato River.—Investigations at Whakamaru covered three possible sites and was of a particularly complex nature involving a very extensive drilling programme. This year investigations were concentrated on the site finally chosen and were completed. Layouts for the scheme were drafted.

At the Atiamuri site the preliminary stage of the investigations was completed, although the final layout has yet to be planned.

At Waipapa, between Maraetai and Arapuni, investigations are in hand in most complex country. Four sites were investigated, and at the first three it has been established that the country rock is not continuous over the bed of the river. The fourth site is now under active investigation and the work is about 40 per cent. completed.

Bay of Plenty.—Reconnaissance surveys of the Kaituna and Rangitaiki Rivers have been made, and several tentative proposals for the development of the Upper Rangitaiki have been examined. The Whakatane River has been photographed from the air for future study.

Lakes Rotoiti and Rotoroa.—A reconnaissance survey has been made of an alternative proposal to develop power between the two lakes by means of a series of short tunnels connected by races, instead of a single 8-mile tunnel as originally proposed. The aerial survey of the surrounding country is now in hand and investigation is proceeding.

Lake Coleridge.—A scheme for increasing the capacity of the race connecting Lake Coleridge and the Harper River has been studied and reported on.

Pukaki.—Preliminary investigations and designs for an initial development of 25,000 kW. and an ultimate development of 100,000 kW. were made and estimates prepared.

Pukaki-Tekapo.—Preliminary investigations and aerial reconnaissance were made into a scheme utilizing the potential head between the tailrace at Tekapo and the Pukaki Lake.

Benmore (Waitaki River).—At this site, which has been referred to in previous statements as Black Jack's Point, subsurface exploration has been continued. Work is proceeding, and at least a further year will be required to complete this investigation. A survey is proceeding towards the development of a village site and irrigation of a camp area so that preliminary tree-planting can be undertaken.

Clutha River.—The preliminary report on the Roxburgh project was completed. It covered several sites in the Roxburgh Gorge and included information on two final sites, together with alternative layout plans for their development. Control of Lakes Wanaka, Hawea, and Wakatipu was also discussed. Final investigations are nearly completed at the preferred site at Roxburgh, and are still in progress at Hawea and Wanaka, where boreholes, shafts and drives are being used.

Miscellaneous.—Arrangements are in hand to erect a number of automatic water-level-recording stations on the Waikato and Rangitaiki Rivers, on Lake Tarawera, and on Lake Rotoiti in the South Island. The collection of flow records has been increased and the recording of data has been reorganized. Arrangements have been made for the aerial survey of several prospective projects, including the schemes proposed for developing Lakes Manapouri and Te Anau. A preliminary survey on the Manapouri - Deep Cove project was carried out to determine the feasibility of transmitting power from Deep Cove to Manapouri.

Design

Plans for further expansion of the staff were made early in the year, and appointments for additional engineers and draughtsmen were advertised both here and in the United Kingdom. Serious delays are being experienced in obtaining the staff required, but in the meantime some reorganization has taken place to make the utmost use of the present staff and to prepare for expected additions.

The architectural staff of the office has also been expanded to give due emphasis to that important aspect of the many large and prominent structures which are under design.

Arrangements for regular model testing of hydraulic structures were made in conjunction with the Dominion Physical Laboratory and tests on Maraetai and Cobb spillways gave invaluable information.

Investigation of scientific problems connected with materials has been arranged through the Department of Scientific and Industrial Research.

The Design Office is also responsible for the preparation of major contracts and for the ordering of the principal materials and fabricated parts for all works.

Power Schemes

Maraetai.—The principal design work for Maraetai Dam and headworks has been brought to virtual completion during the year and design of the power-house and ancillary works is now well advanced.

Whakamaru.—Preliminary work has also been done on the design of the Whakamaru scheme, the construction of which is to follow immediately on the completion of the Maraetai scheme.

Roxburgh.—Study of the Roxburgh scheme has been undertaken and basic designs for this very large work have been produced.

Cobb.—Design of the new intake for Cobb has been completed and the spillway design is now in progress in conjunction with model testing. The principal decisions with regard to the Cobb Dam have been taken. Preliminary designs for the extended Cobb Power-house have been made and detail design work on this item will proceed shortly.

Tekapo.—Tekapo power scheme design, not including the control dam, has been brought to completion except for some details which are now in hand.

Karapiro.—Efficiency tests for Karapiro were completed. This work included the design of the special equipment required.

Waitaki.—Examination and report of schemes for extension of Waitaki has also been made.

Various.—Design of details connected with Karapiro, Waikaremoana, Mangahao, Highbank, and Coleridge has also been undertaken during the year.

Lake-control Schemes

Pukaki.—The designs for Pukaki Lake control scheme were completed.

Tekapo.—A start was made on the design of a dam for Tekapo.

Substations

Major Substations.—The designs for three major substations required for the 220 kV. system at Bunnythorpe, Otahuhu, and Haywards were commenced during the year and for the first two of these are well advanced.

Minor Substations.—The designs for five smaller substations were completed together with those for many lesser works of extension and alteration connected with the Hydro-electric works.

Construction

Maraetai.—During the past year the 25-ft.-diameter diversion tunnel was completed and all preparations for the diversion of the Waikato River have been made. The work during the year on this tunnel involved the excavation to full size of a length of 800 ft., the placing of 1,100 ft. length of arched concrete lining, and the placing of the invert concrete for the whole length of 1,700 ft. Tunnelling-conditions remained difficult because of the inflow of water into the tunnel. This flow remained fairly constant throughout the year (7,000 g.p.m. at the outlet end and 1,500 g.p.m. at the inlet end).

The diversion tunnel gate shaft was concrete lined and the 40-ton diversion tunnel gate and frame installed.

The barrier at the inlet end of the tunnel has been blown up and dragged clear with the diversion tunnel gate in place and closed.

Further excavation has been done on the sloping leg of the spillway tunnel, and the arched portion of the tunnel cross-section has been concrete lined for a distance of about 100 ft.

Excavation for the main piers at the spillway intake has been completed.

Grouting has been continued on the left bank grout curtain. This work was held up for some time when the drilling rigs were shifted to enable "box grouting" to be done. This comprises the drilling and grouting to below present river-level of a box-shaped curtain enclosing the area to be dewatered for dam and power-house construction. The "box-grouting" is now 90 per cent. completed.

Holes have been drilled in the area of the right bank grout curtain to investigate the rock at depth.

Excavation for both the right and left abutments of the dam above river-level has been completed, and diversion of the river will permit the remaining excavation to be carried out.

The lift shaft and adits have been concreted, and the lift installed and tested.

The tracks for the two overhead 7½-ton cableways have been completed and the towers erected.

The steelwork of the concrete plant has been erected and the shell of the cement silo completed. The aggregate-conveyor is in course of construction. A mast and dragline for dragging the river-bed has been erected.

The aggregate-crushing plant located at Whakamaru has been 75 per cent. completed.

A total of 4,200,000 superficial feet of timber has now been sawn at the Mangakino Sawmill.

The average number of men employed for the year was 1,214.

The sealing of the Tokoroa–Maraetai Road has been completed.

Construction work has been carried out on the Mangakino–Whakamaru Road.

Piers of the Mangakino Bridge were completed and falsework and boxing for the deck has been erected.

Mangakino Village.—Work done during the year includes construction work on the administrative building, staff hostel, cinema, hospital, shops, and other miscellaneous buildings.

Karapiro.—With a few minor exceptions, the finishing-work on this station was completed during the year.

Work has included the provision of a floating boom, the grassing and fencing of slopes and other areas, and the tiling of the power-house floor, which is now in progress. Some modifications to the screen cleaner and to the siphons were also made as a result of experience in operation.

Roads on the left bank and the car-park were sealed, and the low-level road to the power-house prepared for sealing, and lighting standards completed.

Efficiency tests were carried out by the Design Office staff in November and the results have been analysed and reported.

The average number of men employed during the year was 50; at present only 30 are employed, mainly on the tiling-work.

Waikaremoana.—The first machine at Kaitawa was tested and operating by April, 1948, and the second by October, 1948.

Work during the year has included the completion of the second penstock and sufficient work at the intake to permit operating over a wide range of lake-levels.

The penstocks have been painted, areas grassed and trees and shrubs planted, and general finishing-work at the power-house carried out.

The work of sealing leaks in the lake was started during the year with the clearing of driftwood timber from the areas and crevices to be sealed by a diver. Materials have also been prepared and stock-piled ready for forming the sealing blanket.

Work remaining includes the completion of the intake to enable the full designed range of lake-levels to be utilized and the construction of the permanent spillway at the lake outlet.

Modifications to the jet dispersers at the power-house were found necessary following a series of tests, and arrangements for this are in hand.

Some temporary buildings and workshops remaining from the construction work at Kaitawa are now being removed.

No. 3 penstock at Tuai was painted internally during this year.

A total of 90 men are employed at the site for the work now remaining.

Cobb River Power Development.—Following the decision taken last year to build an earth dam at Cobb, work has proceeded on the revised scheme and good progress has been maintained.

The dewatering drive, to drain water from the dam-site has been completed and lined and a new 7 ft. by 6 ft. intake tunnel excavated in the hillside in the right bank. This tunnel, 1,500 ft. long, will connect a new intake upstream of the dam, in the bed of the future lake, with the existing intake tunnel, which is at present fed by a concrete pipe-line laid in the floor of the valley. This pipe-line must be removed before construction of the spillway and dam can proceed, and the new permanent tunnel will provide the by-pass, during construction, which will maintain a flow of water to the Cobb Power-house.

The new intake tunnel is to be equipped with control gates and screens located in a shaft upstream of the dam, and excavation of this shaft has been completed and the work of lining the tunnel has started.

The junction between the new and existing tunnels is being prepared, and special arrangements have been made to break through and make the connection with no more than a few hours' shutdown of the Cobb Power-house.

Excavation for the spillway to the dam has progressed as far as is possible without endangering the present pipe-line in the valley floor, and 23,000 cubic yards of material have been excavated in a cut at the downstream end of the spillway system.

In the meantime the assembly and erection of quarry and concreting plant is well forward and exploration of borrow areas has proved the material available for the dam.

Examination of the foundation conditions for the dam has been carried out in shafts and excavations over the dam-site.

The average number of men employed during the year was 160.

Lake Tekapo Development.—The 20-ft.-diameter tunnel over a mile long was holed through on 8th October, 1948, and by March, 1949, the last ring of lining-blocks was in position and the removal of the second shield well advanced. Grouting behind the tunnel blocks is now proceeding and is about 25 per cent. complete. A contract for the steel tunnel lining and for the penstock has been let and the contractor has started at the site.

Excavation of the surge chamber was 75 per cent. complete and excavation for the conduit drains and gate shaft at the surge chamber was completed and the penstock formation prepared for the contractor.

The construction of the power-house by direct labour has now reached turbine-floor level and over 5,000 cubic yards of concrete have been placed.

Excavation at the site of the switchyard and office block was complete and preliminary concrete placed.

The tailrace has been excavated and about half the concrete lining placed.

Work remaining on this scheme includes completion of the works above described, together with the construction of the intake at the lake, which will be started very shortly.

Construction of the dam at the lake outlet has not yet been started, but some preparatory work has been done for site investigation. This dam will be required for lake-control purposes, and is not necessary for initial production of power. It will be built in the dry after the lake is lowered.

Two hundred and forty men are employed at the site.

Lake Pukaki Control.—Excavation on the dam-site for this work encountered difficulties due to the presence of pug in layers and pockets over the area. These troubles have been for the most part overcome and 90 per cent. of the foundation preparation has been completed. This enabled the placing of the core and shoulders of the dam to start, and 20 per cent. of this work was completed.

The main excavation for the spillway has been completed and a contract let for the construction of this work in December, 1948.

Machinery for the operation of the sluice gates and spillway gates is on order.

The efficacy of the coffer-dams was tested in a severe flood which occurred in February, when the lake level rose 6 ft. in three days. The recently completed sluices were operating full open during this period.

The average number of men employed at the site was 329.

Highbank Power-station.—A special screen-cleaning gear of a new type has been installed at the intake at Highbank to overcome choking of the screens due to debris brought down by the headrace.

Some protection work was also done in the tailrace to reduce erosion.

Construction of Substations

Otahuhu.—The piled foundations for the condenser building were completed. This involved the casting and driving of 227 reinforced-concrete piles 18 in. square and 70 ft. to 75 ft. long. The building area is now being excavated and prepared in readiness for the commencement of construction on the building superstructure.

A further 59 precast piles, 18 in. square and 70 ft. long, were cast and will be driven for the piled foundations to the transformer pads in the outdoor station area.

Further test boring and load testing was done to provide data for designing the foundation structures in the outdoor station area.

Fifteen permanent houses are being built to house the substation staff. Eight of these are nearing completion. The storm-water drainage and sewerage systems for the village were completed.

Approach roads have been widened and strengthened and internal roading has been formed and is being metalled.

Bunnythorpe.—A contract was let for the construction of the main condenser and control buildings, and the contractor is making fair progress.

Good progress was made on the construction of the many outdoor structure concrete foundations which are being built by the Department's own forces. Work has, however, been retarded by the shortage of cement.

The storm-water and oil drainage system for the 7-acre outdoor station area has been completed. The sewerage system and treatment plant was completed and is now dealing with wastes from the permanent houses and the construction camps.

Haywards.—A contract was let for the first section of the excavation work. This comprises the excavation of 135,000 cubic yards of material and its transportation to fill adjacent deep gullies. This contract is now nearing completion.

The preliminary clearing, draining, and fencing work was done by the Department's forces.

Smaller Works.—During the year an extension to the switchroom was completed at Half-way Bush, and similar extensions are in progress at Oamaru and Ashburton. Contracts have been prepared for a new workshop and switch and control room at Invercargill and for switch and control rooms at Fernhill and Longburn.

IRRIGATION

Central Otago.—During the past year rainfall conditions varied considerably throughout Central Otago. In the Tarras area, where extremely dry conditions obtained during the previous summer, the rainfall increased from 13·58 in. for the calendar year 1947, to 18·06 in. in 1948, with additional good rains in the past three months. Ample water-supplies were thus available in that area, and, in fact, to all schemes west of the Manuherikia River and Alexandra.

On the Omakau scheme, where water is sold on demand, the sales were short of the peak demands of the two previous seasons, being 12,935 acre feet, as against 14,080 acre feet for 1947–48, and 14,720 acre feet for 1946–47.

Between Alexandra and the Maniototo Plain rainfalls were much below average. In Alexandra itself the precipitation was 11·91 in., 10·23 in., and 10·96 in. for the three years ended 31st December, 1948, an average of 11·03 in., as against the previous twenty-nine-year average of 13·79 in.

At the Manorburn Dam, conditions were relatively worse, the respective rainfall figures being 15·32 in., 14·52 in., and 13·23 in. (an average of 14·35 in.), as against the previous twenty-five-year average of 19·54 in. Very little snow fell during these three years, and both the Poolburn and Manorburn catchments, which supply the bulk of the water for the Ida Valley and Galloway schemes, were in a particularly dry state.

The meagre run-off, coupled with the low state of both dams at the beginning of the season, resulted in the exhaustion of irrigation supplies by the beginning of February. At this stage approximately 50 per cent. of the normal season's quota had been supplied to the Ida Valley settlers, while those on the higher levels of the Galloway Scheme had also to suffer some restriction.

Fortunately, very beneficial rains were experienced in the months of February and March, and areas on both schemes which had been showing evidence of the water shortage made an excellent recovery. Since the beginning of January, 8·93 in. of rain have been recorded in Alexandra and heavier falls elsewhere.

The financial statement for the Central Otago schemes shows revenue as £24,235 and working-expenses as £40,699, a loss of £16,455, the corresponding figures last year being £29,656, £34,261, and £4,605.

The fall in revenue for the past year is due mainly to the reduction in charges on Ida Valley and Galloway due to shortage of water.

The increase in working-expenses is due in part to rising costs, and in part to major pipe-line replacements and to expenditure on deferred maintenance.

The area irrigated on all schemes is 53,711 acres, distributed among 526 irrigators, a slight increase on last year, when the corresponding figures were 53,000 acres and 510 irrigators.

In addition to ordinary maintenance work, the opportunity was taken to gunite the upstream face of the Manorburn Dam in order to reduce seepage through it, the area covered being approximately 2,500 square yards.

Similar repairs are being carried out on the Bonanza Race, where race losses in recent years have been substantial. This race runs at a high altitude where the effects of winter frosts are severe.

Investigations for the relocation of this race, and the augmenting of supplies to Ida Valley and Galloway, are now in hand.

The only construction work, as distinct from major maintenance improvements, was the installation of a pumping plant and water-race to supply some 400 acres on Galloway Flat.

The recent rains in the Queenstown area caused a very heavy flood in the Arrow River, with considerable damage to the 3¼-mile-long main supply line out of the Arrow Gorge. Repair work is now in hand.

Canterbury.—Rainfall during the year was below normal. As a result the demand increased on all schemes and revenue shows an increase over the previous two years.

Levels Plain scheme—commanding 12,000 acres—has, in its twelfth season, earned £750 in revenue.

Redcliff scheme—commanding 4,600 acres—has been in operation thirteen years and revenue for the year was £198.

Ashburton-Lyndhurst scheme—commanding 34,000 acres—is in its fifth season. During the year 1,683 acres were prepared for border-dyke irrigation, bringing the total to 5,912 acres. Revenue for the year was £2,146.

Mayfield-Hinds Scheme.—The main scheme is only partially constructed and provides for the ultimate development of 44,000 acres of irrigable land.

Construction work is now concentrated on the completion of a reduced area of 12,000 acres under irrigation and with a temporary supply of water from the Rangitata Diversion Race.

Operation of part of this reduced area commenced this season and 338 acres were prepared for border-dyke irrigation. Water sales revenue was £163.

Rangitata Diversion Race.—During the period 20th November to 6th December, 1948, the Montalto and Methven sections of the race were dewatered while Highbank Hydro-electric Power-station was closed down for repairs. As many race structures as possible were inspected and no serious wear or defects were observed. The Springburn section could not be inspected as it was necessary to maintain a supply of water for irrigation on the Ashburton-Lyndhurst scheme during this period, this being done from the subsidiary intake from the South Ashburton River.

Apart from this main shut-down, a maximum supply of 1,000 cusecs has been carried in the race during the whole year, and with the exception of a varying irrigation demand ranging from 60 cusecs to 275 cusecs over the period 5th October to 31st March this water has been used by Highbank Power-station.

WATER-SUPPLY

Downlands Water-supply Scheme.—Normal maintenance has been carried out, and some remedial work, consisting of underpinning the main with concrete columns, was done near the intake.

At the Levels Farm Settlement an area has been reticulated for the Lands Department.

Wellington Water-supply. While good progress is being made with the driving and lining of tunnels, failure to obtain adequate and regular supplies of steel for the pipe-line is having a serious effect not only on the progress but also on the economics of the scheme.

Tenders were called early in the year for the fabrication of the whole 33 miles of the pipe-line and the laying of 10 miles of its length, but no satisfactory tender was received, due undoubtedly to the uncertain steel situation.

Out of a total requirement of 10,000 tons of steel only 340 tons are held in stock, and the prospects of obtaining adequate supplies in the near future are poor. Arrangements have been made to have this small quantity made up into pipe. Contracts have been let, but work has not yet started. It will make up into 1 mile of pipe, which it is proposed to lay through Upper Hutt.

The delays so far have resulted in postponing the estimated finishing date for the whole scheme from 1952 to 1956 at the earliest, and as the existing water-supplies cannot cope with the increasing demand until the latter date, temporary supplies will have to be resorted to in three instances, as follows :—

At Upper Hutt, to meet the domestic needs of the southern portion of the borough and the fire protection requirements of military and other interests in Trentham Camp, a permanent reservoir is to be constructed at Trentham, and until water from the main scheme reaches Upper Hutt it will be supplied from an existing well in Trentham Camp.

Similarly, a permanent reservoir is to be built at Porirua, supplied temporarily from local sources, to meet the needs of State housing development at Titahi Bay and Porirua.

To meet the needs of Wellington City, additional pumps are to be installed by the city at Gear Island to deliver water into the Orongorongo main.

Steady progress on tunnelling culminated in March in the piercing of the two headworks tunnels, 2,226 ft. and 9,102 ft. long respectively, and arrangements are now in hand to line them with concrete. In addition, three shorter tunnels aggregating 3,545 ft. have been driven and lined with concrete, while 925 ft. of the remaining 1,400 ft. tunnel has been driven.

At the headworks a commencement has been made on construction of the weir. Over 1,000 cubic yards of rock have been excavated and an overhead ropeway and concreting plant is being installed.

Investigations.—Numerous investigations have been carried out into small community and rural schemes. A water-supply for 30,000 acres of farm settlements at Reporoa was investigated and reported upon with designs and estimates for the Lands Department. A similar scheme for 25,000 acres at Ruawai was investigated in collaboration with a consulting engineer.

COAL-PRODUCTION

Work on opencast mines has continued at Waitewhenua, Glen Massey, Ohai, and Wangaloa. New workings have been opened up at Hillcrest and Rotowaro, and stripping has been carried out for the Mines Department at Mossbank. Details are as follows :—

At Waitawhenua, stripping and coal-production has continued. During the year 158,050 cubic yards of overburden were removed and 42,915 tons of coal extracted. The quantities to date are 657,215 cubic yards of overburden and 151,054 tons of coal.

At Glen Massey output has improved, 255,810 cubic yards of overburden being removed for a production of 62,733 tons of coal, as against 595,250 cubic yards of overburden for 58,715 tons of coal last year.

At Wangaloa, 114,712 cubic yards of overburden were removed, and coal-production amounted to 45,362 tons.

Work on forming access roads and stripping overburden commenced at Hillcrest in November, and to date 179,000 cubic yards have been stripped, exposing a good area of coal. Coal-production will be commenced early next year.

Late in the year plant commenced stripping at Rotowaro, and 21,800 cubic yards of overburden were removed, exposing about 6,000 tons of coal.

At McLeans Opencast Coal-mine at Ohai, departmental machines constructed a stop-bank with topsoil removed from the area and excavated 81,900 cubic yards of overburden and delivered 8,728 tons of coal to the screens.

At Mossbank Mine the machines hired to the Mines Department removed 14,580 cubic yards of overburden and shifted 2,450 cubic yards of overburden at three small private mines.

LIGHTHOUSES AND HARBOUR-WORKS

Lighthouses.—Maintenance of lighthouses and plant has been carried out as usual. Renovations to buildings and quarters has been undertaken where necessary.

Construction of a new distribution line for connecting Baring Head Lighthouse with the public supply system has been commenced, and should be completed by the end of 1949.

Electrification and connection to public supply system is now completed for Nugget Point, Waipapa, and Moeraki Lighthouses.

Work is well advanced for the electrification of North Cape, Channel Island, and Chickens Island Lighthouses.

Installation of four new electric beacons at Lake Taupo is now nearly completed.

Installation of two new electric beacons at Whangaroa Heads and Tauranga is nearly completed.

Preliminary work has been commenced for installation of new electric beacons at Slipper Island, Cape Kidnappers, Ohau Point, Cape Farewell, and Bushey Point, also for electrification and radio-beacon installation at Tiri Tiri, East Cape, Portland Island, Godley Head, Taiaroa Head, and Dog Island.

Three new electric beacons at Motuara Island, Gibson Point, and Slope Point will be completed when equipment is received from overseas.

Concrete reservoirs with connection to the water-supply were completed at Centre Island Lighthouse and repairs were carried out at Waipapa and Dog Island Lighthouses.

At Cape Egmont a small electrically driven pump was installed to supply water to the house of the principal keeper.

Harbour-works.—By arrangement with the Wanganui Harbour Board the Department has been carrying out remedial work to ensure the safety of the South Spit, and the work so far has been successful. A length of 1,165 ft. of the heavy block wall on the river side of the spit has been capped with concrete 4 ft. wide and averaging 5 ft. in height. The rock wall between No. 1 red light and the crane wharf has been built up with rock taken from the Imlay training-wall. To protect the seaward side of the Spit a total of 1,980 piles has been driven, mostly in the vicinity of the weak section opposite the hulk "Mana." Sand has built up well behind the piles, but the work is not regarded as permanent protection.

Repairs to wharves at Tairua and Onekaka were carried out and authority has been obtained for improvements at Coromandel.

Investigations have been made into the extension of the tidal compartments at Westport and into the development of Tauranga Harbour for shipping exotic timber.

AERODROMES

Maintenance

Full maintenance has been undertaken for all aviation establishments, both Air Force and Civil, and has included maintenance work on airfields, buildings, engineering services, roads, grounds, aeradio services, and general aerodrome facilities, involving —

(*a*) *For R.N.Z.A.F.*—Seven Air Force stations in New Zealand, 1 Air Force station in Fiji, and 4 stores depots.

(*b*) *Civil Aerodromes.*—Two international airports, including Nandi in Fiji, 1 international marine airport, 5 regional airports in the Pacific islands, 23 aerodromes serving scheduled commercial air services, 40 other aerodromes or airfields, and 5 emergency seaplane-alighting areas.

(*c*) *Other Aviation Establishments.*—Meteorological stations at Raoul and Campbell Islands and various detached aeradio stations in New Zealand.

Capital Works, R.N.Z.A.F. Stations

Construction items of importance include :—

Lauthala Bay, Fiji.—The erection of 12 housing units has been commenced.

Whenuapai.—The transfer and re-erection of a hangar 220 ft. by 135 ft. ex-Rukuhia has been completed.

Te Rapa Stores Depot. The erection of a barrack block for officers, N.C.O.s, and airmen has been in hand.

Ohakea.—The conversion of barrack blocks into 16 housing units has been completed.

Mangaroa Stores Depot.—Two housing units have been erected from converted buildings.

Shelly Bay Camp.—The conversion of a building into W.A.A.F. accommodation has been completed.

Weedons Stores Depot.—Alterations to stores accommodation has been undertaken.

Taieri.—Eight housing units have been provided from surplus barrack blocks.

Major Airfield Construction, Civil Aerodromes

Gisborne.—The regrading and regrassing of the airfield surface damaged by the deposition of silt in the major Gisborne area floods of May, 1948, was completed and a 250 ft. extension added to the paved runway to give the primary runway an over-all length of 5,000 ft. Building-work undertaken included relocation and alterations to the aeradio receiving-station, the provision of standby electrical equipment and housing, and commencement of the conversion of 2 hutments into housing units.

Napier.—This aerodrome has been extended on the strips principle to I.C.A.O. Class E standards with a grassed surface on good gravel subgrade. An A.T.C. control tower is in course of erection.

New Plymouth.—An extension in turf on the strips principle has been completed to give a main strip of over 5,000 ft. in length.

Paraparaumu.—A 400 ft. extension of the main paved runway was completed to give 5,000 ft. over-all length.

Nelson.—A 800 ft. extension, 500 ft. wide, with a central 150-ft.-wide stabilized metal runway, has been completed to give 5,000 ft. over-all length in one landing direction. A concrete apron 160 ft. by 100 ft. has been placed in front of the terminal building, which has been renovated throughout.

Westport.—An extension in grass on sand subgrade of dimensions approximately 1,100 ft. by 500 ft. was completed to give the principal landing-strip an over-all length of 5,000 ft. A new control tower is nearing completion and improvements to the passenger terminal building undertaken by National Airways Corporation.

Hokitika.—The construction of a new aerodrome with two gravel stabilized runways has been continued on the Seaview site and is nearing completion of the first stage of development to Class F standards. This aerodrome should be open to traffic in the 1949–50 period.

Waitaki (Oamaru).—This aerodrome, of vital importance to commercial air services as an alternate field, has had its three landing-strips extended in grass on a good gravel subgrade to full Class E standards.

Taieri (Dunedin).—An extension in grass approximately 500 ft. by 500 ft. was added to this field to give an over-all length of 5,000 ft. in the main landing directions. The erection of a new control tower was completed.

Mechanic's Bay Flying-boat Base

A new slipway for flying-boats has been commenced.

Surveys and Investigations

At Auckland, engineering and soil surveys have been made at two alternative sites for a major combined international and local civil airport, and at Rotorua into a site for a new commercial airport. At Palmerston North, Christchurch, and Invercargill similar investigations have been made into improvements and extensions required for the internal air services.

Aeradio and Air-traffic-control Development

Although no major new aeradio stations have been established during the year, a great deal of work has been undertaken in remodelling accommodation and facilities at existing stations. In addition, standby electrical generating-sets have been provided throughout to cope with the emergencies of power failures or cuts. Preliminary arrangements were in hand at the close of the period for new aeradio homer-beacon stations at Ohura, Pahiatua, and Waitaki.

Alterations and improvements have been effected to the area air-traffic-control centres at Auckland (Mechanics Bay) and Christchurch (Harewood), and a new combined air-traffic-control and communications centre has been established at Wellington.

Staff Accommodation (Civil Aerodromes)

Except for the provision of flats in converted R.N.Z.A.F. buildings, little has been achieved in providing living-accommodation at the aerodromes for airport staff.

A total of 29 married quarters, consisting of flats or separate housing units, have been built, as follows: Kaikohe (1), New Plymouth (10), Nelson (2), Harewood (8), and Taieri (8). Further similar quarters are under construction at Kaitaia (1), Gisborne (2), and Harewood (4), while 8 temporary single men's quarters have been built at Kaitaia.

Fiji and Pacific Islands

At the regional airports of Nausori (Fiji), Fua-a-motu (Tonga), Faleolo (Samoa), and Aitutaki and Rarotonga (Cook Islands), work has been confined to maintenance, except for minor improvements in converting wartime facilities to civil purposes. At Rarotonga, work is nearing completion on the erection of a new aeradio receiving-station and 4 houses for airport and radio station staff.

At Nandi International Civil Airport (Fiji) work has continued in converting wartime service buildings and facilities to civil purposes. The principal work involved covers the completion to date of 37 married housing units for airport staff, a new meterological radar wind station, reorganization and renovations to technical accommodation, and hostel accommodation for passengers. The reconstruction of runway, taxiway, and apron pavements, which had failed to stand up to the heavy loadings of commercial overseas aircraft traffic, was commencing at the close of the period.

With the decision of the contributing Governments to adopt the recommendations of the South Pacific Air Transport Council and proceed with the development of a new international civil airport at Suva Point, Fiji, steps are in hand to commence the necessary engineering survey and investigations at that site.

Other Work for Island Territories Department in the Pacific Islands

At Rarotonga (Cook Islands) the construction of a central Diesel-power electric generating-station is well forward together with overhead pole reticulation lines and consumer household wiring.

At Niue Island a shaft 180 ft. deep through coral has been sunk to provide well water to augment the island water-supply.

The erection of 3 residences for Island Territories Department officials has been commenced and improvement works have been undertaken on a number of minor buildings and island facilities.

LAND IMPROVEMENTS

Kaipara Harbour Reclamation.—On the Glorit Block work has consisted of cleaning out and renovating all main and lateral drains and of repairing and reconstructing fences. Drains and fences had deteriorated very considerably in recent years.

It has been found necessary to raise and widen the stopbank throughout its entire length of 300 chains, and this work has been commenced. Major repairs to both Nos. 1 and 2 water-supply bores are in hand.

On the Kukutango and Oyster Point Blocks major repairs were necessary to make good damage caused by high tide and storm in June, 1947, and again in September, 1948. The crest of the stopbanks on both blocks was damaged by sea-water action in many places and repairs are proceeding with the few men available for the work.

Land-clearing.—In Southland the output of land-clearing was reduced by the diversion of plant to coal-stripping at Ohai. In spite of this, 1,827 acres of stumps and second growth were cleared for farmers or the Lands Department, 3 miles 51 chains of farm access roads were constructed, 12 miles 62 chains of drainage channels were excavated to dry out swamps, and 40 chains of stopbanks were erected to protect farm lands from flooding.

At Ohakune 650 acres have been stumped and 195 acres have been rooted. Some short lengths of access roads and tramways have been constructed.

Sand-dune Reclamation.—In the Hokio-Manawatu area the weather has been very good for the raising of seedlings and planting out of trees, but heavy winds and dry weather in the spring interfered seriously with the establishment of marram plants and lupin seed.

In the nursery 94,000 seedlings were lined out and 200,000 seedlings raised. Five new single men's huts were erected and a new fire-watching tower built near the nursery.

In the field 99,000 trees were planted out and are doing well and 17,500 bundles of marram were planted with 400 lb. of broadcasted lupin seed, but much of this was blown out in the November gales and will have to be replanted. Constant lookout was maintained from the fire-towers, and during the dry period 20 fires on the beach were extinguished by the patrol men.

At North Waikato Heads, in addition to maintenance of existing plantations, clearing of tree lines, fire-breaks, &c., an area of 238 acres was planted in marram grass and a total area of 258 acres was planted in trees. New internal roads formed amounted to 395 chains and 131 chains of new roads were clayed.

At Woodhill, steady progress was made throughout the year despite scarcity of suitable labour for tree-planting. The main activities, other than planting and general maintenance, consisted of improving the existing access road and new road-formation.

Two walkie-talkie and three ZCI radios have been successfully installed. Fire-fighting equipment has been installed. A total of 105 acres was planted in marram, and approximately 150,000 trees were planted. Eighty chains of roading were formed. Approximately 3000 yards of metal were quarried and laid. Two 18 ft. by 8 ft. huts and three 10 ft. by 8 ft. huts were erected.

Approximately 140,000 trees were lined out and 198 lb. of lupin seed and 47 lb. of pine seed were sown.

Land-drainage.—During the year arrangements were completed to take over from the Lands and Survey Department the operation and maintenance of land-drainage schemes hitherto the responsibility of that Department. This arrangement will take effect as from 1st April, 1949.

HOUSING SERVICES CONSTRUCTION

Mount Roskill (College Trust Block).—Construction of roading and services of this block has been in progress throughout the year. Road-formation and drainage were done by contract and have been completed. The balance of work is being carried out by the Department with its own forces and is now nearing completion.

Mount Albert (Logan Block).—Work on the concrete paths and footpaths in this block was completed during the year after the building operations had ceased.

Remuera (Meadowbank Block).—The sealing of pedestrian accessways was completed during April, 1948.

Hutt Valley.—Very good progress was made during the year with roading and section development in this area. The end of works activities in roading and section development in this area is in sight and another season should complete all work.

A total of 3½ miles of roads have been formed, metalled, kerbed, and channelled, opening up 95 acres of section development.

Eight miles of road formed last season were primed and sealed.

Four miles of 4 in. and 2 miles of 1½ in. water-mains and 70 chains of storm-water pipe were laid.

A start was made on the Taita industrial area and 67 acres were levelled and 40 chains of road were formed and base-course metalled.

The stopbank at Taita was strengthened throughout its length and was extended to a total length of 1 mile 50 chains.

Porirua Basin.—The laying of the culvert under the main access road to the Titahi Bay North Block was completed and 55 chains of road were formed and base-course metalled.

Work was started late in the year on Mungavin's Block, at Porirua, and 60 chains of formation were completed and a further 40 chains opened up. Base-course metalling has been commenced.

Nelson.—In the Bennitt Block 19 chains of road were formed and metalled and 38 chains of kerb and channel completed. A total of 2,054 ft. of storm-water drains and 2,397 ft. of sewer pipes were laid.

In the Warren Block 17,000 cubic yards of filling were placed and ten sections prepared for building.

In the McGillivray Block 350 ft. of additional storm-water drains have been laid and connected to Nelson City system.

CONSTRUCTION AND IMPROVEMENT OF ROADS

No comprehensive roading schemes have been initiated during the period under review, and efforts have been concentrated on providing urgently required access roads to soldiers' settlement blocks and back-country properties. Deferred maintenance is now being carried out by local authorities, and, while this is most satisfactory, it has had

some effect on the amount of capital works undertaken. Replacements of and additions to plant, together with somewhat improved labour conditions, have enabled greater progress to be maintained.

On the construction side 156 miles of new formation have been constructed and 274 miles of new metalling or reconstruction and metalling have been completed. New bridges and bridge replacements totalling 1,066 ft. in length were erected.

Limited progress in connection with the completion of the Haast to Haast Pass Road has been maintained, but a return to full-scale operations will not be possible in this area until the necessary machinery and labour, at present required for more urgent works, can be released.

In spite of shipping and plant difficulties, good progress was made with Chatham Islands roading, and with the exception of the sea wall and the metalling of short sections of recently constructed road the 30 miles of roading is completed. A start was made in the latter part of the year to return personnel and equipment to New Zealand.

On the Mangapeehi to Maraeroa Road a further 2 miles 45 chains of formation and 2 miles 60 chains of metalling were carried out, and work on this road, which will eventually form a valuable east to west link through the centre of the North Island, is continuing.

The table which follows sets out the extent of formation metalling and bridging undertaken :—

Summary of District Reports

	County Roads.			Rehabilitation.			Maori Lands.		
	Formation.	Metalling.	Bridges.	Formation.	Metalling.	Bridges.	Formation.	Metalling.	Bridges.
	M. ch.	M. ch.	Ft.	M. ch.	M. ch.	Ft.	M. ch.	M. ch.	Ft.
Auckland—									
Whangarei ..	..	40·22	80	3·26	0·92	..	8·12	10·74	..
Auckland ..	5·25	7·76	36	..	1·00	..	..	..	..
Hamilton—									
Hamilton ..	34·78	43·12	..	15·37	14·42	140	..	..	..
Tauranga ..	0·27	4·12	134	1·41	0·41	..	..	..	..
Rotorua	0·61	3·50	..	4·68	4·68	45	..	..	..
Napier—									
Napier	..	0·40	178	5·33	3·57	..	0·70	5·32	..
Gisborne	5·32	17·38	..	6·00	5·00	..	0·60	0·98	..
Wanganui—									
Wanganui ..	..	3·58	..	2·12	2·72	30	..	..	..
Stratford	1·66	3·51	18	0·29	0·29	..	..	..	..
Taumarunui ..	..	2·60	..	0·62	1·06	..	8·46	4·16	..
Palmerston North ..	1·73	3·31	..	0·20	0·42	..	..	..	..
Wellington—									
Wellington ..	3·70	3·70	..	2·26	2·26	95	..	..	..
Nelson	2·22	6·78	..	..	..	..	..	..	..
Christchurch—									
Christchurch }	3·51	31·57	70	4·60	4·60	..	..	..	..
Kaikoura .. }									
Greymouth ..	4·35	..	174	..	..	..	..	..	..
Westport	0·58	1·14	50	..	..	..	..	..	..
Chatham Islands ..	12·66	18·16	..	..	..	..	..	..	..
Dunedin—									
Dunedin	0·30	5·60	..	..	0·50	..	..	..	..
Invercargill ..	5·20	2·32	16	3·74	2·02	..	..	..	..
Alexandra ..	1·02	4·41	..	..	..	..	..	..	..
Waikouaiti ..	0·15	0·60	..	1·26	1·26	..	..	..	..
	85·11	205·78	756	52·34	46·53	310	18·28	21·60	..

	Formation.	Metalling.	Bridges.
	M. ch.	M. ch.	Ft.
County roads	85·11	205·78	756
Rehabilitation	52·34	46·53	310
Maori lands	18·28	21·60	..
	155·73	274·31	1,066

DEFENCE WORKS

The usual maintenance and repairs have been carried out at camps and establishments belonging to the Armed Services and some success has been achieved in overtaking deferred maintenance.

Some investigations and surveys such as for additional housing at Waiouru Military Camp have been made, but very little construction work has been carried out.

At Devonport Naval Base alterations have been made to the bulk fuel installation to enable the British Petroleum Co. to store commercial fuel and Diesel oil. This entailed a 6 in. main the full length of the Calliope Jetty.

Valve assemblies for Admiralty furnace fuel have been placed underground and a new 12 in. black-oil main has been laid to connect with bunkering-points on the jetty. Tanker-discharge points have been provided on the Calliope Jetty for both black oil and Diesel oil.

The installation of modern fire protection equipment throughout the Base is proceeding, but the work has been retarded by difficulty in obtaining materials and equipment. The installation of sprinklers in the north yard is about 75 per cent. complete, and wiring is being installed in the south yard for the automatic-alarm system.

A salt-water tank has been erected in the north yard, but the pump has not yet been delivered. At H.M.N.Z.S. "Tamaki" new 6 in. salt-water mains have been laid throughout and a 50,000-gallon salt-water reservoir is almost completed.

At bulk fuel installations throughout the country the demolishing of splinter-proof protection erected around bulk fuel tanks as a defence measure during the war is approaching completion. Demolition at the 138 tanks concerned is completed and painting on the final 6 tanks is well in hand. This work is being undertaken by the oil companies under departmental supervision and with funds provided by the Government.

PLANT AND MECHANICAL EQUIPMENT

During the year the activities of the Mechanical Engineers' Branch have been well maintained despite staff and workshop personnel shortages. The mechanical plant has been considerably increased during the year, and additional new units are continually coming to hand in furtherance of the replacement programme.

During the year the whole of the Department's construction plant was employed, principally on hydro-electric construction works, highways, roads and bridges maintenance and construction, and opencast coal-mining. Work was also undertaken for State housing settlements, land-clearing and water-supply schemes.

The maintenance of aerodromes and buildings both in New Zealand and overseas was also carried on.

Replacement of worn-out plant has been made in the case of some power graders, diesel compressors, diesel excavators, and crawler tractors, whilst new bitumen road plant has been secured for highways work, as well as cableways, diesel dump wagons, and batching plants for hydro-electric projects.

A very large number of machines of all types has been reconditioned in the Department's workshops and put into service again this year. There are approximately 9,500 items of plant to be maintained, and in view of the widespread shortages of spare parts this has proved a difficult task.

The Mechanical Design Office has been fully occupied in designing equipment such as tunnelling plant, gravel washing, screening, and crushing plants, material-handling equipment, including haulage and hoisting plant and general equipment for hydro-electric construction works. Design has also been carried out for other Departments.

The purchase of plant and equipment for other Departments has been arranged and technical assistance and advice has also been supplied to other Departments and local bodies. Officers of the Department have visited island territories and dependencies to advise on and erect generating plants and general mechanical equipment during the year.

DESIGN OFFICE

Design and preparation of plans for a number of bridges for the Main Highways Board were undertaken during the year in the Chief Designing Engineer's Office. The bridge over the Wanganui River at Manunui having failed, plans of a new reinforced-concrete structure 392 ft. long have been prepared. Construction of this structure will be proceeded with as soon as possible in order to release the Bailey bridge now in use at the old bridge site.

Other bridges for which plans were completed include the Ohura Bridge of 220 ft. length on the Te Kuiti – New Plymouth State Highway, and the Ararawa Bridge of 182 ft. length on the National Park – Wanganui State Highway.

Bridge designs in hand include a bridge over the Whirinaki River at Te Whaiti for the State Forest Service, and a suspension bridge of 250 ft. span over the Ruakituri River on the Erepiti Road in Wairoa County.

Preliminary designs have been made for the Petone Overbridge and for the bridge over the Piako River at Pipiroa.

A series of standard plans of three-span continuous bridges is nearing completion. Several new standard specifications have been prepared.

Numerous bridge proposals have been received from District Offices, County Councils, and consulting engineers for examination and approval. Many proposals for water-supply, sewerage, storm-water drainage, and bridge and street works have been examined and approved for the Local Government Loans Board.

Designs and plans of bridges have been prepared for the Island Territories Department for works in Samoa.

Design and plans for steel forms for the tunnel at the Cobb hydro-electric scheme have been prepared and preliminary work has been done on design of steel forms for the Rimutaka Railway tunnel.

Other work includes designs and plans for several small sewage-treatment plants for Government institutions, &c., and plans of a number of units for use in such plants in future.

Designs of two water-supply pumping-stations for mental hospitals have also been done.

Designs for various features of the Wellington water-supply scheme—intake weir, &c.—were checked.

Further work was done for the Soil Conservation and Rivers Control Council in the preparation of specifications, &c., for the manufacture of steelwork, &c., for current meter-gauging stations and runoff-measuring equipment for experimental stations.

The Sydney radio-telephone array at Tinakori has been completely redesigned structurally for the Post and Telegraph Department, and a preliminary structural design of the arrays at Himitangi Radio Station has been prepared.

F. LANGBEIN, M.I.C.E.,
Engineer-in-Chief.

APPENDIX D

TWENTY-FIFTH ANNUAL REPORT OF THE MAIN HIGHWAYS BOARD

The Hon. MINISTER OF WORKS, Wellington.

SIR,—

In accordance with the requirements of section 24 of the Main Highways Act, 1922, the Main Highways Board has the honour to submit its twenty-fifth annual report for presentation to Parliament. The report covers the period 1st April, 1948, to 31st March, 1949.

GENERAL

The present length of main highways maintained or subsidized by the Board is 12,708 miles, and particulars of expenditure for the year ended 31st March, 1949, as well as a detailed statement of the position of various works, are shown later in this report.

Of the total length of main highways, 5,234 miles have been classified as State highways, and it should be noted that this figure is 1,256 miles in excess of that shown in last year's report, meaning, of course, that the State has accepted the full responsibility for future maintenance and construction costs of this additional length within standards approved by the Board.

The total expenditure under vote "Highways Maintenance," which includes bridge renewals, and fixed charges amounted to £3,538,689. Under the vote "Highways construction" the total expenditure was £2,070,288, giving a grand total expenditure of £5,608,977, as compared with a total expenditure of £4,568,918 for the year immediately preceding.

The registration of motor-vehicles showed an increase of 25,809 over the previous year's figures, and the latest figures include 2,984 more heavy trucks—*i.e.*, over 2 tons laden.

The length of new sealing completed was 206 miles, together with 116 miles of priming coats, making a total of 322 miles. Of this total, 21 miles were carried out on deviations and reconstructed sections of the older sealed highways, and 37 miles constituted sealing on previous priming. In consequence, the net increase in dustless surfacing is 263 miles. This makes a Dominion total of 4,186 miles, or 33 per cent. of the highway system. In addition to the above, a length of 314 miles of existing sealed surfaces received a maintenance coat.

The length of new bridging completed was 3,107 lineal feet, compared with 2,664 lineal feet for the previous year.

PERSONNEL

In consequence of the resignation of Mr. William Morrison, who had been a member for nearly eighteen years, Mr. W. G. Belton, President of the New Zealand Counties Association, was, on the recommendation of that Association, appointed to be a member of the Board on the 2nd August, 1948.

LEGISLATION

New legislation affecting the Board and passed since last report is contained in the Public Works Amendment Act, 1948.

Section 22 authorizes the authority having control of any motor-way, highway, road, street, or way over which the public pass or to which the public has access, to construct, erect, dig, or grow thereon, or remove therefrom, such barriers, dividing strips, guiding or sign posts, pillars, or other markers, trees, hedges, lawns, gardens, and other devices as may in the opinion of the authority be necessary or desirable for separating, guiding, or warning traffic, intercepting glare, or for any other purpose.

Section 23 authorizes any local authority through whose district a highway, or part thereof, may pass to construct and maintain on the highway within its district cycle-tracks, footpaths, kerbs, water-tables, and other facilities for pedestrian and cycle traffic, and to pay for same out of moneys available for road and street construction in its district.

Section 33 provides for the charges of removal and re-erection of power poles where they are likely to endanger traffic to be met equally by the authority controlling the road or highway and the utility authority having control over the poles.

Section 44 repeals section 3 of the Public Works Amendment Act, 1947, and the following is substituted therefor :—

3. (1) At the request of the Main Highways Board the Governor-General may from time to time by Order in Council published in the *Gazette*—

(*a*) Authorize the construction of a motor-way, and state as nearly as possible the line of the motor-way, and the two termini thereof:

(*b*) Declare any land or any public highway, whether then actually constructed as a motor-way or not, to be a motor-way.

(2) Every Order in Council under this section may in like manner be from time to time amended or revoked.

Heavy Motor-vehicle Regulations 1940, Amendment No. 6

Regulation 5A provides that no person shall operate any heavy motor-vehicle outside a borough where there is a population of 6,000 or upwards if the air pressure in any tire fitted to the vehicle exceeds 75 lb. per square inch.

Regulation 7A provides a convenient and speedy method for restricting loads and speeds on bridges where such restrictions are deemed necessary.

PROGRESS REPORT

A general description of the more important highway activities carried out in each district is as follows :—

Whangarei District

The major part of the year's work consisted of maintenance and minor improvements. A programme is in hand to remove clay and earth shoulders, built to contain the metal of the carriage-way, and replace them with compacted aggregate feather-edged to the water-tables. This work is improving subgrade moisture conditions and assisting road stability.

Owing to the shortage of steel little progress was made with bridge construction. A total length of 665 ft. is being built, but no structures were completed during the year.

Construction work was restricted owing to the necessity of conserving available authorities, and only 4 miles 79 chains of new formation was completed. In preparation for projected works some 50,000 cubic yards of metal have been stacked on the sites of proposed new reconstruction, and contracts have been let for further considerable quantities of metal.

Suitable metal chips for bituminous sealing were in short supply and it was not possible to undertake all of the work desired. Nearly 8 miles of new sealing were completed.

On the Whangarei–Awanui via Kawakawa State Highway reconstruction and sealing is in hand or has been completed on a number of lengths, notably at Templeton's Hill and between the Lake Omapere – Kaikohe highway junction and Okaihau, and between Whakapara–Waiotu and Mitchell's Flat – Waiomio.

Embankment protection for the eastern approach fill of the Tangiteroria Bridge, on the Whangarei–Dargaville State Highway, has been completed. A length passing through Tangowahine Village has been reconstructed preparatory to sealing.

On the Dargaville–Maungaturoto State Highway metal-supplies are being stacked for the reconstruction of 7 miles between Mititai and Raupo, and similar preparation has been made for Rintoul's Deviation of 3 miles. A length of 1 mile 68 chains was resealed between Dargaville–Mititai and 1 mile 16 chains from Ruawai School to the township.

Nearly 15 miles of the Whangarei–Maungaturoto State Highway have been resealed, chiefly between Ruakaka–Waipu and Waipu Gorge to the junction with the Dargaville–Maungaturoto highway.

The reconstruction and sealing of 3 miles 43 chains was completed on the Topuni–Kaiwaka section of the Birkenhead–Maungaturoto State Highway.

Reformation work has been continued on the Whangarei–Taumaterau highway, a total of 1 mile 34 chains now being completed. Construction of Duck Creek Bridge, 80 ft., and Awaroa Stream Bridge, 100 ft., is in hand.

A section of 60 chains in Russell Township, forming part of the Whakapara–Russell highway, was sealed.

On the Pamapuria–Oruru highway the Peria Bridge, 140 ft., and the Te Puhi Stream Bridge, 85 ft., are under construction.

Sealing was completed on 77 chains of the Paihia waterfront section of the Black Bridge – Paihia Highway.

On the Dargaville–Tikinui highway the Kaihu River Bridge of two 45 ft. and three 60 ft. spans is now half completed.

Auckland District

Work has again been chiefly concerned with making up arrears of deferred maintenance, particularly in regard to reconditioning and resealing existing sealed surfaces and repairs to metalled surfaces. Removal of soil shoulders, widening of formation, drainage improvements, and feather-edged metalling has been carried out, particularly where wet subgrade conditions have given rise to foundation failures.

New sealing was completed over 19 miles 7 chains, while resealing and plant mix surfacing totalled 36 miles 56 chains.

The shortage of materials is retarding urgent bridge renewals, and although a number of contracts have been let progress has been slow.

Considerable investigation work, covering reconnaisance, trial, and final surveys, has been carried out in connection with modifications to the arterial highway systems of the Auckland metropolitan area.

On the Birkenhead–Maungaturoto State Highway shoulder reconstruction has been continued, an additional 1 mile 39 chains being completed between Birkenhead and Albany. Three miles fifty-three chains of the widening was metalled and 5 miles 17 chains sealed. The formation was similarly widened for 2 miles at Dairy Flat and a length of 65 chains was sealed between Albany – Dairy Flat.

Construction of the Wade River Bridge approaches is proceeding. Various lengths totalling 16 miles 71 chains were resealed, the chief sections being Hungry Creek – Warkworth, 6 miles 27 chains; Warkworth – Dome Valley, 4 miles 51 chains; Wayby – Wellsford, 1 miles 74 chains; Albany Hill, 1 mile 23 chains; and Albany Hill – Dairy Flat, 1 mile 33 chains.

On the Auckland–Helensville State Highway reconstruction and metalling was completed between Woodhill and Ohirangi with the exception of a short length at Wharepapa. Widening and metalling of shoulders was carried out on the Te Pua section. In Henderson Borough the construction of the approaches to the new Opanuku Stream Bridge has been completed and the first seal coat applied. Two miles eight chains of plant-mix surfacing was applied, chiefly between Berry Bridge and Waimauku, and from the Kaipara River Bridge to Helensville Township.

Over the Bombay Hills Deviation, on the Auckland–Hamilton State Highway, widening of the formation and reconstruction of the shoulders was continued. Three miles of the shoulders were reformed, 5 miles primed, and 3 miles sealed.

Further reconstruction was carried out on the Pokeno–Paeroa via Ngatea State Highway. In Franklin County 1 mile 74 chains was widened, strengthened with additional metal, and sealed. In Waikato County 2 miles 46 chains was similarly reconstructed.

On the Mangere Bridge – Papatoetoe State Highway kerbing and channelling of the Coronation Road section was carried out, while 25 chains of footpath are being constructed on the Massey Road length.

Seventy-seven chains of plant mix were applied at the Titirangi end of the Waitakere Scenic Drive Highway.

At the Royal Oak end of the Mount Albert – Royal Oak highway, traffic control on the Manukau Road junction, where five roads join, has been improved by the removal of a monument and the construction of a modified roundabout with channelized approach lanes.

Reconstruction is well advanced on the Pukekohe–Buckland sections of the Pukekohe – Glen Murray via Tuakau highway, the final metal course now being applied.

On the Beach Road highway subsoil drainage problems and the highly plastic nature of the clay formation are causing difficulties under the traffic-loading conditions. Local foundation failures have been repaired, a length of 35 chains from the end of the existing sealing to Taiotea Stream Bridge reconstructed, and 1 mile 20 chains was resealed.

Reconstruction was completed on the Glen Eden Town District section of the Waikumete – West Coast highway and the length of 1 mile 14 chains was sealed.

On the Papakura–Hunua highway 50 chains were reconstructed in the Papakura Borough section.

On the Papatoetoe–Howick highway 1 mile 10 chains was treated with plant mix and 1 mile was reformed in preparation for extension of the sealing.

In the Franklin County 3 miles 8 chains of the Papakura–Titi highway was resealed.

On the Buckland's Beach highway plant-mix surfacing was laid over a length of 45 chains, and construction of a sea wall was commenced at the beach.

Work was commenced on the extensive improvement of the Brigham's Creek – Albany highway as part of the programme to relieve congestion on vehicular ferries on the Auckland Harbour. Over the whole length of 9 miles 60 chains the roadway has been widened, the surface improved, and minor deviations made to improve alignment. A 40 ft. R.C. bridge was constructed at Coatesville.

As part of a programme of improvement work on the Waimauku – West Coast highway an initial length of 2 miles has been reconstructed.

On the Drury–Waiuku–Kohekohe highway 8 miles 30 chains from Waiuku to Kohekohe was sealed, and 2 miles 14 chains on Tramway Flat at Puni was resealed.

Hamilton District

Highway reconstruction was carried out over aggregate lengths of 7 miles 21 chains of State highways and 13 miles 15 chains of main highways. On a further 19 miles 10 chains of State highway and 1 mile 8 chains of main highway minor improvement and metal strengthening enabled sealing to be placed.

Adverse weather conditions early in the season retarded the sealing programme, and in consequence, although materials were more freely available, it was not possible to carry out all the work desired. An aggregate of 30 miles 42 chains of new sealing was added to the dustless surfacing of the district, and, in addition, 23 miles 27 chains of State highways was resealed and 18 miles 55 chains of main highways.

On the Auckland–Hamilton State Highway a total length of 2 miles 55 chains of maintenance sealing was carried out.

Reconstruction work between Hangatiki and Te Kuiti on the Hamilton – Te Kuiti State Highway was continued, and with the completion of 3 miles 17 chains of sealing there is now a continuous dustless surface from Auckland to Te Kuiti. Construction of a reinforced-concrete bridge over the Waipa River at Otorohanga has been commenced.

On the Te Kuiti – New Plymouth State Highway maintenance sealing of 4 miles 40 chains was completed. The highway is being improved by a programme of dust-laying sealing, the preparatory work being limited to minor improvement and strengthening, and lengths of 1 mile 40 chains between Te Kuiti – Pio Pio and 12 miles 40 chains between Pio Pio and Mahoenui have been completed and sealed. Two bridges, the Awakino River Bridge, north of Mahoenui, and the Mangaotaki River Bridge, are under construction.

On the Pokeno–Paeroa State Highway 2 miles 18 chains of maintenance sealing was carried out on the Hauraki Plains County length.

Resealing was carried out over 2 miles 62 chains of the Thames–Paeroa State Highway.

On the Paeroa–Whakatane State Highway 4 miles 35 chains were resealed, and 1 mile of new sealing was completed to provide a dust-free surface between Paeroa and Waihi.

Two miles of maintenance sealing was carried out on the Ohinemuri County length of the Hamilton–Paeroa State Highway.

The major improvement work on the Hamilton–Cambridge section of the Hamilton–Rotorua State Highway was continued and is now well advanced to completion. Ten miles sixty-five chains have been reconstructed and initial sealing applied to 7 miles 66 chains. Maintenance sealing was carried out over 3 miles 56 chains on the Mamuku Hill.

Minor improvements and strengthening were carried out on the Te Kuiti – National Park State Highway and 1 mile 10 chains of dust-laying seal was completed.

In the Coromandel County length of the Thames–Coromandel State Highway serious tidal erosions have been repaired and extensive bridge maintenance carried out. One mile thirteen chains of sealing was completed.

On the Tirau–Wairakei State Highway, reconstruction and sealing of a 1 mile 77 chains length between Putaruru and Tokoroa has been completed.

The Tauranga–Pairere State Highway was improved by the strengthening and sealing of a length of 2 miles 45 chains.

Maintenance sealing was carried out over 1 mile 20 chains of the Tahuna–Ohinewai highway, 2 miles 40 chains of the Te Aroha – Waharoa highway, 1 mile of the Kihikihi–Arapuni–Putaruru highway, and 1 mile 60 chains of the Orongo–Netherton highway.

On the Te Awamutu – Cambridge highway the 50 chains section in the Leamington Town District and 4 miles 57 chains in the Waipa County have been reconstructed and 2 miles 6 chains have been sealed.

Nelson's Bridge, of 25 ft. span, on the Ngatea–Waharoa highway, was completed, and several short lengths were sealed.

On the Waihi Beach highway 2 miles 70 chains of maintenance sealing was carried out, while at the township a bridge eroded by floods was replaced by twin 5-ft.-diameter pipes.

On the Taupiri–Morrinsville highway reconstruction is in hand over a length of 1 mile 20 chains.

In the Leamington Township, on the Cambridge–Roto-o-rangi highway, 2 miles 8 chains have been reconstructed.

On the Pipiroa–Kopu highway 1 mile 65 chains of reconstruction is nearing completion.

Major works are proceeding to improve sections of the Hamilton–Raglan highway and 2 miles of construction have been completed. The Okete Stream Bridge, 100 ft., is in hand.

Reconstruction over a length of 4 miles 20 chains of the Matamata–Kaimai highway has been completed and sealing is well advanced.

On the Waitoa–Tirau highway sealing was carried out over 1 mile 40 chains of reconstruction and 2 miles 40 chains of shoulder widening, while 6 miles of maintenance sealing was applied.

A length of 7 miles 62 chains of the Te Awamutu – Pirongia – Ngutunui highway has been under construction, and with the sealing of the final 2 miles the work has been completed.

Tauranga District

The highway-improvement programme in this district is being steadily advanced by the carrying-out of several extensive works. The establishment of the Galatea Quarry is nearly completed and the supply of this good-quality stone will facilitate sealing-work in the Rotorua area.

On the Paeroa–Whakatane highway, 4 miles between the Pongakawa Bridge and the Railway Overbridge were strengthened and reshaped and sealing commenced. Similar work was started over a 3-mile section at Katikati. Maintenance sealing was completed over 4 miles 20 chains near Tauranga and at Whakatane, and materials are on site for a further 5 miles east of Tauranga.

Resealing of the 12 miles 40 chains Rotorua County length of the Hamilton–Rotorua highway has been in hand and has now been completed.

Extensive works are being carried out as resources permit on the Rotorua County section of the Rotorua–Whakatane State Highway over the length 9 miles to 25 miles. Heavy reconstruction is at present proceeding, chiefly between 14 miles and 16 miles. Adjacent to Te Teko a length of 5 miles has been prepared for early sealing, while 65 chains between Awakeri and Whakatane has been resealed.

On the Whakatane–Gisborne via Waioeka State Highway reconstruction work which has been proceeding in the Waimana Gorge is now taking shape and a length of 2 miles has been completed. Reconstruction over 5 miles between the Waiotahi and Waioeka Bridges is well advanced in preparation for early sealing next season.

Between Whakatane and Taneatua 1 mile 52 chains was sealed, and the early sealing of the remaining 2 miles is projected. A length of 2 miles past Taneatua, and the Waioeka Straight of 4 miles, were also sealed. Dustless surfacing now extends from Whakatane to near the Waimana Gorge and from the Waioeka River Bridge to the Waioeka Gorge. Heavy maintenance is in hand between the Waimana Gorge and Kutarere.

Preparations for sealing of the pumice sections, totalling 29 miles, of the Rotorua–Taupo State Highway are being pushed ahead. In Rotorua County 2 miles were reconstructed, while in Taupo County 5½ miles of preparation was completed, initial sealing placed, and bituminous mix laid over 1½ miles. At Waiotapu a further 2 miles of reconstruction and widening were completed.

Extensive improvements are being made to the National Park – Taupo State Highway. At Turangi 3 miles 60 chains of pumice formation is in hand, of which 1 mile 60 chains has been primed. Between Tongariro Bridge – Hatepe, 12 miles of formation have been completed with a further 2 miles in hand, 10 miles 24 chains were primed, and 7 miles 56 chains of bituminous mix surface carpet laid. A further 6 miles were widened and formed between Hatepe–Taupo and initial sealing placed.

On the Tauranga–Pairere State Highway 40 chains of sealing was completed at Tauriko and a further 1 mile 5 chains is ready for sealing.

Considerable minor work in widening and easing corners has been carried out on the Te Ngae – Paengaroa State Highway, and surface improvement is being effected by a change over from pumice maintenance to the application of crushed metal.

On the Opotiki – Te Araroa State Highway a considerable amount of widening and minor improvement work has been carried out.

On the Rotorua–Waikaremoana State Highway extensive flood-damage restoration work has been effected over the Te Whaiti – Ruatahuna section, and a replacement bridge is being built at Te Whaiti.

Formation and sealing of a 1 mile 20 chains length of the Rotorua–Tauranga highway were completed, while 4 miles were sealed on the Mount Maunganui highway.

Improvements to the Paengaroa–Maketu highway are being made with the reconstruction of 4 miles from the State highway junction to Maketu.

On the Te Teko – Awakeri via Edgecumbe highway a major bridge work has been commenced with the erection of a reinforced concrete structure over the Rangitaiki River at Edgecumbe.

Gisborne District

Construction work was retarded by the necessity of diverting all available plant to the restoration of abnormal flood damage which occurred during the record flooding of the Hangaroa and Waipaoa Rivers in May, 1948. After an initial setback, the sealing programme was prosecuted to the full extent of the supply of sealing chips.

The Trafford's Hill Deviation, from 51 m. 40 ch. to 56 m. on the Whakatane–Gisborne via Waioeka State Highway, has been completed except for a short length where large culvert pipes are required. Reconstruction was completed over the length 15 m. 8 ch. to 19 m., 3 miles 5 chains of which were primed and 1 mile 25 chains sealed.

On the Gisborne – Te Araroa State Highway the reconstruction of the Pouawa River Bridge is well advanced, while the sealing of a gap of 3 miles 10 chains completed the dustless surfacing between Gisborne and Tolaga Bay. The Jerusalem Deviation of 1 mile, which eliminates a number of bad corners and a flood area, has been formed and metalled.

Plans have been completed for the unbridged stream crossings on the Opotiki – Te Araroa State Highway.

On the Gisborne–Wairoa via Morere State Highway 5 miles 37 chains of sealing were completed, and minor regrading and widening in preparation for sealing was carried out on the Wharerata Hill. Construction of the Maraetaha River Bridge No. 1 and approaches is nearing completion.

The Poututu section of the Motu Front highway suffered heavy damage by flooding, and extensive repairs and formation raising are in hand.

On the Tokomaru Wharf highway 47 chains of sealing and 60 chains of resealing were completed.

Napier District

Steady progress has been maintained with the extension of dustless surfacing over the highways of the district. An aggregate length of 32 miles of new sealing was completed, while 32 miles of maintenance sealing was carried out.

Metalling and sealing on the Gisborne–Wairoa via Morere State Highway were extended by the completion of 2 miles 10 chains through Nuhaka Township and 60 chains from Wairoa Borough boundary towards Nuhaka.

On the Gisborne–Napier via Hangaroa State Highway between Wairoa and Napier 17 miles of sealing were completed and the unsealed gap has now been reduced to 20 miles. The chief sections prepared and sealed during the year were Wairoa–Ohinepaka, 1½ miles; Ohinepaka–Waihua, 5¾ miles; Kiwi Creek – Waikare, 5½ miles; and Waikoau River – Kareara, 3 miles. Heavy earthwork was completed over a length of 30 chains adjacent to the Mohaka Viaduct, while 70 chains on Bluegum Flat were widened and raised. The reconstruction of 4 miles of the Bay View – West Shore section is in hand and 1½ miles has been completed. The new Deep Creek Bridge, 132 ft., is nearing completion.

Between Waikato's Corner and Esk Overbridge, on the Taupo–Napier State Highway, a low-lying length of 1½ miles was appreciably raised, prepared, and sealed.

On the Napier – Palmerston North State Highway 1½ miles of cycle-track and footpath were built between Whakatu Road and Karamu Bridge. Numerous lengths aggregating 12 miles 36 chains received maintenance-seal treatment. The construction of Mangapapa Bridge, 45 ft., was commenced, while box culverts were built at Harding's Bridge and Dairy Factory Culvert.

On the Woodville–Masterton State Highway the sealing of 2 miles 32 chains in Woodville County was completed.

The Frasertown–Onepoto section of the Frasertown – Lake House highway suffered extensive flood damage, and heavy restoration work, involving slip removal, minor bridging replacement, and considerable culvert renewal, has been carried out.

Widespread and severe flood damage also occurred on the Rotorua–Waikaremoana highway. Very extensive slips and washouts have been made good, while an 8-chain deviation was constructed near the Hopuruahine Turn-off. Some minor bridging has had to be replaced and many culverts renewed. The Waiotukapuna and Hopuruahine Bridges are being rebuilt in concrete and steel. A good deal of protective work and clearing up still remains to be done.

On the Fernhill–Takapau via Maraekakaho highway 3¼ miles were reconstructed and sealed between Washpool and Maraekakaho and a further 2 miles was reconstructed and metalled towards the Takapau end.

Maintenance sealing carried out on various highways included 2 miles 33 chains of plant mix on the Waipawa–Pourere highway and 2 miles 55 chains on the Waipukurau–Matamau via Hatuma highway. Three miles forty chains of new sealing were added to the Woodville–Tamaki and Freelands highways.

On the Hastings–Waimarama highway three sections totalling 3 miles 62 chains were reconstructed and sealed. A contract was let for the construction of the major Tuki Tuki River or Red Bridge, 1,080 ft. in length, to replace the existing unsound timber structure.

Reconstruction and sealing was completed over 2 miles 20 chains on the Farndon – Paki Paki highway and over 2¾ miles on the Waipawa–Tikokino highway. The approaches to the recently built Manga-o-nuku Bridge involving a 50-chain deviation, were completed.

On the Napier–Hastings via Fernhill highway the Ngaruroro River Bridge at Fernhill, 1,320 ft. long, is now almost finished.

Resealing treatment aggregating 8 miles 23 chains was carried out on several other highways, including 2 miles 20 chains on the Otane – Tuki Tuki highway and 1 mile 73 chains on the Dannevirke–Waipukurau via Porongahau highway.

Taumarunui District

The chief activity of the year has centred around general maintenance, although preparations are being made for the carrying-out of several works which will provide substantial improvements. Timber-milling and coal-mining are causing heavy cartage conditions on several of the highways.

Reconstruction work has been proceeding between Ongarue Turn-off and Okahukura, on the Te Kuiti – National Park State Highway, and large dumps of metal aggregate have been built up for further work.

Similar stocks of materials are being accumulated for continuing the partially reconstructed Manunui–Owhango sections of the Taumarunui – National Park State Highway.

On the Taumarunui–Turangi State Highway extensive work has been necessary to maintain the road under heavy timber traffic. A 40 ft. bridge was built at Upper Kurutau and a length of 78 chains was widened. The Wanganui River Bridge at Manunui failed early in the year. The old trusses were demolished and a Bailey bridge was built over the existing piers. The Waihi Bridge, 82 ft. long, was opened to traffic, and construction of the Lower Kurutau Bridge, 120 ft. long, is well advanced.

The Ahititi–Taumarunui State Highway was improved by widening work carried out over various lengths and aggregating 4 miles 32 chains. Some 8,000 cubic yards of crushed metal were spread in maintaining the metal crust and surface. Substantial repairs were effected on the Ohura River Bridge, Tokorima.

On the Taumarunui–Ongarue State Highway 1 mile 55 chains was sealed.

The Tarata Stream Bridge, 73 ft. long, on the Raurimu – Wade's Landing highway, has been completed, and unsound parts of the Pio – Piotea Stream Bridge, Raurimu, have been renewed.

Heavy maintenance was carried out on the Piopio–Ohura highway.

Taranaki District

Continual wet weather occurred during the sealing season and the year's work has suffered as a result. It was not possible to carry out all the sealing work intended and the season's totals were reduced to 7 miles 54 chains of new sealing and 11 miles 45 chains of resealing. Formation work and earthmoving were continually interrupted and set back.

On the Te Kuiti – New Plymouth State Highway 60 chains of formation have been completed of a length of 1½ miles under reconstruction between Uruti and Mangamaio. A contract was let for the reconstruction of the Mohakatino Bridge, with progress to date consisting of the fabrication and delivery of steel girders. The bridge approaches and reconstruction of the roadway at the south end are nearing completion.

The New Plymouth – Hawera State Highway has been improved by widening over a total distance of 5 miles between Inglewood – Durham Road and Rugby Road – Tariki, and sealing of the widened portions is in hand. A length of 1 mile 11 chains south of Stratford was reconstructed.

On the New Plymouth – Hawera via Opunake State Highway widening and reconstruction over 6 miles between Oakura and Leith Road is nearly completed ready for sealing.

Heavy maintenance was necessary on the Stratford–Tatu highway, particularly in the Tangarakau Gorge. The 70 ft. bridge over the Whangamomona River south of Whangamomona partially failed, but repairs were effected by temporarily supporting the structure with Bailey bridge equipment. Six other old timber truss bridges were repaired in the same manner.

Maintenance sealing over 2 miles 29 chains was completed on the Ngatimaru highway, 1 mile 6 chains of new sealing was carried out on the Okato–Puniho highway, while on the Skeet highway 67 chains were sealed and 2 miles 36 chains resealed.

On the Hawera–Mokoia highway a reconstruction contract over 1½ miles has been completed ready for sealing.

A minor deviation and preparatory work for sealing is proceeding over 2 miles on the Inland North highway. Three miles twenty-eight chains of resealing was carried out on the Carrington, Cheal, and Rahotu–Kahui highways, while on the Waihi highway widening and sealing is in hand over 1 mile 10 chains.

On the Devon Road – North Egmont highway reconstruction has been nearly completed over $2\frac{1}{4}$ miles, while two lengths, totalling 2 miles 55 chains, have been resealed.

Maintenance sealing was applied to 2 miles 25 chains of the Opunake–Rawhitiroa highway and 1 mile of the Stratford–Tatu highway was reshaped and sealed.

On the Manaia – Dawson Falls highway 1 mile 50 chains is under reconstruction and minor improvements are being made on the $3\frac{3}{4}$ miles within the North Egmont Reserve.

Wanganui District

Particular attention is now being given to the improvement of North South highway communications leading through the centre of the Island, and this work is being pushed forward as rapidly as resources permit. The route through Wanganui, New Plymouth, and Te Kuiti provides an almost continuous dustless surface, and it is the aim to provide similar conditions on the inland routes.

Earthwork for the Whenuakura Deviation, on the Hawera–Wanganui State Highway, was restarted during the summer under a new contract. Widening-work south of Waverley was completed and sealed over 3 miles 40 chains.

Six miles of new sealing were laid on the Valley Road section of the Wanganui–National Park State Highway. A new bridge at the Upokongaro Stream is under construction.

On the Horopito–Bulls via Taihape State Highway 6 miles of the Tohanga Road section were strengthened and sealed. Formation improvements are being carried out between Ohakune and Waiouru and 2 miles of sealing were completed. On the Cliff Road – Norwood Corner reconstruction, $2\frac{1}{2}$ miles of formation have been completed.

Complete reconstruction and sealing was carried out over a distance of 1 mile 70 chains on the Greatford–Ashhurst highway, while 2 miles 5 chains of the Wanganui River (Right Bank) highway were sealed.

The Rangitikei River Bridge construction at Bulls, on the Wanganui–Levin State Highway, was brought to a successful completion and the approaches built and sealed. A length of 4 miles of the Marangai widening was sealed.

A number of other lengths on subsidiary highways received various sealing treatments.

Palmerston North District

Work on the major highways, which are completely sealed, has consisted chiefly of carriage-way widening, together with maintenance of the surface sealing. On the subsidiary highways, however, the County Councils have been carrying out an active programme of reconstruction over various lengths of their respective highways.

On the Wanganui–Levin State Highway widening and sealing was carried out for 2 miles northwards from Foxton to make a new sealed width of 24 ft. Over the Sanson–Himatangi section extensive repairs have been carried out to areas of faulty pavement.

On the Napier – Palmerston North State Highway reconstruction at Currie's Hill has involved heavy swamp excavation and backfilling.

The Sanson – Palmerston North State Highway has been improved by $3\frac{1}{2}$ miles of widening between the Oroua River and Newbury.

The Levin – Palmerston North via Shannon highway was declared a State highway during the year. Extensive remedial work was carried out over lengths of broken pavement and faulty subgrade, while 2 miles of maintenance sealing were completed near Palmerston North.

Two miles sixty-two chains of the Palmerston North – Himatangi State Highway were resealed over several individual lengths.

On the Longburn–Tangimoana highway 1 mile 64 chains are under reconstruction, 1 mile 30 chains of new construction was sealed, and a total length of 2 miles 45 chains was resealed.

Maintenance sealing was carried out over 3 miles of the Bunnythorpe–Kairanga highway.

On the Pohangina–Apiti Valley highway 1 mile 55 chains of reconstruction, including the Coal Creek Deviation, has been completed, while the 2-mile long Cheltenham–McKay's Line highway was sealed.

On the Awahuri–Mangaweka via Kimbolton highway 2 miles 61 chains were resealed, a 30-chain section involving excavation of swampy subgrade was rebuilt, and reconstruction is in hand over 2 miles 67 chains between Kimbolton and Spur Road.

A 2 mile 49 chain length of the Greatford–Ashhurst highway between Halcombe and Feilding has been reconstructed and 1 mile 34 chains sealed, while 1 mile 79 chains of maintenance sealing was applied.

In the Pohangina County reconstruction has been carried out over four sections of the Ashhurst–Pohangina highway aggregating 3 miles 14 chains and over a 2 mile 78 chain length at Apiti on the Kimbolton–Apiti highway.

Wellington District

The Whirokino Deviation, of 1 mile 7 chains, on the Wanganui–Levin State Highway, has been sealed.

On the Levin–Paekakariki State Highway 7 miles 22 chains of maintenance sealing was completed, chiefly over two lengths south of Otaki.

On the Masterton–Wellington State Highway the median strip along the Hutt Road length was planted with trees, a major washout 10 chains in length in the Taita Gorge was repaired, and 40 chains of maintenance sealing was applied.

Resealing was carried out over a number of short lengths on the Wellington–Paekakariki State Highway and a new 22-ft.-span bridge was completed at Glenside. Formation work has been continued on the new motor-way between Johnsonville and Tawa Flat, a length of 5½ miles being under construction. Two miles and a half of four-lane formation have now been completed, involving 764,500 cubic yards of earthwork.

On the Haywards–Paremata State Highway major reconstruction to four-lane standard was continued for a time between Haywards and Judgeford, the work being carried out in conjunction with the pipe-line location for the Wellington City water-supply scheme. Formation construction was proceeding over a length of 3½ miles, but owing to the difficulty of obtaining steel pipe for the water-supply, main earthwork has been temporarily stopped. The Haywards Hill section was generally completed, however, and to abate dust nuisance a length of 69 chains was given heavy priming treatment.

On the Levin–Palmerston North via Shannon State Highway plant-mix smoothing course was applied over a length of 1 mile 40 chains on the swamp section between Shannon and Makerua.

Further sealing has been carried out on the Upper Hutt–Waikanae highway, 1 mile 75 chains being completed, to make a total length of 11 miles. Extensive repairs were carried out on the Reikiorangi timber bridge.

New sealing was placed for 1 mile on the Heatherlea–Foxton via Koputaroa highway and 1 mile 34 chains of plant-mix surfacing was laid on the Paraparaumu Beach highway.

On the Shannon–Mangahao highway 1 mile 93 chains was reconstructed and sealed.

Wairarapa District

The approaches to the recently built Ngawapurua Overbridge were sealed for 46 chains. A new railway bridge has been built over the Manawatu River at Ngawapurua and the present combined road and rail bridge will be used solely by highway traffic. A new bridge in reinforced concrete, and comprising a 112 ft. arch and seven 15 ft. approach spans, is being constructed over the Ruamahanga River at Mount Bruce. The new bridge-site involves the construction of a 1-mile-36-chain deviation on improved alignment.

Sealing maintenance has been carried out over a number of lengths of the Masterton–Wellington highway, the total distance covering 5 miles 72 chains.

On the Eketahuna–Nireaha highway 72 chains were sealed and reconstruction of a length of 1 mile 3 chains is in hand.

The unsealed length of the Chester highway, 2 miles 16 chains, is now being reconstructed to complete sealing.

On the Masterton–Weber highway two 25-ft.-span bridges were built and a third bridge of 35 ft. span is under construction. Formation work on Thomas' Slip Deviation has been finished and a temporary Army-type bridge will take traffic at the site where a new 90 ft. bridge is required.

Improvements to the Masterton–Castlepoint highway are being pushed ahead with the reconstruction of two lengths from 7 m. 26 ch. to 10 m. 26 ch. and from 10 m. 76 ch. to 13 m. 45 ch., while similar work is projected between 23 m. and 24 m.

Reconstruction to improved standards has been carried out over 2 miles 40 chains of the Masterton–Stronvar highway and over 4 miles 27 chains of the Carterton–Gladstone highway.

Maintenance sealing was completed for 5 miles on the Martinborough – Lake Ferry highway.

On the Martinborough–Masterton highway work is in hand on the renewal of the Taueru River Bridge comprising three 55 ft. and two 40 ft. spans and maintenance sealing was carried out over a length of 2 miles.

On the Carterton–Longbush highway the renewal of the Ahiaruhe Bridge, 50 ft. long, was completed, together with the approaches.

Four miles of the Greytown – Bidwell's Cutting highway were resealed and 72 chains of the Martinborough–Awhea highway were reconstructed.

Nelson District

Active progress has been made on improvement works during the year and appreciable results have been achieved.

Heavy reconstruction has been continued on the Para–Tuamarina section of the Picton–Christchurch State Highway, a further 1 mile 20 chains of formation being completed to bring the total to 3 miles 22 chains. Reconstruction and sealing have been finished over 1 mile 46 chains between Dashwood–Seddon, while a length of 3 miles 67 chains between Seddon – Blind River Loop Junction has been sealed. Between Blind River Loop Junction – Ward 2 miles of improvement and sealing were completed. Altogether 6 miles 56 chains of new sealing were added to the district length of this highway, while 50 chains were resealed.

On the Blenheim–Nelson State Highway, preparation and sealing were finished over 4 miles 39 chains between Davis Creek – Pelorus Bridge, completing a programme for sealing an aggregate length of 23 miles 75 chains. A 1 mile 38 chains gap at Rocky Creek which is scheduled for later reconstruction has been given dustless seal treatment in the meantime. Between Wangamoa and Wakapuaka reconstruction is being carried out over 1 mile 67 chains, while minor improvements have been effected on a number of shorter lengths of the highway.

A considerable amount of improvement work has been in progress on the Richmond–Collingwood State Highway. On Takaka Hill a length of 3 miles 39 chains has been prepared and sealed, reconstruction has been carried out over 1 mile 65 chains between Paynes Ford – Takaka, a 71-chain deviation has been completed on the Hamama Junction – Payne's Ford section, and the Upper Takaka – Takaka length has been greatly improved with minor works. A total of 2 miles 20 chains of dust-laying seal has been laid over a number of short lengths. The construction of the Appleby Bridge, 728 ft. long, over the Waimea River is now nearing completion, while the Rameka Creek Bridge, 40 ft. span, and the Payne's Ford Bridge, 420 ft. long, are both under construction.

On the Nelson–Westport State Highway sealing preparation has been continued between Kawatiri – Clay Bank, 4 miles of filling and regrading and 6 miles of metalling being completed. Land is being acquired and preparations are being made for widening on the Stoke–Richmond section. Extensive crib walling has been constructed at Glenhope. Resealing was undertaken over 1 mile 40 chains, while some 5,000 cubic yards of metal aggregate was used in intensive maintenance of the Murchison County length.

Reforming and metalling has been carried out over 6 miles 40 chains on the Frog Flat – Warwick Junction section of the Murchison – Lewis Pass State Highway, and considerable improvement is being made by minor works between Shenandoah – Frog Flat and by the replacement of small bridges with culverts. A Bailey bridge of 70 ft. span was erected to by-pass the Rappahannock Bridge, which had become unsafe for traffic.

On the Collingwood–Pakawau highway major repairs are being carried out on the Ferntown Bridge.

On the Renwicktown – Hope Junction highway the Marchburn Bridge and approaches have been widened from single-lane to two-lane width, 3 miles of sealing were completed on the Wairau Valley Township – Erina length, while three fords between Branch River – Wash Bridge have been eliminated by the construction of culverts.

Widening over a length of 1 mile was completed on the Mahakipawa Flat Road section of the Picton–Havelock via the Grove highway.

On the Takaka–Tarakohe highway 2 miles of dust-laying seal were completed on the Motupipi–Pohara section, while on the Appleby Motueka highway between Mapua and Tasman 4 miles 20 chains was prepared for sealing.

West Coast District

On the Nelson–Westport State Highway a start was made on improvements between Inangahua Junction and Berlins, but little progress has been possible as a large slip near the Junction has absorbed the available plant and labour. At Foley's Creek a temporary bridge is being replaced with a 4-ft.-diameter culvert. Improvements have been carried out at Windy Point, but a large amount of slip material remains to be moved.

On the Inangahua Junction – Greymouth State Highway the major work on the section to Reefton has been the continuation of widening and preparation for sealing northwards from Waitahu River Bridge. Formation has been practically completed to Cronadun, including a large filling to raise the approaches to York Creek Bridge. Widening of formation is well in hand between Cronadun and Larry's Creek. Considerable improvement has been made to the Reefton–Greymouth section by reformation work from Ikamatua to the foot of the Reefton Saddle. Of the 10½ miles reformed, 8 miles were sealed. With the projected construction of the Blackwater River Bridge, the Hukarere Deviation can be undertaken and the improvements between Ikamatua and Reefton Saddle completed.

Resealing of the Hokitika–Ross section of the Greymouth–Waiho State Highway was continued and 1 mile 48 chains were completed. Improvements involving heavy earthwork were made over the 12 m. 4 ch. to 12 m. 68 ch. portion of the Hokitika–Ross section, the approaches and deviation to the new Donnelly's Creek Bridge at Ross were completed, and test piles were driven at the proposed site of the new Big Waitaha Bridge.

On the Westport–Greymouth (Coast Road) State Highway the 7-mile Creek Bridge of 130 ft. was completed and preliminary work has been carried out for improvements between Runanga and Rapahoe.

Near Waiho, on the Waiho–Paringa State Highway, a 35-chain deviation was completed.

On the Christchurch – Kumara Junction State Highway extensive flood damage has been repaired on several occasions. The construction of a substantial structure to replace the old half bridge at the Bridal Veil Falls has removed a dangerous feature. Work has been commenced on a new bridge over the Wainihinihi River.

On the Reefton–Waipara State Highway reconstruction on the Reefton – Garvey's Creek section has been commenced, but heavy earthwork is involved to meet slip conditions. Good progress is being made with the raising of the roadway above flood-level over 34 chains near the 5 m. point. A 20 ft. slab bridge has been built at Blacks Point Township to replace the old one-way timber bridge.

Considerable improvement work has been carried out on the Westport–Karamea highway. Reformation between 7 m. 7 ch. and 10 m. 5 ch. has been completed and the road sealed, and widening in is progress from 12 m. 6 ch. to 16 m. 35 ch. On the Karamea Bridge – Karamea section the old Factory Creek Bridge has been replaced by culverting and the whole length of 1 m. 69 ch. has been sealed. Granite Creek Bridge has been finished, the large approach fillings required for the Tidal Creek bridges have been completed for 9 chains, and construction of the two bridges is in hand.

On the Granity–Stockton highway the Granity Bridge has been completed and work on the approaches, which involves some 6 chains of heavy rock-work, is in progress.

A contract has been let and work has commenced on the construction of a new 1,015 ft. bridge over the Kokatahi River on the Kanieri–Koiterangi highway.

North Canterbury District

On the Picton–Christchurch State Highway the Irongate Bridge, 93 ft. long, is in the final stages of construction, while the Ohau Stream Culvert and approach formation has been completed. Between Kaikoura and Hapuku widening and reconstruction involving several deviations has been completed and 5 miles have been sealed. Improvements are being made on the Puketa–Oaro length by widening and reforming, including a deviation at the Oaro Bridge approach. The Parititahi and Raramai Road Tunnel duplications have been completed, the lengths being respectively 186 ft. and 207 ft. Reconstruction and sealing have been carried out on the balance of the 12-mile Motunau–Hurunui section. Extensive flood damage occurred in several places, notably at Kahutara Bluff, where a rock slip estimated at 170,000 cubic yards was caused. The roadway was reformed over this slip.

The Reefton–Waipara State Highway is being improved between Red Post and Montrose by reconstruction and sealing over 6 miles 26 chains. Repeated flooding caused extensive damage and the Waiau River is threatening this highway at several points. A contract has been let in England for the supply of steel for the Gorge Creek and Deep Creek Bridges.

Test piles have been driven for the new Kahutara Bridge on the Red Post – Kaikoura highway, while 4 miles 64 chains is being reconstructed for sealing between Red Post and Rotherham.

On the Leader–Waiau highway the Upper Stanton Bridge, a 55 ft. timber structure, has been completed and the Lower Stanton Bridge of 49 ft. is nearing completion.

A length of 2 miles 50 chains was reconstructed and sealed on the Scargill–Motunau section of the Waikari–Motunau highway. In Waikari Township, on the Waikari–Waitohi highway, 68 chains of plant-mix surfacing were laid.

Christchurch District

On the Picton–Christchurch State Highway 3 miles 56 chains of maintenance sealing were completed on the Woodend–Ashley River Bridge section.

Between Church Corner and Paparua, on the Christchurch – Kumara Junction State Highway, 5 miles 60 chains of maintenance sealing was completed.

Resealing was also carried out over 2 miles 1 chain of the Summit State Highway.

On the Christchurch–Akaroa State Highway the Little River – Akaroa length has been strengthened and improved and 2 miles of maintenance sealing were applied between Hoon Hay and Halswell.

The necessary land has been obtained for the Blenheim Road Deviation to provide a southern access to Christchurch as part of the Christchurch–Timaru State Highway.

On the Sockburn – Rakaia Huts highway 4 miles 49 chains have been resealed chiefly over the Leeston–Doyleston and Lake Road – Ellsemere sections.

Reconstruction and sealing was completed over 4 miles 8 chains on the Spark's – Saby's Road section of the Christchurch – Selwyn Huts highway.

On the Rangiora County length of the Rangiora–Woodend highway resealing was carried out over 3 miles 57 chains.

A length of 1 mile 20 chains was sealed on the Christchurch – Governor's Bay highway.

The Darfield–Arundel highway is being improved by reconstruction preparatory to sealing over 4 miles 65 chains of the Darfield – Homebush School section.

Reconstruction and sealing were completed over 3 miles 56 chains of the Hodgson's Road – Fawcett's Road section of the Rangiora–Oxford via Loburn highway and over 1 mile 68 chains of the Waimakariri River Bridge – Giles Road section of the Waimakariri River Bridge – Bennetts highway.

Maintenance sealing was completed for 1 mile 26 chains on the Christchurch–Chaneys via Marshland Road highway and for 63 chains on the Norwich Quay length of the Lyttelton–Motukarara highway.

South Canterbury District

On the Timaru–Cromwell State Highway 4 miles of maintenance sealing were completed between Waitawa – Pleasant Point and reformation and metalling was carried out between Tekapo and No. 3 Camp Turn-off.

On the Christchurch–Timaru State Highway plant-mix surfacing was applied over 1 mile 8 chains at the Rakaia River Bridge.

The 2½ miles Black Birch Deviation, on the Pukaki – Ball Hut highway, was completed. Several deviations have also been constructed on this highway to allow for the raising of the level of Lake Pukaki.

Reconstruction and sealing have been carried out over 4 miles 74 chains of the main Otipua highway, over 2 miles 60 chains of the Waimate–Studholme highway, and over 2 miles 5 chains of the Waihao Bridge – Morven highway.

Resealing was completed on 7 miles 40 chains of the Hinds–Winchester via Arundel highway.

North Otago District

On the Timaru–Dunedin State Highway foundation tests are being carried out for the Kakanui River Bridge, on the Maheno Deviation. Six chains of the northern approach embankment were completed. The second application of plant mix was placed on the 4 miles 60 chains length of widening between Maheno and Herbert. Widening of the sealing is being carried out over 3½ miles between Waianakarua and Hampden and a start has been made with improvements over the 34 chains of steep winding alignment at Kakaho Hill. A new box culvert has been built near Goodwood and the highway raised to prevent flooding. Limited improvements are being made for the most tortuous lengths of the Waitati–Dunedin section, while two major cuttings on the new highway route via the Leith Valley are being pushed ahead.

Heavy flooding washed out an approach to the Omarama Bridge and denuded metal on the Lindis Pass length of the Timaru–Cromwell State Highway. Repairs have been effected. The straightening, widening, and regrading of a 1 mile 41 chains length through Gravelly Gully to the Locharburn has been completed.

On the Milton–Queenstown State Highway a deviation to avoid a tortuous section between Shingle and Gorge Creeks has been continued, 1 mile 4 chains being formed. Near Frankton Wharf a $1\frac{1}{4}$ miles deviation was completed, 3 miles 40 chains of the Frankton–Queenstown section was sealed, and 3 miles 27 chains of dust-laying seal were completed between Gentle Annie Creek and the Victoria Bridge over the Kawarau River.

On the Pukeuri–Kurow–Omarama highway a contract has been let for the supply of 15,000 cubic yards of metal to build up the Waitaki Hydro – Omarama lengths and a contract has been let for resealing 6 miles on the Otiake–Kurow section.

On the Waiareka–Ngapara–Duntroon highway a contract has been let for metalling and sealing 5 miles from Weston. The Queen's Flat Bridge, 75 ft. long, and its approaches, was completed.

Two miles twenty chains of the Dunedin – Port Chalmers highway were sealed and the Dunedin – Macandrew Bay section of the Dunedin – Harrington Bay highway was resealed.

The Mosgiel–Middlemarch–Dunback highway has been improved by sealing between Mosgiel and Outram, while 56 chains north of Deep Stream were reconstructed.

Reconstruction was carried out over the whole length of the Allanton–Outram highway.

Widespread damage was caused by several severe storms, resulting in the disruption of access to many communities. Repair works are still being carried out.

South Otago District

Reconstruction has been proceeding on the Clinton–Arthurton section of the Dunedin–Gore State Highway, 2 miles 74 chains of formation and 4 miles of metalling being completed during the year. The Waipahi Overbridge has been finished. Resealing was carried out on 6 miles 30 chains between Lake Road and Milton, on 3 miles 62 chains between Milton and Balclutha, and on 2 miles south of Balclutha.

On the Milton–Queenstown State Highway formation work involving 50,000 cubic yards of filling has been completed and 3 miles were primed. On the Glenmore–Waitahuna section the remaining formation and metalling work was completed, and with the sealing of 7 miles 39 chains the whole of this 10 miles 16 chains length has been finished. Culvert construction and fencing is in hand in preparation for reconstruction between Waitahuna and Evans Flat. Preparation and sealing of a length of 8 miles between Island Block and Ettrick was continued and completed, $4\frac{1}{4}$ miles of sealing being carried out during the year. Reconstruction was commenced over 6 miles 49 chains on the Ettrick–Roxburgh sections, the formation was completed, and a length of 3 miles 20 chains was sealed.

On the Balclutha – Kaka Point highway 1 mile 52 chains of dust-laying seal were laid and 24 chains were resealed.

Buchanan's Creek Bridge, on the Balclutha–Lawrence highway, was completed.

Southland District

On the Dunedin–Gore State Highway, construction of the Pukerau Bridge is now well advanced after slow initial progress.

Fencing was erected for the Kennington Deviation, on the Gore–Invercargill State Highway. Between Brydone and Edendale five lengths aggregating 3 miles 17 chains were resealed.

Extensive improvement work is being carried out on the Queenstown–Invercargill State Highway. Between Lumsden and Caroline, reforming and base-course metalling have been completed for 8 miles 19 chains, extending through Josephville, and a contract has been let for the supply of top-course metal and sealing chips. Between Caroline and Benmore improvements and metalling were completed over a length of 10 miles 50 chains, of which 8 miles 42 chains were sealed. Reconstruction was completed over 2 miles 44 chains between Centre Bush and Limehills. A length of 3 miles was reconstructed between Winton and Lochiel and metalling is now proceeding. Between Lochiel and Buxton's Corner removal of clay shoulders, widening, and remetalling is well advanced over a length of 7 miles 54 chains. Between Lorne and Invercargill City boundary carriage-way widening and reforming, and the provision of cycle-tracks and footpaths, is well advanced, and the work done has provided greatly improved road-safety conditions. Sealing was carried out over 1 mile through Athol Township. At Blackmore Creek an old wooden bridge was replaced by a 6 ft. culvert, and at the Makarewa River a Bailey bridge 140 ft. long has been erected for use until the new permanent bridge can be constructed. A contract has been let for the construction of the Erye Creek Bridge, 225 ft. long.

On the Lorne–Riverton State Highway the Makarewa Stream Bridge is being erected, but progress has been hampered by continued flood conditions. Between Wrights' Bush and Waimatuku 65 chains were reconstructed and sealed, and between Waimatuku and Thorbury 1 mile 58 chains were sealed. Metal strengthening was carried out between Wallacetown and Iron Bridge and 42 chains were reconstructed and sealed between Wallacetown and Tomoporakau.

Extensive repairs were carried out on several bridges on the Riverton-Tuatapere State Highway.

The Lumsden – Te Anau – Milford Sound highway suffered considerable damage from frequent severe floods from November to March, and extensive repair work has been necessary. The programme of repairing and rebuilding timber bridges on this highway was continued. Four hundred and eighteen linear feet of bridging was overhauled on the Te Anau – Eglinton Valley section, two bridges totalling 120 ft. were rebuilt over the Upper Hollyford River, and twenty bridges totalling 410 linear feet were rebuilt in the Homer–Milford section. The sawmill set up in the Eglinton Valley provided 243,000 super feet of bridge and building timber for this work.

OVERLOADING OF HIGHWAYS

The extensive damage to the highways caused by the increasing numbers of heavier and larger commercial vehicles during the past three or four years is causing the Main Highways Board grave anxiety. Many of the highways constructed in pre-war years for a very different kind of traffic were never intended to carry the long, wide, and heavy trucks and buses of to-day, which operate at high speeds. This is not a problem peculiar to New Zealand.

In Canada, the United States of America, and Australia the roading authorities are exercised at the deterioration of the pre-war roads as a result of the operation of the totally different post-war traffic. Mr. Thomas H. MacDonald, Commissioner of Public Roads for the United States of America, recently pointed out that his statement of 1940, that roads are destroyed by climatic and soil conditions, no longer applies. Loads carried then, he said, were seldom heavy or large enough to overtax the structural capacity of the highways. Now, he complained, the causes of road deterioration are found primarily in overloading.

Long trucks and buses when operated on the many narrow tortuous highways of New Zealand are very destructive to the verges of the carriage-way by virtue of the length of the vehicles. It will be appreciated that long buses and trucks take up more road space on sharp curves than on straights, and therefore these vehicles, in negotiating the curves, tend to travel with wheels on one side running right at or over the edge of the pavement. This causes rutting along the verges of metalled roads and rapid breaking away of the edges of the bituminous pavement on sealed roads.

Wide vehicles also cause excessive damage along the verges of the pavements, but in this case it is on the straight sections of road, where speeds are highest, that most damage results. The large passenger-buses are more destructive in this direction than the wide goods-trucks, for the reason that buses operate at higher speeds. A vehicle being operated at high speed has a strong tendency to swing away from passing vehicles, and on 16 ft., 18 ft., and even 20 ft. sealed surfaces, vehicles which are the full 8 ft. wide overrun the shoulders. It is at the junction of the shoulders and the pavement where the road is weakest, and thus these wide vehicles are the cause of serious verge damage.

While the longer and wider trucks and buses have created problems which call for more costly construction and greater expenditure on maintenance, it is the increase in the numbers and weights of heavy vehicles which is causing the most serious amount of damage on the highways, roads, and bridges of New Zealand. Not only are the highways called upon to carry a greater volume of trucks and buses at the upper limit of legal loading, but also excessive overloads are all too common, and in some areas may be said to be almost normal practice. The Crown, at present is not bound by heavy traffic regulations, but in justice to other operators it would seem very desirable that the regulation should be made to apply to all operators. Fortunately the Railway's Department's road vehicles, which now operate from one end of the Dominion to the other, with but a few exceptions do substantially adhere to the loading regulations and road classifications, but this position cannot be expected to remain where other commercial vehicles operating in the same area are allowed to continue the enjoyment of the benefits of overloading.

The Board's concern with the disastrous effects of overloading has been very real, and considerable investigations have been carried out in an endeavour to determine a reasonable and practical balance between modern heavy traffic demands and the country's capabilities. Desirable limits for axle loads, the relationship of load distribution and axle spacing, and upper limits for tire pressures were determined. At the instigation of the Board there has been full discussion of the problem, and with the co-operation of the interested parties a compromise solution, in so far as highways are concerned, has been recommended to the Transport Department for the gazetting of new loading regulations. If and when these are brought into force, importers of vehicles, operators, and road designing and constructing authorities will have clear issues on which to base their respective policies, while our existing highways will have some measure of protection.

The traditional sealing carpets of New Zealand will have to be abandoned in favour of wider and thicker and consequently much more costly bituminous surfacing if 8-ton to 9-ton axle loadings are to be imposed upon the roads designed for 5-ton to 6-ton axle loads. Until the roads can be so strengthened, despite excessive maintenance, continual potholing and surface failures with ultimate break-up will become the order of the day. Even if £60,000,000 could be made available to strengthen the existing sealed highways, to say nothing of the additional work required on the much greater mileage of gravel-surfaced highways, it would not be physically possible to complete such work within the next few years. Such strengthening could only be completed under a long-term policy.

Apart altogether from the consideration of road surfacing is the damaging effect of heavy loads on the numerous wooden bridges on which we must rely for many years to come. The overloading which obtains on so many timber truss bridges gives cause for grave concern. Sealed road surfaces which fail and break up can be converted back to gravel, and with some "feeding in" of metal, combined with grading, can be kept open to traffic, but if bridges are loaded to failure, vital communications will be completely broken, with disastrous results to the community.

The Board has been criticized for not controlling the loading of the highways, and it is therefore necessary, in defence against such criticism, to make it quite plain that, except for sub-standard bridges, the Board has no more than a nominal say in the classification of highways and, of greater importance, has no say at all in the enforcement of heavy traffic regulations.

Until highways can be sufficiently strengthened, all steps should be taken to ensure that the existing pavements are not destroyed by loadings beyond the capacity of the pavement. Not only will this call for energetic enforcement, but also penalties for overloading will have to be greatly increased if the fines are to act as any deterrent. At present the financial return from hauling one overload will frequently more than pay the fines which are inflicted by the Courts.

In view of the increasing numbers of large vehicles, in addition to the classification of roads as to their capacity to carry heavy loads, it would seem that our highways should also be classified as to the length of vehicle which should be permitted to traverse them. There is a tendency to operate the same length of truck or bus in the difficult as in the easy topographical areas. A long vehicle on a wide road of good alignment is of no particular concern, but if the same vehicle operates on our many narrow tortuous roads not only does the road suffer undue verge damage, but also such a vehicle is a menace and a danger to other road-users.

It would also be desirable to limit the width of vehicles on the narrower roads and highways, but the 8-ft.-wide truck and bus have now become too firmly established to permit of any width limitations without causing considerable economic loss to operators.

The Board has a full appreciation of the vital importance of road transport to the economy of New Zealand, and consequently, in so far as it is physically and financially possible, the Board is anxious to provide roads which will allow of the cheapest transport, and in this connection it is necessary to bear in mind that the cost of road transport is the cost of vehicle operation or direct haulage costs, *plus* the cost of roading. Only by the recognition of the pertinent facts and by the good will and co-operation of all interested parties will it be possible to build and maintain our roading system so that over-all transport costs will be a minimum.

HIGHWAY ENGINEERING AND DESIGN

The steep increase in the gross weight of goods vehicles operating on the highways during the past two or three years has made it quite plain that a more careful selection of mineral binders for the metal or gravel courses will have to obtain in the future if the sealed highways are to withstand the heavy traffic of to-day.

In the pre-war years it was the policy throughout the newer countries of the world to build what was called "low-cost" roading with light sealed surfaces, in preference to expending all the roading funds on short lengths of expensive pavements. To obtain the greatest length of dustless surfacing, ordinary pit gravels with or without added clay as a binder were used extensively to form the metal crust of base and top course. Fairly plastic clays were often accepted as the binder so that the water-worn and rounded gravel was strongly bound together. Such metal crusts when sealed provided very

satisfactory service under pre-war loading, but under the much heavier loading of the post-war period many of these roads are cracking and potholing and even failing completely.

The lighter wheel loads of ten years ago caused little deflection or deformation of the road surface, but the greatly increased numbers of trucks and buses with far heavier wheel loads which obtain at the present time cause much greater road deflections, particularly if the road structure is strained beyond its elastic limit. This means that, whereas the lighter loads caused little stretching of the road surface, the heavier loads deform and stretch the road crust to a much greater extent. Indeed, as the heavy wheel loads pass along the road a slight groove or rut temporarily forms under the wheel. This deformation causes slight cracks to open in the road surface.

A sound road will regain its original shape and the cracks may close up again on the passing of the wheel load. However, particularly in the winter months when road surfaces often remain wet and slushy, the pressure exerted by the tires forces small amounts of moisture through the temporary surface cracks. This moisture does not readily escape and over the winter months there is a gradual build-up of water in the clay-bound metal or gravel course. If the clay binder is rather too plastic, instead of serving the purpose of cementing the gravel together, as the moisture increases the clay becomes a lubricant between the stone fragments so that movement and rocking of the gravel occurs. This quickly leads to potholing and perhaps complete break-up of the surface.

To avoid such conditions and to retain a desirable surface under the more frequent and heavier truck loading it is imperative that for the future more attention must be paid to the selection of a suitable mineral binder fraction. Experience has shown that neither existing binders in pit gravels nor any added binder should have a plastic index exceeding 5. In the past, materials with plastic indices of 6 to 10 or higher have often been used. The binder should possess at least a few pounds tension and should have some plasticity, but with the plastic index lying between 0 and 5.

It may be possible in the laboratory to mix a highly plastic clay with a metal course aggregate so that the total resulting binder fraction passing the fifty-mesh sieve has a low plastic index. Field mixing, however, will not achieve this. Unbroken and unmixed lumps of clay will remain in the road-mixed metal course. These clay lumps, no matter how small, will almost invariably eventually lead to surface failures.

If loadings on the highways continue to increase, it will almost certainly be necessary to abandon the cheaper clay-bound water-worn gravel courses in favour of crushed rock, which, through its interlocking properties, has high stability when the voids are filled with non-plastic crusher dust. This latter type of water-bound roller-compacted macadam will not deteriorate due to the entrance of small quantities of moisture. However, if care is taken in the selection and mixing of sand-clay binders, gravel courses should give satisfactory service under a good seal coat for any reasonable highway loading, and in the meantime at least, until sufficient crushing plants can be obtained to produce the necessary crushed stone for the higher class of macadam, gravel-course construction will have to be accepted.

VISITS OF INSPECTION TO THE NORTHERN PORTIONS OF THE NORTH AND SOUTH ISLANDS, AND CONTACT WITH LOCAL BODIES AND AUTOMOBILE ASSOCIATIONS

As mentioned in last year's report, the Board paid a visit to North Auckland, Auckland, Coromandel, and Waikato areas in April, 1948. In November, 1948, the Board visited Nelson, West Coast, and Canterbury areas.

The Board's policy of extending dustless surfacing wherever possible was greatly appreciated, and although the number of improvement works in progress was limited it was pleasing to the Board to observe that the arrears of maintenance were being gradually overtaken and the surface condition of the highways were, generally speaking, good.

Once again the Board is happy to record that local authorities and automobile associations have on all occasions been most helpful and willing to co-operate with the Board in endeavouring to cater for the ever-increasing demands made by road-users.

EXAMINATION FOR FOREMEN AND OVERSEERS OF ROAD CONSTRUCTION

The twenty-second examination for Foreman and Overseers of Road Construction was held on 17th November, 1948, when sixteen candidates presented themselves for examination.

Nine papers on general road construction and maintenance, and nine papers on tar, bituminous, and concrete road construction, were returned. Four candidates were successful in passing paper No. 1, and seven passed paper No. 2. Four secured a partial pass, and seven who had previously secured a partial pass completed the examination.

SIGNPOSTING, CENTRE-LINE MARKING, ETC.

The amount expended by the Board during the year in subsidizing the erection and maintenance of road signs by the automobile associations of New Zealand was £5,225. The marking of centre-lines on paved surfaces and the lettering of standard warning notices on pavements adjacent to railway-crossings and other dangerous localities has also received attention.

ADVANCES TO LOCAL AUTHORITIES

During the year ended 31st March, 1949, the Board entered into twenty agreements with local bodies in regard to advancing to them their shares of the cost of works carried out on main highways. The principal of these advances amounted to £35,306 2s. 10d. The total of principal advanced to local authorities since the inception of the Board is £392,440 2s. 10d., of which the sum of £52,833 5s. 5d. was outstanding at 31st March, 1949.

PLANT

The facilities provided by the Board to enable local authorities to acquire plant under the hire-purchase system were again taken advantage of to a considerable extent. The purchases for 1948–49 amounted to £55,631 6s. 8d. The total value of plant purchased under this system since its inauguration is £529,266 4s. 11d., of which sum £94,600 3s. 6d. remained outstanding at the 31st March, 1949.

OPERATIONS OF MAGNETIC TRUCK AND TRAILERS

During the year the magnetic truck and one trailer-type magnet operated in the North Island, and the other trailer-type operated solely in the South Island. These machines, which are utilized for clearing main highways of iron or steel puncture-producing

articles, cleared 4,034 miles in the North Island and 1,220 miles in the South Island. The weight of material picked up was 17,963 lb. in the North Island and 514 lb. in the South Island. The average yield per mile of highway in the North Island was 4·45 lb. and the South Island 0·42 lb., compared with 4·57 lb. and 0·63 lb. respectively for the previous year. The low mileage in the South Island is due to breakdown of the equipment and the necessity for extensive overhaul.

DECLARATIONS, REVOCATIONS, AND ADJUSTMENTS OF MAIN HIGHWAYS

The following are the lengths of main highways declared and revoked during the year ended 31st March, 1949, including formal adjustments :—

MAIN HIGHWAYS DECLARED

	M.	ch.
No. 1 Highways District—		
Dargaville–Ohaeawai via Waipoua Forest	93	9
Otaika–Portland	2	10
No. 2A Highways District—		
Piha	9	55
Brigham's Creek – Albany	9	60
Kumeu–Riverhead	2	0
No. 2B Highways District—		
Tirau–Wairakei	24	30
Tauranga–Pairere	22	36
Kawhia Access	39	30
Thames–Paeroa	1	22
Matamata–Kaimai	8	24
Wharepuhunga	12	0
Waitoa–Tirau	28	34
Piopio – Ohura via Aria	21	16
Huntly–Rotowaro via Waikokowai	11	20
Kauroa–Kawhia	24	30
Paraheka Loop	0	30
Waitete	0	57
Te Aroha – Springdale	8	40
No. 3 Highways District—		
Rotorua–Whakatane	50	40
Tirau–Wairakei	29	65
Tauranga–Pairere	16	60
Opotiki – Te Araroa	70	59
Waiouru–Turangi	20	60
Rotorua–Waikaremoana	72	40
Taumarunui–Turangi	5	68
Mount Maunganui	0	5
Opotiki–Matawai via Motu	28	64
Tauranga–Station	1	60
Te Teko – Awakeri via Edgecumbe	8	0
No. 5 Highways District—		
Rotorua–Waikaremoana	12	58
Woodville–Ashhurst	7	23
Hunter – Brown Street	0	30
No. 6 Highways District—		
National Park – Taupo	20	56
Taumarunui–Turangi	31	36
Ahititi–Taumarunui via Tatu	51	67
Chateau	8	45
Mangatupoto–Ohura	24	0
No. 6 Highways District—*continued*		
Taumarunui–Ongarue	1	56
Stratford–Tatu	8	73
Raurimu – Wades Landing	0	30
Piopio–Ohura via Aria	15	14
No. 7 Highways District—		
Waitara–Inglewood	9	72
Ahititi–Taumarunui via Tatu	15	32
Stratford–Tatu	63	13
No. 8 Highways District—		
Waiouru–Turangi	12	40
No. 9A Highways District—		
South Street	0	62
No. 11 Highways District—		
Murchison – Lewis Pass via Shenandoah	29	25
Murchison – Frog Flat via Matakitaki	26	50
Waimea West	5	2
Picton–Waikawa	4	38
No. 12 Highways District—		
Waiho–Paringa	56	25
Murchison – Lewis Pass via Shenandoah	16	0
Reefton–Waipara via Lewis Pass	42	50
Gannons	3	25
No. 13 Highways District—		
Reefton–Waipara via Lewis Pass	81	51
Red Post–Kaikoura	64	33
Hanmer Junction – Jollies' Pass	8	61
No. 14 Highways District—		
Amberley–Mount Brown	10	40
No. 15 Highways District—		
Mount Somers–Ashburton Gorge	8	10
No. 16 Highways District—		
South Oamaru–Waianakarua	4	62
Kaikorai Valley	0	18
No. 17 Highways District—		
Janefield	2	5
Roxburgh Street	0	66
	1,292	52

MAIN HIGHWAYS REVOKED

	M.	ch.
No. 1 Highways District—		
Dargaville–Kaihu	16	52
Waipoua Forest	26	68
Waimamuku–Ohaeawai	49	49
No. 2A Highways District—		
Kumeu–Albany	9	40
No. 2B Highways District—		
Thames–Paeroa	2	76
Pairere–Kaimai via Hinuera	15	0
Kumara–Paraheka	8	0
Kauroa–Te Mata	4	60
Matamata–Tauranga	15	56
Kawhia–Wharepuhunga via Kawa	51	30
Waitoa–Wairakei	52	64
Piopio–Tatu via Aria and Ohura	21	16
No. 3 Highways District—		
Rotorua–Whakatane	50	40
Tongariro Bridge–Waihi Pa	5	40
Papamoa–Mount Maunganui	8	60
Opotiki–Matawai via Motu	35	24
Matamata–Tauranga	16	64
Waitoa–Wairakei	29	65
Opotiki–Te Araroa	64	64
Waiouru–Tokaanu	20	60
No. 5 Highways District—		
Rotorua–Waikaremoana	12	55
McLean Street North	0	41
Woodville–Ashhurst	6	28
No. 6 Highways District—		
National Park–Taupo	21	20
Mangatupoto–Ohura	22	40
Bruce	8	45
Stratford–Taumarunui	37	13
Piopio–Tatu via Aria and Ohura	22	0
Ahititi–Ohura	16	61
No. 7 Highways District—		
Stratford–Taumarunui	63	13
Lepperton Junction–Inglewood	9	79
Ahititi–Ohura	15	32
No. 8 Highways District—		
Waiouru–Tokaanu	12	40
No. 11 Highways District—		
Murchison–Maruia via Matakitiki	33	10
Murchison–Maruia via Shenandoah	22	63
No. 12 Highways District—		
Waiho–Karangarua	31	25
Reefton–Hanmer Junction	42	50
No. 13 Highways District—		
Waipara–Kaikoura via Culverden	91	15
Red Post Junction–Jollie's Pass	23	20
Reefton–Hanmer Junction	40	30
No. 14 Highways District—		
Ashley–Balcairn via Marshmans	8	0
No. 16 Highways District—		
South Oamaru–Wainakarua	4	12
	1,052	20

The following Main Highways were classified as State Highways as from 1st April, 1948:—

NORTH ISLAND

	M.	ch.
No. 1 Highways District—		
Pakaraka–Awanui via Mangonui	68	6
Dargaville–Ohaewai via Waipoua Forest	93	9
No. 2A Highways District—		
Mangere Bridge–Papatoetoe	8	8
Waitakerei Scenic Drive	15	23
No. 2B Highways District—		
Thames–Coromandel	33	72
Tapu–Kaimarama	24	70
Tirau–Wairakei	24	30
Tauranga–Pairere	22	36
Kawhia Access	39	30
No. 3 Highways District—		
Tirau–Wairakei	29	65
Tauranga–Pairere	16	60
Te Ngae–Paengaroa	24	0
Opotiki–Te Araroa	70	59
Waiouru–Turangi	20	60
Rotorua–Waikaremoana	72	40
Taumarunui–Turangi	5	68
No. 4 Highways District—		
Opotiki–Te Araroa	30	66
Gisborne–Wairoa via Morere	25	32
No. 5 Highways District—		
Rotorua–Waikaremoana	12	58
Gisborne–Wairoa via Morere	32	73
No. 6 Highways District—		
Chateau (Bruce)	8	45
Taumarunui–Turangi	31	36
Ahititi–Taumarunui via Tatu	51	67
No. 7 Highways District—		
Ahititi–Taumarunui via Tatu	15	32
Waitara–Inglewood	9	72
No. 8 Highways District—		
Waiouru–Turangi	12	40
No. 9A Highways District—		
Palmerston North–Himatangi	16	32
Palmerston North–Levin via Shannon	10	0
No. 9B Highways District—		
Palmerston North–Levin via Shannon	19	76
Haywards–Paremata	9	40
Western Hutt	6	12
Khandallah–Johnsonville	1	10
Lower Hutt–Eastbourne	5	61

SOUTH ISLAND

	M.	ch.
No. 11 Highways District—		
Nelson–Stoke via Jenkins Hill ..	1	52
Murchison–Lewis Pass via Shenandoah	29	25
No. 12 Highways District—		
Waiho–Paringa(Karangarua–Paringa Road)	25	0
Murchison–Lewis Pass via Shenandoah	16	0
Reefton–Waipara via Lewis Pass ..	42	50
Westport–Greymouth (Coast Road)	60	67
No. 14 Highways District—		
Christchurch–Akaroa	51	19
Summit	8	40
No. 16 Highways District—		
Queensberry–Wanaka	16	1
Palmerston–Clyde via Becks ..	104	37
No. 18 Highways District—		
Riverton–Tuatapere	30	8
	1,256	7

Since the inception of the main highways system all field investigations, designing, and supervision, apart from that carried out by local authorities, have been undertaken for the Board by the Works Department, which receives payment in accordance with approved arrangements. The Board acknowledges the continued co-operation, and greatly appreciates the valuable services rendered by officers of the Department. It also greatly appreciates the loyal and efficient work of its engineering and clerical staff in carrying out its policy.

Signed on behalf of the Main Highways Board :

F. LANGBEIN, M.I.C.E., Chairman.

MAIN HIGHWAYS STATEMENT OF ACCOUNTS

STATEMENT SHOWING PARTICULARS OF NET EXPENDITURE ON CONSTRUCTION, RENEWALS, MAINTENANCE, ETC., FOR THE YEAR ENDED 31ST MARCH, 1949, AND TOTAL TO DATE

	Construction and Improvement of Main Highways.		Renewals of Main Highways.		Maintenance, Repairs, &c., of Main Highways.		Totals.	
	Total for Year 1948–49.	Total since Inception of Main Highways Act, 1922, to 31/3/49.	Total for Year 1948–49.	Total since 1/4/36 to 31/3/49.	Total for Year 1948–49.	Total since Inception of Main Highways Act, 1922, to 31/3/49.	Total for Year 1948–49.	Total since Inception of Main Highways Act, 1922, to 31/3/49.
Highways District—	£	£	£	£	£	£	£	£
No. 1	144,419	*1,768,900*	11,100	*463,292*	207,887	*1,890,859*	363,406	*4,123,051*
No. 2A	176,869	*3,505,068*	18,146	*278,358*	292,096	*3,863,417*	487,111	*7,646,843*
No. 2B	154,327		32,987		252,620		439,934	
No. 3	342,750	*1,482,921*	22,717	*93,699*	240,094	*2,101,170*	605,561	*3,677,790*
No. 4	57,603	*745,812*	1,328	*83,225*	130,152	*1,365,292*	189,083	*2,194,329*
No. 5	125,454	*1,137,136*	43,361	*245,396*	164,467	*1,915,193*	333,282	*3,297,725*
No. 6	40,788	*881,699*	9,172	*38,176*	68,283	*1,234,783*	118,243	*2,154,658*
No. 7	67,065	*1,030,461*	22,030	*79,493*	145,118	*1,357,899*	234,213	*2,467,853*
No. 8	76,553	*1,294,063*	47,053	*207,557*	125,628	*1,474,247*	249,234	*2,975,867*
No. 9A	41,506	*1,908,905*	165	*118,028*	65,173	*1,590,023*	106,844	*3,599,582*
No. 9B	199,838		3,715		83,402		270,391	
No. 10	26,485	*479,736*	16,691	*121,933*	56,623	*1,039,917*	116,363	*1,658,150*
Totals for North Island ..	1,453,657	*14,233,891*	228,465	*1,739,157*	1,831,543	*17,832,800*	3,513,665	*33,795,848*
No. 11	165,815	*1,383,100*	18,510	*87,005*	106,911	*1,388,246*	291,236	*2,858,351*
No. 12	75,650	*1,226,629*	19,663	*187,985*	130,561	*2,072,712*	225,874	*3,487,326*
No. 13	66,316	*461,823*	8,221	*71,235*	60,117	*666,182*	134,654	*1,199,240*
No. 14	29,591	*932,354*	2,600	*31,271*	84,043	*978,185*	116,234	*1,941,810*
No. 15	24,082	*590,243*	Cr. 536	*35,605*	77,780	*1,042,875*	101,326	*1,668,723*
No. 16	54,850	*1,031,529*	3,230	*30,811*	117,770	*966,267*	175,850	*2,028,607*
No. 17	131,050	*1,068,444*	1,119	*19,157*	120,986	*846,432*	253,155	*1,934,033*
No. 18	69,277	*1,144,731*	6,112	*61,314*	106,185	*1,061,664*	181,574	*2,267,709*
Totals for South Island ..	616,631	*7,838,853*	58,919	*524,383*	804,353	*9,022,563*	1,479,903	*17,385,799*
Totals for Dominion ..	2,070,288	*22,072,744*	287,384	*2,253,540*	2,635,896	*36,855,363*	4,993,568	*51,181,647*

MAIN HIGHWAYS STATEMENT OF ACCOUNTS—*continued*

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1949, AND TOTAL TO DATE

EXPENDITURE.		Total for Year 1948-49.	Total since Inception of Main Highways Act, 1922, to 31/3/49.
		£	£
Net expenditure on construction, renewals, maintenance, &c. (see separate statement)		4,993,568	*51,181,647*
Administration—			
Administration expenses (including salaries, travelling-expenses, office rents, printing, stationery, postages, and miscellaneous expenses) ..	£ 347,406	..	*2,287,960*
Fees and travelling-expenses of members of the Main Highways Board other than Government members ..	1,295	..	*27,433*
Miscellaneous expenses—			
Advertising, maps, rent of halls, traffic tallies, transport of samples, depreciation of furniture, &c. ..	2,637	..	*9,119*
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 ..	..	..	*9,887*
Grant to Transport Department towards Traffic inspection ..	..	..	*42,906*
Petrological laboratory and other experimental work, expenses of..	2,081	..	*24,885*
Total, administration ..		353,419	*2,407,205*
Loan charges—			
Charges and expenses of raising loans, management charges of Consolidated Stock on account of Construction Fund, &c.		..	*88,080*

INCOME.			Total for Year 1948-49.	Total since Inception of Main Highways Act, 1922, to 31/3/49.
			£	£
Public Works Account: Capital			1,969,628	*16,663,000*
Securities redeemed, Loans Redemption Account			..	*1,313,613*
Consolidated Fund—Public Debt Repayment Account			..	*55,720*
			1,969,628	*18,032,333*
		£		
Revenue from the Consolidated Fund		3,660,396		
Less Commission on collection by Post and Telegraph Department—				
Motor-registration fees and licences ..	£ 24,127			
Fees for registration and change of ownership ..	8,036			
		32,163		
			3,628,233	*45,288,755*
Interest from investments			..	*218,444*
Interest from local authorities on plant purchased on their behalf			4,781	*49,828*
Interest on advances to local authorities ..			1,650	*50,895*
Miscellaneous receipts			4,685	*45,736*
Rent of and tolls from ferries			..	*2,082*

Interest on amount appropriated out of Public Works Fund and paid into Main Highways Account Construction Fund	..	..	*796,900*		
Interest on loans, recoupment to Consolidated Fund (section 4, Finance Act, 1919)	..	..	*2,803,201**		
Transfer to reserve for redemption of main highway securities	..	..	*1,252,130*		
Payment to local authorities in commutation of toll-gate charges (Finance Act, 1925, section 20) ..	1,347	..	*43,690*		
Payment to Wellington City Council in commutation of fees chargeable in respect of motor-vehicles using Hutt Road (Hutt Road Act, 1939, section 6)	11,029	..	*460,570*		
Total, loan charges ..	———	12,376	*5,444,571*		
Subsidies, &c., in respect of other than main highways—					
Municipal Corporations (Municipal Corporations Act, 1933, section 71)	40,618	..	*571,943*		
County Councils and other local authorities (Finance Act, 1930, section 37)	200,432	..	*3,315,417*		
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)	..	..	*363,887*		
Maintenance and construction of roads giving access to outlying areas (Finance Act (No. 3), 1931) ..	..	..	*45,918*		
Total, subsidies ..	———	241,050	*4,551,058*		
Accumulated Revenue Account ..	..	..	*332,886*		
Balance, being liability to Public Works Account and Consolidated Fund	..	8,564	*Cr. 229,294*		
		£5,608,977	*£63,688,073*	£5,608,977	*£63,688,073*

* No interest charged after 30th June, 1944.

MAIN HIGHWAYS STATEMENT OF ACCOUNTS—*continued*

GENERAL BALANCE-SHEET AS AT 31ST MARCH, 1949

LIABILITIES.	—	Total.	ASSETS.	—	Total.
	£	£		£	£
Accumulated Revenue Account—					
Balance at 1/4/47	..	*332,886*	Sundry debtors	..	*31,138*
Sundry creditors	..	*648,127*	Advances to local authorities (Main Highways Amendment Act, 1926, section 2)	..	*52,551*
			Interest due and accrued	..	*2,156*
			Buildings and land	..	*112,361*
			Stocks of materials, tools, &c.	..	*434,411*
			Furniture, fittings, &c.—		
			Expenditure to 31/3/49	927	..
			Less depreciation to 31/3/49	920	*7*
			Plant and equipment—		
			For Main Highways Board—		
			Expenditure to 31/3/49	612,044	
			Less depreciation charged to works ..	587,975	*24,069*
			Purchased for local authorities—		
			Expenditure to 31/3/49	529,266	
			Less repayments of principal	434,240	*95,026*
			Liability of Public Works Account and Consolidated Fund—		
			Balance at 1/4/48	237,858	
			Less decrease to 31/3/49	8,564	*229,294*
		£981,013			*£981,013*

NOTE.—The Main Highways Account was abolished by Finance Act (No. 2), 1947, and has been replaced by votes in the Consolidated Fund and the Public Works Account.

J. W. SCOTT, A.R.A.N.Z., Chief Accountant, Ministry of Works.
F. LANGBEIN, M.I.C.E., 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.—J. P. RUTHERFORD, Controller and Auditor-General.

APPENDIX E

SEVENTH ANNUAL REPORT OF THE SOIL CONSERVATION AND RIVERS CONTROL COUNCIL

The Hon. the MINISTER OF WORKS.

SIR,—

In accordance with the requirements of section 33 of the Soil Conservation and Rivers Control Act, 1941, the Soil Conservation and Rivers Control Council has the honour to submit its seventh annual report for presentation to Parliament.

The report covers the period 1st April, 1948, to 31st March, 1949.

GENERAL

The Council met on eleven occasions during the year and inspections were made of the Southland, Otago, Manawatu, Wairarapa, and Rangitikei Catchment Districts.

Steady progress has been made with soil conservation and river control work during the year despite difficulties and delays beyond the control of the Council experienced in regard to the constitution of additional catchment districts and shortage of trained staff. No new catchment districts or soil conservation districts have been constituted during the year.

River control works have again accounted for the major expenditure, with the clearing of river channels a special feature. There has been a very large increase in drainage works both in old drainage districts and in new developmental areas. This work is responsible for a considerable immediate increase in production.

Only one major river control scheme and one major drainage scheme have been completed during the year, but several major proposals have been finalized and finance arranged, while proposals for several other major works are well advanced.

Lack of soil conservation staff has hampered progress on that side of the work, a fact which is giving the Council very considerable concern, as the putting into effect of soil conservation practices in our worst problem areas is a matter of considerable urgency. Education and publicity work has been effective up to a point in making landholders aware of the problem, but it is necessary to back this up with personal contacts by trained conservators.

The minor works scheme has been decentralized and procedure simplified, and this has resulted in a considerable speed-up of works. Catchment Boards and other constituent local authorities are taking increasing advantage of the maintenance subsidies offering for river and drainage work. Catchment Boards are still handicapped by lack of ready finance to cover the local share of the cost of minor works, general works, and maintenance. This has been met temporarily by special grants from the Council.

Boards received considerable assistance during the year by way of subsidies. A recent survey of authorizations indicated that rates of subsidy averaged 2·50 to 1 for river works, 1 to 1 for drainage works, and 3 to 1 for soil conservation works. Considering total expenditure, including special grants, Catchment Board contributions amounted to 27 per cent. of the total.

The total expenditure from the soil conservation and rivers control vote during the year 1948–49 was £464,942, as against £326,914 for 1947–48. In addition, local-body contributions amounted to approximately £160,000.

Several important amendments to the Soil Conservation and Rivers Control Act were made during the 1948 session of Parliament to facilitate the more efficient administration of the Act.

Although progress in soil conservation work has been somewhat disappointing for the reasons given above, valuable experimental and research work has been initiated by the Council on Council reserves and demonstration areas in co-operation with Catchment Boards and interested Departments. Of these, two projects are of special interest:—

(1) Experimental work in stabilizing a badly slumped area of 7,000 acres in the Waipaoa Catchment, Gisborne district.

(2) Experiments and trials with aerial distribution of fertilizer and seeds as applied more particularly to hill-country farming. This project gives indications of making a major contribution to erosion control on large areas of hill country, as well as increasing production.

Research and experimental work generally has been handicapped by shortage of trained staff and the necessary equipment and facilities.

The Council has strongly recommended that senior engineering and soil conservation staff should be sent overseas to gain experience and bring the Council up to date in regard to the latest developments in soil conservation work and river control engineering, and it is hoped to arrange this during the next financial year. Overseas specialists in soil conservation and river control should also be encouraged to visit New Zealand from time to time so that we may have the benefit of their advice.

The Council is endeavouring to co-ordinate its activities to the fullest extent with the work of all Government Departments, local bodies, and special authorities who can assist in furthering the work of soil conservation and river control in this country.

LEGISLATION

During the 1948 session of Parliament a further amendment to the Soil Conservation and Rivers Control Act was necessary for more efficient administration. Among other things, provision was made for the appointment by the Council of advisory and technical committees; the undertaking of hydrological research; simplification in procedure of appointments of non-elective members of Catchment Boards; classification for rating by agreement with landowners; adjustment of rating system for the collection of rates; modification of procedure for minor river and drainage works; purchase and sale of plant and machinery to Catchment Boards; and the extension of provisions for dissolution of special drainage or river authorities to include districts administered by the Crown.

Advisory Committees

During the year the undermentioned Committees have been actively engaged on the many aspects requiring consideration, and the Council is indebted to the assistance given and enthusiasm shown by the Committee members:—

Central Standing Committee, consisting of representatives of the Departments of Agriculture, Lands, Forestry, Grasslands Division of Scientific and Industrial Research, Soil Bureau of Scientific and Industrial Research, Botany Division of Scientific and Industrial Research, Meteorological Services, Marine (Fisheries Research), Internal Affairs (Wildlife), and Works, and Soil Conservation Council. The Committee advises on research and experimental aspects of the Council's activities.

Publicity and Educational Advisory Committee, comprising representatives of the Council, its staff, and New Zealand Catchment Boards Association, which advises on matters relating to information and publicity.

Technical Committee, Hydrological Data, an advisory Committee whose main function is the collection, correlation, and publication of hydrologic data. The personnel of this Committee is given elsewhere in this report.

Advisory and Co-ordinating Committee on Aerial Distribution of Fertilizer and Seeds, constituted by the Council for the purpose of investigating and making recommendations on aerial distribution. The Committee comprises the Chief of Air Staff, the Deputy Chief of Air Staff, the Director of Civil Aviation, the Engineer to the Council, the Senior Soil Conservator to the Council, and representatives of Federated Farmers of New Zealand, farmers' fertilizer companies, the New Zealand Fertilizer Manufacturers' Research Association, the Departments of Agriculture, Lands and Survey, Ministry of Works, Soil Bureau of Scientific and Industrial Research, and Grasslands Division of Scientific and Industrial Research.

CATCHMENT DISTRICTS

It is regretted that no new catchment districts have been constituted during the year, due to factors beyond the control of the Council.

The Local Government Commission held a further public inquiry into the constitution of the Wellington Catchment District as a result of objections received to the provisional scheme, but to date no final scheme has been promulgated.

Public inquiries were also arranged by the Local Government Commission into the proposed constitution of the Bay of Plenty and Waikato districts. The Commission approved a provisional scheme for the Bay of Plenty district, but objections were received and no date has yet been fixed for a further hearing. The hearing for the Waikato district was adjourned after the evidence had been heard, as the Commission wished to consider the Auckland and North Auckland districts in conjunction with the Waitako district before coming to a decision. Additional reports are now being prepared for the Auckland and North Auckland areas for submission to the Commission.

The twelve catchment districts and one soil conservation district already constituted cover approximately 58 per cent. of the area of the country, 40 per cent. of the population, and 50 per cent. of the rateable capital value. When the Wellington, Bay of Plenty, and Waikato districts are formed, this will give approximately an 85-per-cent. coverage of the Dominion. Other areas which will justify special submissions later are Marlborough, Wanganui, and Taranaki districts.

CATCHMENT BOARDS

The Otago Catchment Board was elected during the year and held its first meeting in November, 1948.

Other Catchment Boards have made considerable progress during the year in improving their organization and efficiency, and as a result the quantity of work has been increased and standards improved. Boards are handicapped in some cases due to lack of soil conservation staff and have also been handicapped to some extent by a shortage of man-power, material, and plant. The plant and material position has improved slightly, but difficulties still exist in regard to the supply of certain types of plant from dollar sources. Difficulties are still being experienced in regard to finance for minor works, maintenance, and works of a general nature, but these difficulties have been temporarily met by special grants from the Council. The Catchment Boards Association has been very active during the year in ensuring uniformity of procedure and practice in the administering of the Act and in putting forward recommendations for improvements. The relations between the Association and the Council have been most cordial.

SOIL CONSERVATION DISTRICTS

Investigations have been made and reports prepared in regard to the constitution of a soil conservation district in the Marlborough Sounds area, and a meeting of interested parties is to be held at an early date to enable a firm recommendation to be made. The Waitaki Soil Conservation Committee is functioning smoothly, and by exercising its powers with caution has gained the confidence of the landholders.

SOIL CONSERVATION

Progress in soil conservation is being severely retarded by lack of Council and Catchment Board soil conservation staff, and as a consequence only a minimum of work has been possible in information service, conservation surveys, demonstration and experimental work, and conservation operations. Indicated on Table III is the small amount of conservation work undertaken.

An important event of the year was the Seventh Pacific Science Congress, attended by noted conservationists from several countries. The Council arranged for Dr. E. S. Archibald, Director of Experimental Farms, Canada, and Dr. E. G. Holt, Research Specialist, Soil Conservation Service, United States of America, to undertake a comprehensive aerial reconnaissance of this country during the intersessional period. They expressed admiration for the excellent pasture and tree cover of the country, but were amazed at the seriousness of the soil-erosion problems in many parts—and in particular North Auckland, East Coast North Island, and South Island high country. They discussed problems of prevention and control with Catchment Boards, departmental officers, and Cabinet Ministers, and commended the regional administration by Catchment Boards. The dominant note at the Science Congress was the world food shortage, coupled with the soil-erosion problems of the Pacific Region and the consequent urgency of assessing by survey the land capability and conservation needs of each of the Pacific countries.

1. Information Service

(*a*) *Evidence to the Sheep Industry Commission.*—A comprehensive report covering the problems and the conservation needs of New Zealand and the Council's policy and organization as it affects the industry was prepared and submitted.

(*b*) *Scientific Papers.*—Papers titled "Modification in Land Use for Conservation in New Zealand" for the Seventh Pacific Science Congress and "Preliminary Aerial Top-dressing Trials" for the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, were prepared and forwarded by the Senior Soil Conservator.

(*c*) *Mobile Cinema Unit and Movie Films.*—During the past year this unit has continued to visit Catchment Boards in rotation, having made comprehensive screenings to schools and adult farmer audiences. The programme, consisting of the following films, has been made under the Council's direction in New Zealand: "Assets to Ashes"; "We Live by Water"; "Soil Conservation Work at Te Awa"; "Bringing Back the Balance"; "Farmers Tackle River Gully and Slip Erosion"; "Poverty Bay To-day and To-morrow." These films on the problems and their control in this country have been well received and the increased attendances augur well for the future of this service. A new programme is in course of production for the new circuit commencing next October.

The Council is appreciative of the ready co-operation and assistance of Catchment Board members, Federated Farmers, Young Farmers clubs, and headmasters of schools in increasing the scope of the mobile cinema Unit's service to the community.

(*d*) *Bulletins.*—The production of further bulletins is under action and supplies of those already published are exhausted. Reprints of technical papers published have been circulated freely.

(*e*) *Newsletter.*—Three quarterly cyclostyled newsletters have been distributed in a mailing-list of approximately five hundred. This feature is proving popular with staff and farmer members of Catchment Boards.

(*f*) *Film Strips and Lantern-slides.*—Production of new film strips and lantern-slides for use by district officers is being proceeded with as both are popular with teachers and lecturers.

(*g*) *Agricultural and Pastoral Show Displays.*—Comprehensive displays of models, photographs, diagrams, and specimens of material of use in soil conservation practice have been exhibited at the principal agricultural and pastoral shows in the North and South Islands. Catchment Boards co-operated freely in their respective districts to adapt the display to cater for the needs of the particular region.

(*h*) *Press.*—Considerable information has been made available through the good offices of the press, particularly the local press in the respective catchment districts, and the farmers' periodicals. To both, information and articles have also been contributed by the Council's staff.

(*i*) *Educational Committee.*—Close liaison with the Catchment Boards is maintained by this Committee, consisting of Catchment Boards Association representatives and Council's staff.

2. Soil Conservation Reserves and Demonstration and Experimental Farms

The Council's policy of directly tackling soil erosion and conservation problems on a practical basis on typical farm units in various problem areas in the country has been proceeded with, and positive encouraging results are already coming to hand.

(*a*) *Wither Hills, Blenheim.*—In a little over four years 400 acres of the worst sheet- and gully-eroded land in New Zealand has responded remarkably well to recuperative treatment. The benefits of comprehensive conservation treatment—spelling, fire and pest control, control of cattle and sheep grazing, contour cultivation, contour banks, modern pasture management, tree-planting, debris dams, adequate fencing and water-supply—are reflected in reduced run-off, control of sheet and gully erosion, as a result of good establishment of sown pastures and regeneration of native pastures.

Most important of all, the carrying-capacity has been doubled. The maintenance of this improvement is being further investigated by comparing cattle only with a sheep and cattle utilization on two comparable catchments on the farm. Data on pasture regeneration, run-off, soil loss, stream flow, soil structure, and costs and behaviour of sown pastures is being collected to record the recuperative changes taking place, and costs are being analysed. This project has revealed the beneficial effect on stream flow of comprehensive and inexpensive conservation measures applied over entire catchments.

(*b*) *Esk, Hawkes Bay.*—This reserve of approximately 7,400 acres was abandoned farming-land acquired in the interests of protecting the upper Esk Catchment. Control of fire has resulted in regeneration of protective fern and scrub, but since the greater part of the reserve is not suitable for farming, the Council has arranged for the State Forest Service to take it over and progressively afforest the area, reserving a small area for farming operations if such are found to be practicable.

(*c*) *Waerenga-o-Kuri, Poverty Bay.*—This farm unit of 998 acres was acquired in the Gisborne district in 1947 on typical slip and gully eroded unstable mudstone country for demonstration and experimental purposes. Comprehensive conservation measures are being applied in a unified farming programme to ascertain the cost and feasibility of soil conservation work on such country.

During the past year greater stock numbers have been carried as a result of a liberal top-dressing, a narrow cattle-sheep ratio, rotational grazing, cultivation for supplementary feed crops and later sowing to high-grade pastures, spaced tree-planting, gully control work, stock ponds, planting for stability and shelter, and revegetation of slip and flow areas, and the prospects are promising on this unstable country.

Nevertheless, information is acquired very often the hard and expensive way; failure in some gully control structures before they were well established has resulted in useful experience being gained very early in the programme of gully control.

Data on grazing management, history, behaviour of structures, run-off and soil loss, effect of trees on stabilizing slopes, and costs is being collected.

(*d*) *Tara Hills, North Otago.*—This single-unit sheep-run of 8,000 acres on typically eroded high country was acquired in 1947 to work out in practice a recuperation programme and its cost under the local conditions.

Besides the fire and rabbit control programme undertaken, regeneration of the critically important "winter country"—the lower sunny depleted and eroded slopes—has been commenced, both by fencing to control stocking of this land and by irrigation of flat areas to relieve the grazing burden on this essential country during the recuperative treatment (at least).

Data is being collected on the influence of management on the regeneration of native grasses and of burning, rabbits, sheep, and cattle on erosion, while new strains of native and exotic grasses, trees, and shrubs are used for trial purposes.

(*e*) *Adair, South Canterbury.*—On this 80-acre typical downlands property, portion of one of the first settlements in the South Island, acquired because of its derelict and eroded condition, good progress has been made in the erection of contour banks and broad-base terraces. On this farm the objective is to measure differences in terms of crop yields between contour-conservation cultivation practices and normal cultivation practices demonstrated side by side in adjacent fields.

Whether or not soil and water saving conservation practices successfully used overseas are satisfactory and what modifications are needed for our conditions will be determined as information is built up under continuous, precise conditions of observation and measurement.

Last season normal crop rotations and management were used, but fallowing for weed-eradication was necessary during the dry summer months.

(*f*) *Tangoio.*—On this 450-acre block adjoining unstable land acquired for highway-protection purposes, a recuperative treatment programme is under action. The danthonia-dominant pastures on the rolling to steep slip-eroded land have been spelled, top-dressed, oversown with subterranean clover, and prudently cattle-grazed, and are showing evidence of improvement.

In addition, slip-colonization trials and the effect of space planting of trees is being undertaken.

(*g*) *Mid Dome, Southland.*—Owing to the difficulty of providing a residence for the overseer, little has been achieved on this sheet and gully eroded mountain-side in the tussock high country of Southland. As soon as rabbits are brought under control much revegetation trial work will be undertaken to protect and stabilize slopes that now shed run-off and rubble to the actively aggrading streams that are choking the Oreti River.

(*h*) *Ihungia, East Coast, Poverty Bay.*—The space planting and gully-control work and the exclusion of cattle and sheep from this 192-acre block of very unstable country is having a beneficial effect in stabilizing the soil and reducing erosion, which threatens the highway above.

(*i*) *Tablelands, Eastern Wairarapa.*—The Council has been negotiating with the Lands Department to take over the management of one of the worst eroded sections in this fertile hill country during a restorative period of from five to ten years. Conservation practices proved to be effective on this property will have a wide application in the east coast districts of the North Island.

3. Co-operative Experimental Work With Catchment Boards and Departments

The team-work achieved through the Central Standing Committee (the Council's Advisory Committee on research and experimental work) has resulted in progress being made in tackling conservation problems, and individual Departments are actively pursuing research on particular aspects of soil conservation.

In addition, necessary work in some catchment districts has considerable experimental value if adequate records are maintained.

(*a*) *Te Awa.*—In co-operation with local farmers, the Manawatu Catchment Board and the Grasslands Division of the Department of Scientific and Industrial Research are doing research into the grassland problems of hill country. In addition to investigating the effects of management upon the pastures, valuable trial work on gully, stream, and slip control is being carried out.

(*b*) *Mangaweka.*—The Rangitikei Catchment Board, the Grasslands Division, and the Council are co-operating with a local farmer in hillside stabilization trials using various spacings of trees, improved management of pastures, and debris dams in various combinations on unstable slopes.

(*c*) *Waiouru.*—The Rangitikei Catchment Board, Grasslands Division, and State Forest Service have co-operated in revegetation trials on wind-eroded pumice grassland by extending their plantings of trees, shrubs and grasses affording them various types of protection.

(*d*) *Poverty Bay.*—Moderately successful results have attended the work of the Grasslands Division of the Department of Scientific and Industrial Research, the Department of Agriculture, and Poverty Bay Catchment Board in regrassing trials on slips and flow-eroded areas in the district.

(*e*) *Wairarapa.*—It is too early to expect results from the grassing trials carried out on slips by the Grassland Division, Department of Agriculture, and the Wairarapa Catchment Board.

(*f*) *Aerial Top-dressing and Seeding Trials.*—The preliminary trials in aerial distribution of superphosphate and pasture seeds organized by the Council and carried out by the R.N.Z.A.F. and Aerodromes Services of this Department gave considerable promise.

The R.N.Z.A.F. succeeded in making a suitable 1-ton hopper, which was attached to an Avenger aircraft. The trials at Ohakea proved that an adequate distribution of from 2 cwt. to 2½ cwt. per acre was obtained by flying at 400 ft. elevation in parallel flights 90 ft. apart at 125 miles per hour. Placement of the fertilizer and flying control on hilly terrain at Raglan were further investigated during very satisfactory trials on hilly pasture land.

At this stage a fully representative departmental, farmers', and fertilizer-manufacturers' advisory and co-ordinating Committee was set up by the Council, and larger-scale field trials were organized to extend over several farms on various types of soil, slope, pasture conditions, and terrain in the Wairarapa. A great deal of initiative and energy by the R.N.Z.A.F. in adapting old equipment and preparing a flight of three planes has made these larger trials possible.

The ballistics of various grass and clover seeds useful in oversowing native and sown pasture land were investigated in experimental distribution flights at Rongotai and information regarding height and pattern of spread were obtained.

Armed with this information, practical seed-sowing trials were undertaken at Tara Hills (200 acres), Awatere (50 acres), and Wither Hills (600 acres).

The distribution was reported as being very satisfactory and the strike good at Tara Hills and Wither Hills, and observations on establishment are being continued.

The inadequacy of fertilizer and seed-distributing equipment on the dominantly hilly and inaccessible pastoral land of New Zealand, and the fact that phosphate and clover are the key to conservation management of these lands, which are the backbone of New Zealand's live-stock industry, indicates the vital role the aeroplane could play in soil conservation and in the agricultural economy of the country.

4. Operations

(*a*) *Fire Control.*—The Council has taken active steps to control fire, mainly by the operation of Catchment Board by-laws. By this means, together with the enactment of the Forest and Rural Fires Act, it is felt that real progress has been made. However, the fact that the 1948-49 fire season has been a good one should not be regarded as evidence that the country's problems in this connection have been overcome.

(*b*) *Pests.*—As rabbits in many parts of New Zealand still constitute the worst cause of erosion, the Council has warmly welcomed the amendment to the Act and the constitution of the Rabbit Destruction Council.

The Council is appreciative of the extensive work done by the Department of Internal Affairs in controlling the depredations of deer, opossums, and goats. The damage to protective cover on unfarmed land by all three is serious from a watershed point of view, while the destructive effects of opossums is so critical in many farmed districts that tree-planting for conservation purposes is nullified.

(*c*) *Subsidy Work With Farmers.*—Increasing numbers of farmers have availed themselves of the Council's subsidies for conservation, tree-planting, and gully-control work :—

(i) A subsidy of £1 for £1 for spaced tree-planting on eroded or erodible land, which includes the cost of fencing, has resulted in much useful work being done.

(ii) A subsidy of £3 for £1 for gully-control and stabilization work involving structures has developed activity in this important class of work.

(iii) Assistance to the extent of the cost of survey has been made available to encourage the construction of contour banks, pasture furrows, and broad-base terraces.

5. Surveys

Valuable experience was gained in two conservation surveys of the Te Weraroa and Ruamahanga Catchments—geology, soil, climate, farming, forestry and river data was collected to provide basic information of the soil conservation and river control needs of each area.

CONSERVATION FORESTRY

During the last century the area of native bush in the Dominion has been reduced from approximately 27,500,000 acres to the present figure of 12,500,000. In this relatively short period of time the axe and the fire-stick have been employed with little discrimination on all types of bush country, of which much has proved unsuitable for farming. As a result, while vast areas of bush have been successfully converted to permanent pasture and arable land, there are now very considerable tracts which, for topographic, climatic, and other reasons, should be retired again to forest. Headwater control is the only permanent solution to the problems of the plains ; and the reafforestation of this deteriorating country, either by artificial planting or by the encouragement of natural regeneration, constitutes a major task in the conservation of those resources of soil and water upon which prosperity so largely depends.

Since the passing of the Soil Conservation and Rivers Control Act in 1941 there has been steady progress in the acquisition for conservation purposes of land unsuitable for agriculture, and up to the present time the Council has been an active agent in negotiating for the retirement of over 50,000 acres in the North Island and nearly 20,000 acres in the South Island. In accordance with a Cabinet decision, all such areas are first inspected by officers of interested Departments to ensure that no land which should legitimately be retained for farm production is retired for protection forest. In most cases representatives of the Department of Lands and Survey, the State Forest Service, the Department of Agriculture, and the Soil Conservation Council make these inspections jointly; but where special circumstances make it desirable, officers from the State Hydro-electric Department, the Department of Internal Affairs, or the Department of Scientific and Industrial Research may also be consulted. If large areas are involved, and more particularly where existing forest reserves adjoin, the State Forest Service has normally arranged to acquire the land and accept responsibility for its management; for smaller areas, control by Catchment Boards has been the rule; and it is the Council's practice to acquire as soil conservation reserves only those areas which are to be made use of as experimental and demonstration farms or where erosion problems are so severe as to require special treatment.

Of particular interest in the North Island is the afforestation scheme now being planned in the headwaters of the Esk River, in Hawkes Bay District. Here an area of 7,400 acres of steep, comparatively infertile country, most of which should never have been cleared for farming and which has been further impoverished by rabbits and other pests, was acquired by the Council as a soil conservation reserve, and later transferred to the State Forest Service for management and rehabilitation. Houses and hut accommodation for forest workers are being built, access roads constructed, and land for a tree nursery prepared. With the establishment of a settlement of forest workers in this remote submarginal country, the way will lie open for the completion of an ambitious scheme, first to exterminate pests and prevent bush fires, second to assist regeneration on the steeper slopes where protection forest is essential to control run-off and soil erosion, and third to plant production forests on the easier slopes in order to supply the timber needs of a district seriously deficient in forest resources.

In the South Island similar work has yet to be undertaken; and, in addition, a special problem of a different nature now faces the Council. Fire, overgrazing, and the ravages of pests have created almost desert conditions in the grassland of the high country. The tussocks and associated species are fast disappearing; and bare, gullied hillsides, screes, and shingle fans dominate the scene. Adverse environmental conditions now render hazardous the re-establishment of grasses; and the fact that much of the country lies outside the habitat range of native trees adds greatly to the difficulty of restoring a vegetative cover to the ground. To remedy this situation in the Waitaki Soil Conservation District, the Council is investigating the possibilities of certain exotic trees which are capable of thriving in conditions of low rainfall, poor soil, and severe winter frost. The stabilization of steep slopes and watercourses with these trees may yet prove not only the answer to flood and shingle-movement problems in the lower reaches of the rivers, but also provide conditions under which other plant species may be successfully reintroduced on the hills.

The work already undertaken by the Council is evidence of a growing realization that conservation forestry has a vital part to play in controlling erosion and run-off on hill country and in protecting the valuable agricultural land below; but attention must also be drawn to the formidable task which still lies ahead. Not only is the area surveyed to date a mere fraction of the total requiring examination, but there is also an urgent need for further research into conservation problems. Taking into consideration only the more obvious biological aspects of the work, it must be accepted that existing knowledge is inadequate: much has still to be learnt regarding the ecology of native

forest and grassland associations, regarding the behaviour and control of introduced animals and plants, and regarding land-use classification. Progress will be slow until these problems have received detailed study, and there is accordingly a real need for trained personnel to conduct this research and to apply in the field the knowledge so acquired.

HYDROLOGY

In 1946 the Council set up a permanent advisory Committee known as the Technical Committee, Hydrologic Data, to advise the Council on all matters concerning organizing on a national basis the collection and publication of basic hydrologic data—namely, rainfall, snowfall, evaporation, stream gauging, and ground water.

This Committee consists of the following members, or their representatives, all but one being resident in Wellington :—

A consulting engineer, who is Chairman, who is able to act for private enterprise, County Councils, Catchment and River Boards, and power engineers.
The City Engineers, Wellington and Auckland.
The Director of Meteorological Services, Air Department.
The Chief Civil Engineer, New Zealand Railways.
The Assistant Engineer-in-Chief (Civil), Ministry of Works.
The Assistant Engineer-in-Chief (Hydro), Ministry of Works.
The Director, New Zealand Geological Survey, Department of Scientific and Industrial Research.
The Soil Conservation Engineer and the Senior Engineer to Council.

This Committee has made several progress reports, which have been adopted by Council, the most important being—

(1) In May, 1946, that Meteorological Services should be requested to increase by 400 the number of manual rain-gauges in the national skeleton network, thereby increasing their density to 1 per 60 square miles in the more important river systems, and to increase by 100 the number of automatic recording rain-gauges.

(2) In May, 1947, that Council should increase the number of river-gauging stations to provide a reasonable first cover of the more important rivers, and a programme capable of being undertaken within the next few years, by 130 staff gauging, 76 automatic gauging, and 38 maximum-level-recording stations. It was estimated that the capital cost of these additional stations would be about £120,000, their annual maintenance cost about £7,000, and for field, analysing, and publishing staffs and miscellaneous costs some £24,000 per annum.

(3) In February, 1947, that Council should promote amending legislation for the control of ground water in order to define and protect the rights, within limited and restricted areas, of a large section of the population which depends solely, or partially, upon underground water for domestic, agricultural, and industrial purposes.

(4) In December, 1947, that Council should approve the agreement reached with the Director of Meteorological Services as to how rainfall data should be analysed and published monthly and annually.

Excellent progress has been made by Meteorological Services in intensifying their national skeleton network of rainfall stations. At the beginning of the year there were in the national network some 766 manual and 32 automatic rain-gauges, whereas by

March, 1949, these numbers had been increased to 830 manual and 45 automatic rain-gauges. Practically the whole of these increases have been made in sparsely populated areas from which it was so important to have records, and the increase has only been possible by landholders agreeing to care for the instruments and volunteering to take observations.

The Director of Meteorological Services has also been able to progress with the analysis of past excessive rainfalls recorded at every rainfall station in New Zealand. The statistics of these excessive falls are practically complete and copies for particular stations can now be supplied upon request.

Council wishes to place on record its appreciation of the active co-operation received at all times from Meteorological Services and also to acknowledge the continued assistance given by Catchment Board and Ministry of Works Engineers as well as all the voluntary unpaid rainfall observers in this basic data collection work.

It is regretted that, generally, the situation regarding river-gauging stations is not so satisfactory throughout the country. Practically all the difficulties can be attributed either to general staff shortages or to staff which might be available under normal circumstances being diverted to works which are more of the moment. While it was confidently expected that at least 4 stations authorized would be completed during the year, in actual fact none was built, this, however, being mainly due to the non-supply of steel forms. At the end of the year 3 stations were actually under construction.

Surveys of gauging-sites are continuing and two survey parties are being organized for hydrological work, one each in the North and South Islands.

Amending legislation concerning the control of ground water is under consideration.

During the year under review a thunderstorm, producing phenomenal intensities, was experienced in the Bay of Plenty area, while record floods were recorded in Poverty Bay and Wairoa and a heavy flood occurred in the Clutha River.

The Bay of Plenty thunderstorm occurred on the 17th to 18th April, 1948, and covered most of the coastal area of Bay of Plenty. The Tauranga automatic rain-gauge recorded 2 in. of precipitation in twenty minutes, 3·75 in. in one hour, 5·75 in. in two hours, and 8·35 in. in six hours.

In Poverty Bay on 13th May, precipitation was wide and heavy, various falls being recorded between 3·61 in. and 11·56 in. on that day, with between 1 in. and 3·96 in. on the preceding day. This rainfall resulted in a record flood in the Waipaoa River on 14th May, a peak discharge of 140,000 cusecs being recorded at Kanakanaia Bridge from a catchment of 606 square miles.

In the Wairoa River Catchment over the three days, 12th to 14th May, between 6·79 in. and 17·70 in. of rain fell, resulting in the largest peak discharge which has ever been recorded on a New Zealand river—namely, 404,100 cusecs at Wairoa Town Bridge from a catchment of 1,415 square miles.

Warm rains and snow, averaging about 1 in. of precipitation, fell in the upper Clutha Catchment on 28th and 29th October, giving a river fresh at Roxburgh of 37,500 cusecs on 30th October. Heavy rain again fell on 1st and 2nd November, in amount between 1 in. and 6·39 in., resulting in a flood of 78,000 cusecs at Roxburgh on 3rd November from a catchment of 6,660 square miles, and a flood of 100,000 cusecs at Balclutha on 4th November from a catchment of 8,100 square miles. At Roxburgh this is thought to have been the second highest flood on record, the largest, 117,000 cusecs, having occurred in September, 1878.

WORKS

Eleven Catchment Boards are now organized and have been energetically carrying out their functions. A twelfth Board, Otago, held its first meeting during the year and has not yet completed the appointment of its staff. During the year Catchment Boards have cleared willows and obstructions from 147 miles of rivers, protected 32 miles of river banks against erosion, built 29 miles of stop-banks, and dug 152 miles of drains.

The Council's schemes for minor works at fixed rates of subsidy are now well established. These cover four types of work—viz., space planting of trees to prevent earth movement, gully control works, small communal drainage schemes, and river control works. The extent to which the various Boards avail themselves of the subsidies offered is a measure of the particular problems of the district concerned. Thus the Poverty Bay district has completed thirty-two minor gully control schemes, Hawkes Bay twenty-one minor tree-planting schemes, and Manawatu seventy-one minor river control works. The minor drainage subsidy has not been so much used, generally because most drainage schemes exceed the £250 limit on such minor works. As would be expected however, Southland has made most use of it and has completed three works.

For the first time the Council has subsidized maintenance carried out under the control of Catchment Boards. This has chiefly been applied to drainage works and the subsidies paid were not high. The results, however, have been gratifying in that more work has been done, and done to a higher standard, than previously. The Council attaches great importance to this work, as much of its past expenditure on drainage has been on the reconstruction of drainage schemes which had been rendered inoperative by years of neglect.

Surveys and investigations have been completed and comprehensive control schemes designed for the Waipaoa, Lower Tuki Tuki, Mangatainoka, and Makarewa Rivers, while plans are well advanced for major works on the lower Ruamahanga and lower Manawatu Rivers.

Negotiations have been completed for two major river works, the Motueka, on which some work has already been carried out, and the Tauherenikau, on which work will begin next summer.

Hauraki Catchment District

The problems of this district are those of slow-flowing silt rivers and chiefly comprise drainage, willow-clearing, and stop-banking. Only 4 chains of river-bank have been protected against erosion. The Board was one of the last formed and has only in the past year started active operations. However, it includes some well-established drainage and river authorities, including the Waihou and Ohinemuri River improvement scheme, administered by the Ministry of Works, and the Hauraki Plains Drainage District, administered by the Lands Department. From April, 1949, this district also will be administered by the Ministry of Works.

County Councils and Drainage Boards have been active in clearing drains with the help of the Council's maintenance subsidy. A total of 32 miles 29 chains of main drains have been so cleared, all by means of plant. The Thames Valley Drainage Board has cleared willows from 30 miles 28 chains of the Waitoa River and from 1 mile 40 chains of a tributary. Hormone sprays have been used to kill second growth. Willow-clearing in the Waihou and Ohinemuri Rivers has been carried out by the Ministry of Works, 5 miles 60 chains having been cleared and a further 14 miles ring-barked and poisoned. In addition, 6 miles 70 chains of stop-banks have been built on the Waihou.

Three drainage schemes have been completed, the Tirohia-Rotokohu, the Hikutaia, and the Onetai. The Hauraki United Drainage Board's system has been extensively reconditioned, new drains dug, a tidal stop-bank built, flood-gates raised, and concrete

crossings built. In all, drainage work completed during the year has aggregated 4 miles 36 chains of new drains dug, 37 miles 4 chains of old drains reconditioned, 12 miles of stop-banks, and miscellaneous structural work on flood-gates and crossings.

Poverty Bay Catchment District

The steep mudstone hills in this district make it one of the worst in the Dominion for slipping and gullying. Consequently much work is being done with gully plugs, tree-planting, and other conservation measures. The Board maintains a special works unit to carry out experimental gully control work and to demonstrate the construction of gully plugs and debris dams to farmers. This demonstration work has been very successful and a number of farmers are now competent to undertake the construction of their own conservation works. For the control of various kinds of earth movement the Board has completed nine minor tree-planting schemes and thirty-two minor gully works. Experimental work to determine the most suitable type of dam for multiple installation in a gully and to test methods of stabilizing hillsides and reclaiming wide aggrading stream-beds is being carried out at Waerenga-o-Kuri Reserve and in the Te Weraroa Stream Catchment of the upper Waipaoa.

A major scheme for the control of 28 miles of the Waipaoa River has been designed. The timber groyne at the mouth has been repaired and extended and two Case groynes built to trap sand. These have been very effective. A series of five permeable timber groynes are to be built at Te Wairau Bend, and to date one groyne 150 ft. long has been constructed. A length of 34 chains of bank has been protected from erosion by anchored trees interspersed with plantings of boxthorn. The largest flood so far recorded in the Waipaoa occurred in May.

The May flood caused considerable deposition of silt on the river-flats in the lower reaches of the Waipaoa, completely choking drains. These have been cleaned out, partly by drag-line, but mostly by hand, the total length being 38 miles 4 chains.

Other river-works carried out have been the protection of 40 chains of the Waiapu by means of anchored trees, fascines, and willow planting, and the clearing of 3 miles 15 chains of willows in the Waihora. Second-growth willows have been sprayed with hormone in the Waihora ($5\frac{3}{4}$ miles) and in the Hikuwai ($11\frac{1}{2}$ miles). The digging of the main channel for the Taraheru drainage scheme has been completed, a length of 2 miles 40 chains.

Hawkes Bay Catchment District

This Board is concerned with shingle rivers, willow infestation, slipping hillsides, and sheet and wind erosion. Tree-planting has been used to advantage in stabilizing slips. A nursery has been established to provide suitable trees and twenty-one minor tree-planting schemes have been completed. Two minor gully works were also carried out.

A scheme has been designed to control the Tuki Tuki River for a distance of 6 miles upstream from its mouth. In the neighbourhood of Waipukurau and Waipawa work has been in progress for the last three years on the improvement of the Manga-o-nuku, Waipawa, Upper Tuki Tuki, and Makaretu Rivers. This has chiefly consisted of willow-clearing in the main channels, willow-planting on the banks, with the associated fencing to protect the young growth from stock, and the construction of anchored tree and willow fascine bank-protection. During the year 6 miles 50 chains of river has been cleared of willows and 34 chains of heavy and 2 miles 30 chains of light bank protection completed.

Rangitikei Catchment District

The main concern of this Board is, at present, the lower Rangitikei River, where work is in progress on channel improvement with some lengths of protection on bends. The work is being done to a previously established alignment so that ultimately, and with the assistance of the river itself, an adequate fairway will be provided over the whole length. During the year 2 miles of channel has been cleared of willows and gorse, 9 chains of diversion cuts have been excavated, and 37 chains of heavy and 48 chains of light bank-protection have been completed.

Three minor tree-planting jobs have been completed and some experimental work has been done in slumping country with tripod planting of willows. A timber company has been assisted with a scheme to reclaim sand-dunes for tree-planting. So far activities have been directed towards the establishment of marram-grass nurseries and towards the fencing of the area to be planted.

At Omatane 40 chains of new channel has been excavated for a stream coming off an eroded catchment which has obliterated its old course and was damaging fertile flats. Three concrete drop structures have been built and a twin concrete box culvert is under construction.

Manawatu Catchment District

Manawatu has been particularly active in the number of minor river works carried out, a total of seventy-one different jobs having been completed. Three minor tree-planting schemes and 1 minor gully control work have also been done.

The chief work has been on the Manawatu River. At McRae's Bend a 25-chain diversion cut was made and a timber deflector 108 ft. long built above it. At Scott's Bend 25 chains of bank is being faced with limestone rip rap and the equivalent of some 20 chains had been completed by the end of the year. Bank-protection of anchored and weighted trees interspersed with willow-plantings has been carried out at many places, while at others protection has been effected by constructing groynes of anchored and weighted trees with the subsequent planting of the bank with willows. Notable points where such work has been carried out are at Brotherston's on the upper Manawatu, at Old Foxton Road, and at Cowdrey's and Anderson's Bends. Three lengths of stop-bank, aggregating 41 chains and containing 26,500 cubic yards of earth, have been set back. These are known as Saunder's, Johnson's, and Barber's No. 4; work on the first was begun during the previous year.

Of the nine subsidiary drainage authorities, only four have so far applied for a subsidy on maintenance. These four have made good use of the assistance. Drainage works carried out during the year have been the completion of the Buckley Drainage Board's extension and of improvements to three drains by the Moutoa Drainage Board. The improvement of Seifert's Drain by the Makerua Drainage Board is 85 per cent. complete and that of the Manawatu Drainage Board's main drain in Taonui Basin is 55 per cent. complete.

In May there was a large flood which damaged works in the Manawatu; these have all been repaired. The same flood started erosion in other rivers in the district and gave rise to many of the minor river-works which have been carried out.

A comprehensive report has been prepared on a control scheme for the Mangatainoka River and for the upper section of the Otaki, while proposals for a control scheme on the lower Manawatu are well advanced.

Wairarapa Catchment District

Assisted financially by the Council, the Catchment Board made an experimental opening of Lake Onoke at a site not tried before on account of expense. This was so successful, and has been maintained so cheaply, that throughout the year maximum lake-levels, except during a flood, have been no higher than the previous minimum levels. This has permitted the grazing of a considerable area of marginal land that could previously only be used for short periods at long intervals.

A heavy flood occurred in the Ruamahanga River in May, and had it not been for the new lake opening, extensive and prolonged inundation in the neighbourhood of Lake Wairarapa would have caused considerable damage and loss of production. The flood caused erosion at many points in the upper reaches and damaged a number of the Board's works.

At Allsop's Bay a length of 89 chains of stop-bank has been set back on the west side of the river to provide a greater flood channel. This follows on after similar work on the east side done the year before. Further similar work is contemplated in a programme for the stage improvement of the channel between Lakes Wairarapa and Onoke. Besides a number of bank-protection works in the Ruamahanga, the Board has also carried out work in the Waipoua, Waiohine, Tauherenikau, Tauranganui, and the Waiorongomai, and minor works have been completed in other streams. Together all these works total 47 chains of willow-clearing, 75 chains of heavy bank-protection, 1 mile 29 chains of light bank-protection, 2 miles 6 chains of diversion cuts, and 1 mile 4 chains of stop-banks.

As a result of the May flood, which was the biggest in living memory in the Tauherenikau, the scheme for diverting this river was amended and stop-banking extended farther upstream. This scheme has been approved and a subsidy granted. Negotiations are in progress regarding a loan to cover the local share of the cost, and it is intended to start work next summer.

Nelson Catchment District

A major scheme has been drawn up for the lower reaches of the Motueka River and negotiations for finance completed. The scheme provides for the protection of rich alluvial flats on which most of the Dominion's tobacco is grown. Although work has not begun in earnest, several urgently needed parts of the scheme have been carried out, consisting of 29 chains of rip rap, 35 chains of stop-banks, and 14 chains of willow-planting. In various places a total of 25 acres of willows have been cleared.

Willows have been cleared from a choked length of the Anitoki and from two sections of the Waingaro River. In the Takaka River two cuts have been made and a bar at the entrance to Page's Cut removed. Good results have also been achieved by the removal of hard bars at the entrances to cuts at Fennel Island and Pugh's which has permitted the use of willows and retards to protect Pugh's Bend instead of the expensive rip rap previously proposed. Work is in progress on the Aorere River involving bank-protection, stop-banking, and channel-clearing. Together with twelve minor works in various rivers and streams, these works aggregate 7 miles 52 chains of channel-clearing, 56 chains of heavy bank-protection of anchored trees and willow-planting, 32 chains of light bank-protection, 38 chains of diversion cuts, and 58 chains of stop-banks.

North Canterbury Catchment District

As with Lake Wairarapa, low levels have been maintained in Lake Ellesmere throughout the year. This has been possible, partly due to the clemency of weather conditions, but also to the use of earth-moving plant which has been able to open the lake cheaply and expeditiously when conditions were suitable. For both these lakes,

and for Lake Forsyth, various schemes for permanent openings have been propounded. These were based on the difficulty of making frequent openings by hand methods. But, on last year's experience, it appears to be possible to keep the lake-levels within satisfactory limits by periodical openings with modern plant at a fraction of the cost of sinking fund and maintenance charges for a permanent opening.

The Sefton - Ashley - Saltwater Creek scheme for the control of gullies in the upper catchment and for the improved drainage of some 4,000 acres in the lower reaches has been started, and 30 chains of channel cleared through heavy willow growth. A larger scheme, involving diversions of the Eyre and Cust Rivers and improved drainage between Oxford and the sea, has been designed and approved, but financial discussions are still in progress. An improvement scheme is in progress in the Selwyn between Lake Ellesmere and the Hawkins. It involves the excavation of a larger channel in the lower reaches, willow-clearing, and stop-banking. To date 4 miles 20 chains of the heaviest work near Lake Ellesmere has been completed.

In the Ashley River 20 chains of willow gabion training-bank has been completed. Six miles of channel in the Eyre and Cust Rivers has been cleared of willows and surplus shingle. Similar work has been completed over some 4 miles of the Hawkins. In the Waimakariri the control works have been maintained. This has included $1\frac{3}{4}$ miles of anchored tree work and 42 chains of stop-bank.

Special wide weed-buckets have been developed for use with drag-lines for drain maintenance. A special bulldozer attachment is also in use for smaller drains. With this plant the Board has been active in maintaining the many miles of drains in its district and last year cleared a total $131\frac{1}{2}$ miles, all during the three months of the late summer when the work is most effective. A drainage scheme involving 4 miles of stream improvement and the reconstruction of $5\frac{1}{2}$ miles of drains has been completed at Wairiri. A length of $2\frac{1}{2}$ miles of Spencer's Drain in Waimairi County has been reconstructed. The Ellesmere County Council has nearly completed its drain-improvement scheme.

South Canterbury Catchment Board

The chief work of this Board is the clearing of the beds of wide shingle rivers which have become infested with willows and other growth. Work has been proceeding vigorously, and during the year under review a total of 64 miles 66 chains of clearing has been carried out in the Ashburton, Hinds, Orari, Waihi, Temuka, and Opihi Rivers. Having previously attempted to do the work by hand and machine methods on living trees, the Board is now successfully coping with the problem by an intensive use of hormones to first kill the trees and second growth. When dead, the trees are more easily removed by heavy tractors and the small dense growth by burning.

Another large work is the Ashburton-Hinds drainage scheme for the improvement of 87,000 acres and involving the reconstruction of 173 miles of old drains and the digging of 13 miles of new ones. An extensive drainage system was constructed half a century ago, but when the property was more closely settled lack of labour and other causes brought about a neglect of maintenance, so that ultimately the scheme became defunct. This work is now being reinstated and improved, and 149 miles of reconstruction and 9 miles of new drain have been completed to date, the lengths for the last year being 33 miles and 3 miles respectively.

Twenty-one minor river-works have been completed. In addition, larger works, some of which are still in hand, have been carried out in the Hinds, Temuka, Kakahu, Waihao, and Opihi Rivers and in Fairlie Township Creek. In all, this has involved 3 miles 16 chains of heavy and 3 miles 42 chains of light bank-protection, 65 chains of diversion cuts, and 3 miles 52 chains of stop-banks.

In Chapman's Creek, in the headwaters of the Ashburton River, experimental work has been carried out in the control of high-country creeks. Two unusual wind-erosion jobs were undertaken in the Clyde River where blow-outs in sand-dunes threatened to cause major river diversions. The breaches in the dunes were blocked with drums of shingle backed up by brushwood fences. These are successfully trapping sand blown from the wide river-bed and restoring the dunes.

Westland Catchment Board

No big works have been carried out during the year in this district of numerous large and rapid rivers and heavy rainfall. In Big River a 12-chain diversion cut was made and is satisfactorily operating. A similar cut 3 chains long was made in the Mawhera-iti. The heavy protective work completed last year in the Taramakau near Inchbonnie is functioning satisfactorily. Half the area between the stop-bank and the river was planted with willows and poplars during the year and further planting is to be carried out during the coming winter. In the Poerua, 8 chains of rip-rap protection has been completed and existing work strengthened. In the Kokatahi River a 15-chain stop-bank was built and was being protected with fascines. It was breached by a flood in December and repaired. In February a heavy flood carried away the new work before it had been adequately protected, and then proceeded to wreck the whole bank. Proposals have been prepared for very heavy work at this point.

Otago Catchment District

This Board held its first meeting in November and has yet to obtain staff before it can become fully operative. However, a considerable amount of work has been done in the district, mainly by the Lower Clutha River Trust. Some work has also been carried out by the Taieri River Trust and by County Councils under the direction of the Ministry of Works. It has consisted almost entirely of the maintenance of existing works, repairs to flood damage, and some very small river-works.

The Lower Clutha River Trust suffered a severe flood in November. In March there was another high flood which was just contained within the stop-banks. Inch-clutha has experienced a series of large floods of recent years and, except for a few small drainage works, the whole of the activities of the Trust have been directed towards the repair and strengthening of the flood-protection works.

The Taieri River Trust has completed the repair of the flood-gates at the Outer Area, Henley. This has amounted to almost complete reconstruction. Further work has been done to improve Lee Canal.

A total of 1 mile 20 chains of the Waipori River has been cleared of willows. Channel improvements have been carried out in the Kyeburn River over a length of about a mile, and in the Hopwood Burn 300 ft. of training-bank has been repaired and a further 500 ft. constructed.

Southland Catchment Board

Much of the land in Southland responds readily to improved drainage, and this type of work has been the Board's chief concern. A number of river-works, including twenty-seven minor ones, have also been carried out, and a major scheme prepared for the Makarewa River. Other comprehensive schemes are being investigated. Much of the drainage work has involved the clearing and enlarging of natural streams to provide better outlets for farmers' main drains. During the year Kingswell Creek (2 miles 47 chains), Taunamau Stream (1 mile 73 chains), Ota Creek (2 miles), and Opahaka Creek (5 miles 6 chains) have been improved in this manner. Work is in progress in two others—Moffett's Creek, where 60 chains has been completed, and Terrace Creek, a large scheme covering 18 miles 78 chains of natural channels, of which 2 miles 34 chains has been improved.

River-works have comprised 2 miles 36 chains of heavy weighted tree protection, 51 chains of light protection, 1 mile 11 chains of diversion cuts, and 3 miles 32 chains of stop-banks in the Aparima, Oreti, and Waikaia Rivers. In the Waimatuku River 1 mile 60 chains of channel has been improved.

Work Done Under Ministry of Works

In addition to the works done in catchment districts, the Council has subsidized jobs in other parts of the Dominion. These have been done either directly by, or under the supervision of, the Ministry of Works.

Auckland District

The Raupo Drainage Board has cleared 2 miles 48 chains of main drain, restored the Ruawai Stop-bank, and faced a length of 22 chains with spalls, and has removed a blockage caused by slumping at the mouth of the Muddy Mouth Deviation. The Otamatea County Council has cleared willows from 8 chains of the Kikiwhiti Stream as an experiment before embarking on a more ambitious scheme. In the Aka Aka Swamp 2 miles of drains have been reconstructed, and at Otaua, on the Waikato River, 1½ miles of stop-banks have been repaired.

Hamilton District

Works done directly by the Ministry of Works and the Lands Department in the Hauraki Catchment District have been included in that part of the report.

Willows have been cleared from a total length of 19 miles 29 chains in the Mangapu, Te Onetea, Mangaorongo, and Waipa Rivers and in the Koromatua, Ohote, and Mangaiti Streams. Further lengths have been poisoned. Bank-protection works consisting of 2 miles 14 chains of heavy anchored tree work, 19 chains of light work, 49 chains of rip rap, and 34 chains of diversion cuts have been completed in the Whakatane, Rangitaiki, Waiotahi, and Waimana Rivers.

Extensive drainage works have been carried out in the Waikato and Bay of Plenty areas both by Drainage Boards and by the Lands Department. A total of 5 miles 60 chains of new drains have been dug and 31 miles 29 chains of existing drains reconstructed.

Napier District

At Wairoa 40 chains of drain has been reconstructed. Two small river-works have been carried out.

Wanganui District

In the Wanganui River near Taumarunui two cuts have been made totalling 48 chains in length, one at Mananui and the other at Winter's Island. Nine chains of light bank-protection has been completed in the Mangarohoe and Waitewhena Streams where debris from an opencast coal-mine was causing serious aggrading. The planting of the spoil dump to prevent further slumping is being done by the Mines Department.

Wellington District

The excavating of a channel for the Otaki River by means of a tower excavator was completed during the previous year. This year the plant has been dismantled and 70 chains of stop-bank built containing 29,000 cubic yards of material. An 8-chain diversion cut has been made and 2,375 lineal feet of rail groynes built. The berms have been planted with willows.

In the Hutt River, flood-damage repairs have been carried out both by the Ministry of Works and by the Hutt River Board. The latter body has also built two timber and two stone groynes and a gabion weir 15 chains in length.

Christchurch District

In the Inangahua River further bank-protection has been carried out, a stop-bank was built near Cronadun, and some small cuts have been made and snags removed to improve the channel. In the Maruia River two protection works have been satisfactorily completed. Near Westport 40 chains of Bradshaw's Creek has been cleared of snags and enlarged. Two cut-offs totalling 9 chains have been made. In the Little Totara 4 chains of protection and 22 chains of channel improvement were completed. Repairs have been effected to 3 chains of eroded stop-bank and 6 chains of breached bank-protection in the Waiau River near Spotswood. Willows have been cleared from islands in the Kowhai River near Kaikoura. In all, this work amounts to 1 mile 5 chains of heavy and 3 chains of light bank-protection, 41 chains of diversion cuts, 8 chains of stop-banks, and 1 mile 62 chains of channel-clearing.

Dunedin District

In the Waitaki Soil Conservation District at Duntroon 10 chains of bank-protection work has been completed in the Waitaki River.

STAFF

The Council wishes to express its appreciation of the enthusiastic work of its small but efficient staff. During the year resignations have caused a slight reduction in staff, and difficulties have been experienced in effecting replacements and additions necessary to ensure that the work of the Council is fully effective.

APPRECIATION

The Council desires to record its deep appreciation of the assistance willingly tendered by Departments of State, Catchment Boards, local bodies, and farmers within New Zealand and particularly to soil conservation and river control authorities in the United Kingdom, Canada, Australia, United States of America, India, and South Africa, without whose experience and information progress would be slow indeed.

Signed on behalf of the Soil Conservation and Rivers Control Council:

W. L. Newnham, M.I.C.E., Chairman.

Table I—Statistics : Catchment and Soil Conservation Districts

The following is a complete list of catchment and soil conservation Districts constituted as at 31st March, 1949. The statistics have been obtained from Catchment Boards who supplied new valuations of constituent local authorities as at 1st April, 1948, and from the *N.Z. Official Year-book*, 1946 :—

Name.	Area (Approximate) (Square Miles).	Rateable Capital Valuation (Approximate), (£ Million).			Population (Approximate).	Headquarters of Board.
		Rural.	Urban.	Total.		
Catchment districts—						
Hauraki	1,360	13·8	4·2	18·0	45,000	Box 505, Te Aroha.
Rangitikei	2,896	14·4	2·5	16·9	26,470	Box 22, Marton.
Manawatu	2,700	27·6	12·6	40·2	75,800	Box 422, Palmerston North.
Hawkes Bay	3,055	18·1	11·7	29·8	57,800	Box 233, Napier.
Wairarapa	2,237	13·6	4·1	17·7	26,250	Box 41, Masterton.
Poverty Bay	2,135	10·8	5·0	15·8	31,500	Box 338, Gisborne.
Nelson	2,518	4·4	5·0	9·4	30,570	Box 41, Nelson.
Westland	6,306	1·9	3·0	4·9	26,820	Box 50, Greymouth.
North Canterbury ..	4,165	25·1	40·5	65·6	162,750	Box 788, Christchurch.
South Canterbury ..	4,326	20·8	8·5	29·3	61,850	Box 160, Timaru.
Otago	13,210	18·0	29·8	47·8	327,460	Box 620, Dunedin.
Southland	11,467	18·0	12·1	30·1	71,850	Box 408, Invercargill.
Totals, twelve catchment districts	56,375	186·5	139·0	325·5	944,120	
Soil Conservation District—						
Waitaki	4,600	3·0	0·0	3·0	4,750	Kurow.
Totals, catchment and soil conservation districts	60,975	189·5	139·0	328·5	948,870	
Totals, New Zealand (including Stewart and Chatham Islands)	103,416	315·6	331·5	647·1	1,702,298	
Percentage covered by catchment and soil conservation districts	59	60	42	51	56	

Table II Expenditure, 1st April, 1948 to 31st March, 1949

Item.	Voted, 1948-49.	Expenditure, 1948-49.	Miscellaneous Receipts.
	£	£ s. d.	£ s. d.
Flood and erosion control works	300,000	312,968 13 5	11,986 13 7
Hydrological data	20,000	7,425 6 6	91 17 5
Hydraulic model laboratory	15,000	11 11 4	..
Initial expenses of Catchment Boards and loans to local authorities	70,000	64,461 0 3	15,478 6 9
Investigations and surveys	15,000	7,695 12 8	479 7 2
Publicity and educational work	10,000	8,225 11 8	46 16 6
Research and experimental work	7,500	26,863 14 1	8,585 2 2
Soil conservation reserves : Acquisition and fencing	15,000	8,352 18 7	171 0 0
Soil conservation districts : Investigations and initial expenses	750	40 8 3	..
Soil conservation works	50,000	26,928 9 10	3,544 7 1
Travelling-expenses and fees of Council ..	2,500	1,968 7 10	4 17 2
Contribution from Consolidated Fund ..	..	..	5,000 0 0
Totals	505,750	464,941 14 5	45,388 7 10

Amount appropriated for year ended 31st March, 1949, £450,000.

Table III—Works Completed during Financial Year 1948–49

District.	Minor Works: Numbers of Schemes.				New Drains Dug.	Drains Reconstructed.	River Channel Cleared.	Heavy Bank-protection.	Light Bank-protection.	Rip-rap Bank-protection.	Diversion Cuts.	Stop-banks.
	Tree.	Gully.	Drain.*	River.*	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.
Catchment Boards—												
Hauraki	..	1	..	4	4 36	37 4	31 68	0 3	..	0 1	..	18 70
Poverty Bay ..	9	32	..	9	2 40	38 4	3 15	1 2	0 57	..	..	..
Hawkes Bay ..	21	2	..	..	..	..	6 50	0 34	2 30	..	..	..
Rangitikei ..	3	1	..	3	0 40	..	2 0	0 37	0 48	..	0 9	..
Manawatu ..	3	1	..	71	0 47	4 41	0 7	6 1	5 41	0 21	1 30	0 65
Wairarapa ..	1	4	1	25	0 23	..	0 47	0 75	1 29	..	2 6	1 4
Nelson	..	..	..	12	..	..	8 27	0 56	0 32	0 29	0 38	1 13
North Canterbury ..	3	..	1	2	..	8 30	26 17	0 44	..	..	0 56	..
South Canterbury ..	4	1	..	21	3 10	33 40	64 66	3 16	3 42	..	0 65	3 52
Westland	..	..	..	1	..	..	..	0 45	..	0 8	0 15	0 20
Otago	..	..	..	..	..	..	1 40	..	..	..	..	0 8
Southland ..	2	..	3	27	..	19 4	1 60	2 36	0 51	..	1 11	3 32
Totals Catchment Boards	46	42	5	175	11 36	140 43	146 77	16 29	15 10	0 59	6 70	29 24
Works districts—												
Auckland	..	..	..	..	..	4 48	0 8	..	..	0 22	..	..
Hamilton	..	..	..	..	5 60	31 29	19 29	2 14	0 19	0 49	0 34	..
Napier	..	..	..	..	..	0 40	..	..	0 2	..	..	..
Wanganui	..	..	..	..	..	..	..	..	0 9	..	0 48	..
Wellington ..	..	..	..	..	..	..	..	0 34	0 10	..	0 8	0 48
Christchurch ..	..	..	..	..	..	..	1 62	1 5	0 3	..	0 41	0 8
Dunedin	..	..	..	..	..	..	..	..	0 10	..	..	..
Totals, works districts	..	..	..	..	5 60	36 37	21 19	3 53	0 53	0 71	1 51	0 56
Grand totals ..	46	42	5	175	17 16	177 0	168 16	20 2	15 63	1 50	8 41	30 0

*Lengths of respective types of work entered under applicable heads in other columns.

APPENDIX F

ANNUAL REPORT ON BUILDINGS BY THE GOVERNMENT ARCHITECT

The GOVERNMENT ARCHITECT to the Hon. MINISTER OF WORKS.

SIR,—

I have the honour to submit the following report on the activities of the Architectural Division for the year ended 31st March, 1949 :—

Work has proceeded satisfactorily despite difficulties common to the whole building industry. Shortages of man-power have necessitated negotiation with contractors, in some cases causing delays in the commencement of contracts, while shortages of materials and the necessity for the introduction of substitutes have retarded progress. Shortage of subcontractors, particularly for the mechanical engineering work now so essential in modern buildings, has led to further delays.

These problems, together with that of obtaining competitive tenders for works distant from contractors' headquarters, have made estimating and the evaluation of tenders most difficult.

The position regarding technical and clerical staff remains difficult, and will continue so whilst such a vast programme of work remains to be undertaken.

More senior staff with experience are still needed to deal efficiently with the work in hand and to give adequate departmental training to junior men.

Professional and technical liaison with all Government Departments has been maintained, and the aim to co-ordinate and standardize the work done in the Division has been recognized as being to the advantage of all concerned. During the year an architectural group was established to work in close association with the engineers of the State Hydro-electric Department, and further steps have been taken to unify fire-protection services.

Professional and technical advice has been given to the Accommodation Board, and work has also been carried out for the Earthquake Damage Commission, the Standards Institute, and the Local Government Loans Board. Where it has been found necessary to assist other Departments with their architectural work, qualified officers have been seconded to those Departments.

Maintenance of buildings owned by the Government is increasing and it is evident that a special section will need to be formed to carry out this class of work. In this connection the district workshops must play an important part.

During the year a tornado, passing through Frankton and Hamilton, did extensive damage to houses and commercial buildings, and I am pleased to report that the staff of the Division carried out emergency repairs and reinstatment in a commendable manner.

The expected visit of Their Majesties to the Dominion threw a large volume of preparatory work on some of the staff, particularly on those in the workshops at Wellington. Although it is regretted that the visit was postponed, this work reduced routine production considerably.

The following summary indicates the extent of the work handled by the Division during the year :—

	£
Works completed and under construction	2,137,000
Working drawings completed or in hand	1,150,000
Sketch plans were prepared for buildings and ancillary work to the value of	2,500,000
Workshops handled work to the value of	351,100

During the year the following works were carried out :—

Department of Agriculture

At Motutapu the stock lairage was completed by the workshops staff. Alterations and additions are proceeding at Flock House, Bulls.

Air Department

The replanning and fitting up of the Air Movement Building at Whenuapai has been completed, and barracks have been moved from Ardmore and re-erected at Te Rapa for staff accommodation. At Hobsonville existing buildings have been converted to a training-school, while others in Fanshawe Street, Auckland, have been converted for the R.N.Z.A.F. Transport Section. Construction of air-traffic-control towers at Napier, Taieri, and Gisborne is proceeding. To provide more staff accommodation at Wigram a recreation-hall has been converted into flats. At Westport Aerodrome extensions to the Passenger accommodation amounting practically to a new building, and a small housing for the anemometer, have been completed.

Education Department

The Pasadena Intermediate School assembly-hall was completed.

Alterations were carried out at the old Newmarket School and at the Titirangi School for the Deaf.

At the King Edward Technical College, Dunedin, a domestic-science block was completed and extensions to the heating installation at the South Otago High School were carried out.

At the Auckland University College additional staff-rooms were added.

To repair earthquake damage and strengthen the structures, contracts have been let for work at the Wellington East Girls' College, the Hawera Technical School, and the Palmerston North Technical School. A laundry at the Burwood Girls' Home is also under construction. At Sumner School for the Deaf the alterations to the kitchen are nearing completion. The erection of the new Southland Technical College is proceeding, but delays are being experienced due to shortages of cement.

A major project has been undertaken at Lincoln College, where construction is proceeding on a large dormitory block and a high-level water-storage tower.

Hospitals

At Burnham existing buildings have been converted for the accommodation of pensioners. The large St. Helens Maternity Hospital at Christchurch is still under construction, the structural shell of the main building having been completed.

Internal Affairs Department

At Government House, Wellington and Auckland, extensive alterations and renovations were completed in preparation for the Royal visit.

Soldiers' Graves

At Waikumete Cemetery a semi-lawn scheme has been completed. Similar work is in hand at Taita and Akatarawa.

Internal Marketing Department

At Tauranga a factory was built and plant installed for the processing of citrus fruits. Fruit-storage accommodation has been erected in the Otago area.

Labour and Employment Department

Miners' hostels have been completed at Reefton and Ohai. To provide accommodation for one hundred single men at Huntly a miners' hostel was constructed. Another similar, but smaller hostel was erected at Ohura. At Blackball a third hostel to accommodate twenty-four miners, a manager, and staff is under construction.

Surplus military camp buildings at North Head and Narrow Neck were converted for the accommodation of male and female immigrants, and similar work is in hand at Dunedin.

Maori Affairs Department

At Halsey Street, Auckland, a Maori community centre has been constructed, and at Rotorua the Janet Fraser Memorial Hostel has been completed and occupied.

Renovations to the Rangiatea Church, Otaki, are proceeding.

Mental Hygiene Division

Considerable work in the nature of alterations and additions was carried out at the Seacliff Mental Hospital. The F 2 Ward was completed. Alterations and improvements have been made to buildings at Ravensthorpe and Avondale. New villas have been completed at Porirua. The major building scheme at Lake Alice is proceeding steadily, work being concentrated on the eleven-bed and the fifty-bed villas.

Ministry of Works

Conversion work has proceeded during the year on the plant depot at Mangere Crossing. The first phase of the workshop and office block is complete and the removal of Army buildings for conversion to staff residences is nearing completion. At Lake Pukaki the works office was completed. Camp accommodation is near completion at Porirua.

The Blenheim Road Store, Christchurch, is under construction. The roof framing has been delayed due to the shortage of structural steel, but work is once again proceeding.

The plant depot at Sockburn was completed.

National Broadcasting

Work consisting of alterations, extensions, and redecoration was carried out at the 4YA and 4ZB Studios. New studios have been provided for stations at Rotorua and Whangarei. Alterations have been made to the Gas Co. Buildings, Christchurch, for 3XC.

Navy Department

To provide more adequate fire protection in stores and workshops at the Devonport Naval Base, extensive automatic sprinkler systems are being installed. Huts for staff accommodation have been erected at H.M.N.Z.S. "Tamaki." Extensive alterations have been carried out at the St. Mary's Bay depot for Volunteer Reserve training.

Police Department

New police-stations were erected at Karamea and Dobson and a lock-up completed at Chatham Islands. At Fairlie a new police-station is under construction.

Post and Telegraph Department

Te Kuiti post-office has been completed and Feilding Post-office is nearing completion. The following are under construction: Balclutha and Hokitika Post-offices, Nae Nae and Riccarton Telephone Exchanges, Cheviot Post-office carrier equipment building, and Fairlie line store and garage.

Scientific and Industrial Research Department

A laboratory has been erected at Mount Albert for the Plant Diseases Section. At Christchurch Magnetic Observatory additional buildings are under construction. The conversion of a building for the Entomology Station, Ashburton, has been completed.

State Hydro-electric Department

Additional accommodation for Head Office staff has been constructed in Sydney Street, Wellington. The Half-way Bush concrete additional building has been completed.

Tourist and Health Resorts Department

Extensive alterations have been carried out at the Wairakei Hotel. Mountain huts at Mount Cook are being renovated.

General

All the workshops have been extremely busy during the past year on various works half of which were services rendered to other Departments for office furniture and internal office alterations.

In addition to the engineering services included in the above-mentioned works, engineering installations including heating, electrical, air-conditioning, refrigeration, mechanical, and fire protection services were carried out to the value of £319,949.

In conclusion I again wish to place on record my appreciation of the continued loyalty and efficient service of my staff. In the retirement of Mr. G. F. Penlington, Assistant Government Architect, after a long career of service in the Division, the organization has lost a most capable officer. I wish to record my appreciation of his support and unfailing devotion to duty.

I wish also to acknowledge the co-operation of officers of other Divisions and Departments, of the master builders, and the many organizations of the building industry.

R. A. Patterson, F.N.Z.I.A., F.I.A.A.,
Government Architect.

APPENDIX G

ANNUAL REPORT OF THE DIRECTOR OF HOUSING CONSTRUCTION

THE DIRECTOR OF HOUSING CONSTRUCTION TO THE HON. MINISTER OF WORKS.

SIR,—

I have the honour to submit the following report on the Division's activities for the year ended 31st March, 1949.

1. GENERAL

The number of houses completed and handed over by the Housing Division during the past year reached the record figure of 4,193, as against 3,210 for the preceding year, while a further 3,587 houses were under construction at 31ST March, 1949. In the Auckland District the carpenters' dispute came at a critical period of the year and the loss of completed houses was estimated at 50. The Auckland District programme for this year will also be seriously hampered.

It is pleasing to report that the material supply position in certain directions has shown a distinct improvement over the past year, but it is still by no means satisfactory, and is discussed in the following section.

Every effort is being made to introduce new contractors to State housing work, particularly in the smaller centres, where there is always difficulty in letting contracts. Special attention is also being given to reducing the average time for completion of houses, and considerable improvement in this direction has already taken place.

2. BUILDING CONSTRUCTION

Although the past year has been a record one for house construction, the results have not been achieved easily and the demand for certain material items continues to outstrip the available supplies. Apart from the shortage of cement, the biggest difficulty is the shortage of exterior sheathing-materials, whether wood, brick, or cement board, and periodic local shortages of particular lines.

The use of *Pinus insignus* has alleviated the shortage of framing-timbers, although its use for weatherboard framing cannot be unreservedly recommended. This is mainly due to the fact that, as yet, a satisfactory protective paint has not been produced, although exhaustive tests are being carried out.

A contract has been let for the construction of two experimental houses in sun-dried brick, but it is most unlikely that such a method of construction will be adopted to any extent, due to the heavy labour cost. Such houses cost more to build by contract than the most expensive type of brick or concrete house.

Although the activities of the Rehabilitation Department's trainee scheme has resulted in a considerable increase in the number of carpenters, there would appear to be no corresponding increase in the number of men engaged in the sub-trades. This has given some concern over the past year and the completion of houses has been held up for lack of subcontractors, more particularly in the painting trade.

With the virtual completion of the housing scheme in the Hutt Valley, construction is well under way on the first units at Titahi Bay in the major project for the Porirua Basin, where it is planned to build approximately 3,000 houses. Progress is being well maintained at Tamaki (Auckland) where it is planned ultimately to build 6,000 houses; indeed, in all the main towns major schemes are proceeding.

Constant review and revision of existing standard houses to effect improvements are taking place. New designs have been added to those already in use, and the standard specification has been rewritten.

3. SHOPS

To ensure that the tenants in new State housing areas are provided with adequate shopping facilities, plans have been prepared for all those places where major schemes have been undertaken. Shops at Orakei and Taita were completed and opened for business during the year, and four shops at Corstorphine, Dunedin, are nearing completion. A total of 17 shops were completed and opened for business during the year.

Contracts have been let for a further 11 shops, and plans have been prepared for shops in twelve other areas.

4. FLATS

(*a*) The lack of reinforcing-steel and cement has necessitated the suspension of schemes for blocks of flats in all the main centres, with the exception of a small six-unit block at Petone which is under construction.

Plans and specifications have, however, been prepared for blocks of flats in other towns, particularly Auckland and Christchurch, so that when the supplies are available, construction can be commenced immediately.

(*b*) Pensioners' Flats.—During the past year, work has proceeded on the preparation of plans for two blocks of pensioners' flats in Ponsonby, Auckland. The plans for the block in Picton Street, which consists of nine units, have now been completed, contract documents are being prepared, and tenders for the construction of the block will be called very soon. Structural drawings for the larger block of thirty-six flats in Bayard Street are in hand and work is proceeding satisfactorily. In both of these blocks every consideration has been given to the comfort of the tenants, as in the Picton Street block, where there is a community laundry and drying-room, electric cooking and heating, and gas-coppers. All the flats are of the one-bedroom type.

Sites are held in a number of the larger towns on which it is proposed to build accommodation for pensioners, and several building schemes for the housing of elderly people will be undertaken during the coming year.

5. SIZE OF HOUSES

The following table sets out the various sizes of houses built during the year and at present under construction as compared with previous years.

The proportion of larger-sized houses built continues to increase.

	Units Completed.					
	1948–49.		1947–48.		Total to Date.	
	Number of Units.	Percentage of Total.	Number of Units.	Percentage of Total.	Number of Units.	Percentage of Total.
Bed-sitting room	..	..	8	..	231	1
One bedroom	24	1	137	4	2,477	8
Two bedrooms	1,462	35	1,214	38	12,990	42
Three bedrooms	2,357	56	1,593	50	13,149	43
Four bedrooms	348	8	253	8	1,801	6
Over four bedrooms ..	2	..	5	..	76	..
	4,193	100	3,210	100	30,724	100

6. WORK FOR OTHER DEPARTMENTS

(*a*) This aspect of the Division's work continues to assume greater proportions. During the year 779 houses were completed for other Departments, as compared with 335 the previous year.

Apart from the erection of timber-workers' dwellings and farm houses for land-settlement, the most important work was the provision of dwellings for workers engaged on hydro-electric construction work.

The model village at Mangakino for the construction workers engaged on the Waikato River hydro-electric development scheme is nearly complete. This marks an epoch in the history of New Zealand in that it is the first township complete with all services, including shopping, offices, hospital, Plunket rooms, cinema, hostel, community centre, &c., that has been planned and built in this country as one co-ordinated undertaking. A similar project has been planned for Roxburgh.

Hostels have been designed and construction is well advanced at Kaingaroa in the North Island and Golden Downs in the South Island for the State Forest Service. Plans for a hostel in Lower Hutt for the housing of junior public servants obliged to live away from home are in an advanced stage.

The following is an analysis of house units built for other Departments :—

Department or Service.	Completed, 1948-49.	Completed, 1947-48.	Completed up to 31st March, 1949.	Under Construction at 31st March, 1949.
Agriculture	4	4	47	2
Air	44	..	44	..
Army	29	..	128	22
Education	..	2	4	2
Forestry	37	8	76	62
Health	3	..	5	6
Hydro-electric	187	59	246	19
Land-settlement	107	145	404	128
Marine	1	..	2	..
Marketing	..	..	22	..
Mental Hospitals	..	2	5	3
Mines	..	1	66	..
National Airways	..	..	..	3
National Broadcasting	8	1	18	2
Police	1	1	2	..
Post and Telegraph	23	12	76	15
Ministry of Works	17	16	142	1
Railways	39	14	65	20
Rural	1	8	149	..
Scientific and Industrial Research	1	1	4	..
Timber workers	269	44	321	63
Social Security	8	..	1	..
Dairy factories	..	17	17	..
Rehabilitation	..	..	1	..
Fire Boards	..	..	..	6
Totals	779	335	1,845	354

(*b*) *Land-settlement.*—Housing to enable ex-servicemen to be settled on the land continues to hold the first priority among the many urgent claims upon the services of the Division.

Although only 107 houses were completed during the year, 128 are under construction and contracts for 72 more have been let. Plans for 118 units have been prepared for tendering.

These figures take no account of miscellaneous farm buildings which were built during the year or of old farmhouses which were renovated or converted into modern farm residences. A summary of this work is as follows :—

——	Auckland.	Hamilton.	Napier.	Palmerston North.	Wellington.	Christchurch.	Dunedin.	Total.
Renovations and conversions	2	..	2	8	..	25	..	37
Implement-sheds	7	32	27	18	1	28	8	121
Milking-sheds	4	19	3	16	1	13	..	56
Piggeries	2	..	..	..	..	7	..	9
Pump-houses	..	..	..	..	..	..	2	2
Stables	..	..	1	..	..	2	..	3
Wool-sheds	..	1	2	1	1	15	2	22

The greatest difficulty encountered in the building of rural houses is the reluctance of builders to undertake work in isolated country areas when there is ample work available in the towns. Nevertheless, some builders have co-operated willingly with the Division and have undertaken work in an effort to facilitate the rehabilitation of ex-servicemen and to assist the economy of the Dominion.

(*c*) *Timber-workers.*—The scheme for the provision of portable houses for timber-mill workers which was commenced in 1947 is proceeding very satisfactorily.

These houses are partly financed by a levy on timber-production through the Timber Production Advisory Committee.

During the year 269 houses were completed, and at 31st March 63 were under construction. Contracts have been let for 90 more, and arrangements are in hand to let a further 53.

These houses were designed for prefabrication in the factory and erection on the site, although many builders prefer to do the whole of the construction on the actual site

7. REHABILITATION TRAINEE CONTRACTS

The year was one of considerable activity for rehabilitation trainees. During the year, 1,044 houses were completed, bringing the total to date to 2,276. In other words, 46 per cent. of the total houses built under this scheme were completed in the twelve months ended 31st March, 1949.

The following tables show the trainee activities in each housing district, together with comparative figures for previous years :—

——	Auckland.	Hamilton.	Napier.	Palmerston North.	Wellington.	Christ-church.	Dunedin.	Total.
				UNITS HANDED OVER				
Up to 31st March, 1947	122	40	65	20	150	79	68	544
Year ended 31st March, 1948	141	61	88	43	96	163	96	688
Year ended 31st March, 1949	202	70	151	103	214	190	114	1,044
Total to date	465	171	304	166	460	432	278	2,276
				UNITS UNDER CONSTRUCTION				
As at 31st March, March, 1947	152	50	118	59	167	162	93	801
As at 31st March, 1948	200	112	163	119	211	187	138	1,130
As at 31st March, 1949	183	133	103	110	136	112	136	913
				NUMBER OF TRAINEES EMPLOYED				
As at 31st March, 1947	488	167	206	145	396	312	199	1,913
As at 31st March, 1948	526	301	270	258	416	326	334	2,431
As at 31st March, 1949	398	205	272	305	334	302	255	2,071

8. LAND ACQUISITION AND DISPOSAL

The acquisition of land for subdivision and development into sites for State housing purposes has been well maintained, and during the year approval has been obtained to acquire either by direct purchase or under the Public Works Act sufficient land to provide an additional 3,816 houses in 62 different towns. Since the inception of the Government's housing scheme, land sufficient for a total number of 52,110 house units

has been acquired in 185 different towns, irrespective of the areas required for setting apart as recreational or plantation reserves which may be associated with the larger subdivisions.

Particular interest centres on the Wellington scheme for the large development in the Porirua Basin and at Titahi Bay, where land for 830 units has already been acquired for housing purposes and further acquisitions are proceeding.

In regard to the disposal of building sections, while every endeavour has been made to meet the demand for sections by returned servicemen and others, owing to the necessity of maintaining an adequate supply of serviced sections to meet the requirements of building contractors and the carpentry trade training schools it has not been possible to make as many sections available for disposal as had been hoped. During the past year a total of 54 sections in 7 towns have been approved for release, excluding sites for churches, kindergartens, schools, and other purposes. To date 471 sections in 37 towns have been released. This does not include 24 shop-sites which have also been sold to ex-servicemen.

9. PLANNING

The preparation of detailed planning schemes has proceeded in advance of the building requirements throughout the country. Of major schemes at present in hand, the detailed planning of the 6,000-unit Tamaki block, Auckland, is virtually completed, and negotiations are in train with educational, religious, and kindergarten bodies and other associations in connection with their special site requirements. At Mount Roskill, in the Winstone Park area, blocks totalling 500 units have been tentatively schemed.

The extensive Porirua-Titahi Bay project has reached the stage where some 700 units have been planned within a broad outline plan covering a wide area and which will finally embrace approximately 3,000 units.

In Invercargill a single scheme incorporating some 700 units has been finalized, and it is anticipated that this will enable the State housing requirements in that city to be met for ten years ahead.

At Whangarei a complete roading layout has been prepared for the 600-unit Otangarei block, and subdivision of 130 of these units has been completed. At Hamilton detailed planning has been completed of over 300 of the 400 units in the Fairfield area. In New Plymouth exhaustive investigations have been completed on two blocks totalling 550 units, and outline schemes have been prepared for approximately half of these.

As regards other towns and cities, the following summary shows the number of units for which detailed or outline schemes have been completed during the year: Christchurch, 1,600; Dunedin and environs, 550; Palmerston North, 158; and Wanganui, 155. Smaller schemes up to 100 units have been prepared in either outline or full detail for blocks in Gisborne, Hastings, Masterton, and approximately twenty other boroughs and small towns.

10. PLANNING FOR OTHER DEPARTMENTS

During the year work has proceeded on the planning and development of housing settlements for several Government Departments including the State Forest Service, State Hydro-electric Department, Ministry of Works, and the Army Department.

A grand total of 1,160 house units, apart from recreational, community, and other ancillary buildings, is involved in this planning. The largest schemes are the works construction village at Roxburgh of 600 units, and the Army settlement at Waiouru of 200 units. Two settlements have been broadly planned for the State Hydro-electric Department, one at Maraetai of 60 units, and the other as part of the Roxburgh scheme.

For the State Forest Service, villages have been planned at Rotoehu, Tairua, Karioi, Wairapakau, Waimihia, Glenbervie, Tapanui, and Ashley, each of these averaging about 30 units.

11. SITE-DEVELOPMENT

Despite the continuing factor of labour and materials shortage, and especially of pipes and cement, engineering work completed shows substantial advancement over the preceding year.

In the preparation of some 5,000 house sites, some 640,000 cubic yards of earthworks were moved and the formation of approximately 38 miles of new roading was completed. On this was laid 250,000 square yards of sealing.

As regards engineering services, 27 miles of water-mains, 13 miles of storm-water sewers, and 28 miles of sanitary sewers were laid during the year, in addition to house drainage connections to over 4,300 units.

The formation of main roading and preparation of house sites and reserves in advance of building contracts have continued on the large new housing areas in the Auckland metropolitan area, at Porirua - Titahi Bay, and in a number of smaller schemes at Christchurch, Invercargill, Dunedin, and other towns and boroughs. The policy adopted in carrying out development works has been to secure first the essential services for the requirements of house units under construction, and, due to the supply position, ancillary work on paths and fences has of necessity lagged to some extent behind the building programme.

The past year, however, has seen a marked improvement in the supply of fencing-materials and all districts are now overtaking the leeway. A total of 230 miles of fencing was erected. The continued control of cement for more essential works has required the use of bituminous sealing for house access paths, and good progress has been made with this work. The 1948 planting programme, due to the greatly improved supply position, was the most ambitious yet carried out. In all, over 2,000,000 trees of all kinds were planted. The number of sections on which development was completed during the year totalled 4,560.

In the provision of recreational areas associated with housing schemes, work is still restricted by the need for using all heavy earth-moving plant available on more urgent work. Nevertheless, in co-operation with the municipalities concerned, 18 children's playgrounds and 11 larger areas up to 30 acres in extent have been completed and are now in use.

12. STATISTICS

The following tables give a summary of the activities of the Division up to the present time.—

(*a*) House units handed over for occupation, twelve months ended 31st March, 1949, and to date:—

District.	1st April, 1948, to 31st March, 1949.			Total to Date.			House Units Under Construction as at 31st March, 1949.		
	State Rental.	Other Departments.	Total.	State Rental.	Other Departments.	Total.	State Rental.	Other Departments.	Total.
Auckland ..	941	61	1,002	9,912	191	10,103	864	67	931
Hamilton ..	306	387	693	2,016	871	2,887	361	113	474
Napier ..	242	43	285	1,444	125	1,569	210	31	241
Palmerston North	370	79	449	2,567	210	2,777	387	31	418
Wellington ..	808	45	853	7,327	168	7,495	660	22	682
Christchurch	536	116	652	3,727	204	3,931	401	39	440
Dunedin ..	211	48	259	1,886	76	1,962	350	51	401
Total	3,414	779	4,193	28,879	1,845	30,724	3,233	354	3,587

(*b*) The following table shows the figures for house construction district by district since the inception of the Division. Land-purchase figures are also shown, which figures include sections on which houses for other Government Departments have been built. It should be noted that the figures for other Government Departments are already included in the total house-construction figures :—

Year Ended 31st March.	Houses Handed Over for Occupation in Housing Construction Districts.									Total Unit Sections Purchased.
	Auckland.	Hamilton.	Napier.	Palmerston North.	Wellington.	Christchurch.	Dunedin.	Total.	Houses for Other Govt. Depts. Included in Previous Col.	
1938	95	12	..	31	197	29	35	399	..	9,296
1939	990	186	181	234	593	295	186	2,665	..	4,653
1940	1,340	219	200	234	713	459	230	3,395	27	6,472
1941	1,587	215	175	349	799	541	300	3,966	61	3,532
1942	1,291	247	129	302	649	389	201	3,208	20	5,037
1943	362	283	67	103	171	206	67	1,259	165	7,623
1944	263	74	22	86	242	116	77	880	24	3,571
1945	685	107	95	227	604	158	93	1,969	52	1,877
1946	873	189	104	282	1,139	281	117	2,985	129	3,777
1947	677	281	166	207	758	329	177	2,595	253	2,913
1948	938	381	145	273	777	476	220	3,210	335	1,759
1949	1,002	693	285	449	853	652	259	4,193	779	4,566
Total ..	10,103	2,887	1,569	2,777	7,495	3,931	1,962	30,724	1,845	55,076

(*c*) *Financial.*—Expenditure for the year totalled £8,886,322, bringing the total expenditure to date to £55,645,692.

In conclusion, I wish to say that the excellent results achieved over the past year reflect great credit on the staff, who have given of their best, and I desire to place on record my appreciation of their loyal and efficient service.

Credit must also be given to the many contractors who have so whole-heartedly co-operated in the carrying-out of the housing programme.

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Director of Housing Construction.

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