

1926.
NEW ZEALAND.

DEPARTMENT OF LANDS AND SURVEY.

SWAMP DRAINAGE.

REPORT FOR THE YEAR ENDED 31st MARCH, 1926, TOGETHER WITH STATEMENT OF ACCOUNTS.

Presented to both Houses of the General Assembly pursuant to Section 13 of the Swamp Drainage Act, 1915.

SIR,—

Department of Lands and Survey, Wellington, 28th June, 1926.

In pursuance of section 13 of the Swamp Drainage Act, 1915, I have the honour to forward the report of the Chief Drainage Engineer covering operations on lands proclaimed under the Swamp Drainage Act and amendments.

The spoil dealt with comprised over 520,000 cubic yards, including a great deal of rock. The various machines have naturally been subject to severe wear-and-tear, but have been maintained in good working-order.

Dredging-work in the Kaitaia area will probably be completed at an early date, while the Waihi scheme has now been practically completed.

Illustrative plans are also attached.

I have, &c.,

J. B. THOMPSON, Under-Secretary.

The Hon. A. D. McLeod, Minister of Lands.

REPORT BY CHIEF DRAINAGE ENGINEER.

SIR,—

I have the honour to submit my annual report on the areas proclaimed under the Swamp Drainage Act, 1915, and amendments.

KAITAIA DRAINAGE AREA (61,430 ACRES), MONGONUI COUNTY.

The principal works carried out during the year have been the improving of the Awanui River by dredging and scooping, excavation of the Whangatane spillway, maintenance and improvement of existing drains, and construction of new outlets.

Rainfall records have been kept at Kaitaia, and readings taken daily showing water-level at different points in the Awanui River. The total rainfall for the year was 57.90 in., the wettest month being May, with 10.43 in., and the driest February, with 0.88 in. Rain fell on 147 days. The highest water-level recorded in the Awanui River at Foster's bridge was 71.2 in., and the lowest 53.8 in.; at the Church Road bridge the highest reading was 80.1 in. and the lowest 65.7 in. Rainfall records obtained from Victoria Valley show that the rainfall generally is greater in the higher portions of the area, as was to be expected; but no complete records of rainfall are available for the watershed other than at Kaitaia. Graphs are attached showing rainfall and river gauge-readings.

No severe floods were experienced this year. The river overflowed its banks at different points on several occasions, but the low-lying country was not covered to the same extent as in previous years. Even distribution of the rainfall, and the fact that no large amount fell within short periods, allowed the channels to cope with flood-waters, while the unwatering and drying-out of the Tangonge basin provided storage for a large volume of flood-water.

The following schedule shows details of rainfall for the past eight years :—

Year.	Rainfall for Year.	Wettest Month and Rainfall.		Driest Month and Rainfall.	
			Inches.		Inches.
1918-19 ..	47·30	Oct., 1918	9·06	Aug., 1918	1·39
1919-20 ..	31·71	July, 1919	7·37	Dec., 1919	0·62
1920-21 ..	53·11	May and Aug., 1920	8·02 (each)	Mar., 1921	1·13
1921-22 ..	49·42	Mar., 1922	5·84	Jan., 1922	2·24
1922-23 ..	44·81	Oct., 1922	7·46	Jan., 1923	2·02
1923-24 ..	49·23	Oct., 1923	7·92	Dec., 1923	1·38
1924-25 ..	48·89	May, 1924	10·34	Mar., 1925	0·51
1925-26 ..	57·90	May, 1925	10·43	Feb., 1926	0·88

The average for the past eight years was 47·79 in.

Awanui River.—Dredges Nos. 7 and 10 (Priestman) were engaged in widening, deepening, and straightening this river, whilst scoops were made use of where possible to remove the top soil from cuttings in high country where it was impossible for the dredges to dispose of the large amount of spoil necessary for the excavation of the channel. On nearing Awanui one settler's bridge had to be dismantled and re-erected, whilst at Awanui the centre span of the bridge on the main road had to be dismantled in order to allow the dredges to pass through. Owing to the limited space between the piles, only a few inches beyond the width of the pontoon being available, the chutes on both dredges had to be dismantled. From the bridge northwards the river is used by both steamers and scows, and as the chutes on the dredges would have interfered with shipping a rearrangement of chutes was carried out. Only one chute was replaced on each dredge, special bracing for the chute retained being necessary, and in addition ballast had to be placed in the pontoons so as to keep them on an even keel. The river has been widened out to 60 ft. on bottom as far as Awanui, and from this point on the channel has been widened out to 70 ft. In addition the silt and timber were removed where found necessary. At the end of the year both dredges as well as scoop teams were employed in excavating a diversion below Awanui, which will assist navigation as well as drainage. In carrying out this work some of the spoil had to be handled twice, especially when the dredges were commencing the cut. A total distance of 2 miles 60 chains was dredged, 108,358 cubic yards of spoil being removed by dredges, and 24,500 cubic yards by scoops. The cost of dredging has necessarily been more expensive this year on account of the dismantling at the bridges and the double handling of spoil at the cut below Awanui.

Whangatane Spillway.—Dredge No. 22 (Bay City) was employed in excavating this channel, which will provide relief for flood-waters from the river at Kaitaia. This will benefit the whole district, and it is hoped to be able to open this channel for next winter. By the end of the year the dredge had reached tidal water, only 20 chains remaining to be dredged in order to give the spillway a good outlet into a tidal creek which provides a natural channel into Rangaunu Bay. Hard sandstone has been encountered at a depth of 7 ft. to 8 ft. at the lower end of the channel, and this formation continues for the remainder of the distance. As the plant cannot excavate this material, the spoil banks have been built up to 5 ft. above high-water mark, and these banks will protect the adjacent low-lying lands when the spillway is carrying flood-water. For some distance above the Kaingaroa-Awanui Road sand was located in the bottom of the channel, and the weight of the dredged banks caused the sides to slip, thus reducing its capacity considerably. In this locality a wide berm will require to be left, so that the channel will not become blocked with the slips. A distance of 112 chains was dredged, necessitating the removal of 51,085 cubic yards of spoil. Bridges have been erected as required to give access to properties severed by the dredged channel, as well as at road-crossings.

Dredges.—The three dredges employed on these works have removed a total of 159,443 cubic yards, the average cost for the year being 10·48d. per cubic yard. The following figures show the comparison of output and cost per cubic yard for the past five years :—

				Spoil removed. (Cubic Yards.)	Cost per Cubic Yard.
1921-22 ..	..	..	..	61,309	10·20d.
1922-23 ..	..	..	..	138,900	10·47d.
1923-24 ..	..	..	..	162,081	10·72d.
1924-25 ..	..	..	..	149,789	10·55d.
1925-26 ..	..	..	..	159,443	10·48d.

Drains.—Some 200 chains of new drains were constructed during the year, whilst in addition the Tarawahakaroa Stream was improved near the Kaitaia Township for a distance of 80 chains by killing willows, removing snags and sandstone bars. Some ten miles of drains were cleaned and three and a half miles improved by deepening. In certain localities the drains still require to be deepened so as to bring them to the final grade, but several of these are now in hand, and on completion all fall available will have been taken advantage of.

Roads.—No formation of roads has been carried out during the year.

Stop-banks.—No further stop-banks were constructed, but eight miles were repaired and the adjoining drains cleaned. The sixteen flood-gates in operation were inspected periodically and kept in repair.

Bridges.—Two bridges on the Awanui River were removed to allow dredges to pass through, and re-erected on completion of the dredging. A temporary bridge at the Mangatete Road crossing on the Whangatane spillway was removed, and a permanent structure erected when the roadway had been dredged, a road-deviation and temporary bridge farther down stream carrying the traffic meanwhile. One pile bridge was erected on the Whangatane spillway to give access to property severed.

The summary of the year's operations is as follows: Dredged channels, 4 miles 12 chains; spoil excavated by dredges, 159,443 cubic yards; spoil excavated by scoops, 24,500 cubic yards; new drains constructed, 2 miles 40 chains; drains deepened and improved, 4 miles 40 chains; drains cleaned, 10 miles; stop-banks kept in repair, 8 miles; pile bridges removed and replaced, 2; pile bridges erected, 2; landing-stage erected, 1; garage erected, 1.

The dredging in hand will be completed early in the ensuing year, and the floating plants will then have carried out all the work for which they can be used in this area. The principal works remaining to be carried out in addition to completion of the Whangatane spillway are deepening and extension of existing drains, removing willows from Kaitaia River and Tarawahakaroa Stream, completion of stop-banks, and erection of flood-gates.

Works Expenditure.—The total expenditure for the year as shown in the books at Auckland Office was £15,835, the principal items being day labour, £5,362, and piecework contracts, £3,468.

The local officer in charge is Mr. T. S. McMillan.

HIKURANGI DRAINAGE AREA (50,000 ACRES), WHANGAREI COUNTY.

The weather conditions throughout the year under review have been generally favourable for the prosecution of the river-control works in hand. The excavations were totally submerged by flood-waters on one occasion only in May, when works were held up for some weeks. During the year rain fell on 172 days, the total fall being 51.47 in. June was the month of greatest precipitation, with a fall of 9.85 in. spread over twenty-two days, and March the driest, with a fall of 0.72 in. spread over five days. In January there was a total fall of 8.95 in., but otherwise the weather conditions were exceptionally good from October till the end of the financial year.

The following is a summary of the main features of the year's operations:—

Excavating-machines.—No. 12 Bucyrus machine, equipped as a shovel, was engaged throughout the whole period on the rock-excitation of No. 3 diversion, the machine taking the whole cut in one face at grade depth. No. 13 Bucyrus, with drag-line equipment, was in the early part of the year engaged in removing the slip in No. 2 diversion, and for the remainder of the year was engaged on No. 3 diversion working the automatic skip in conjunction with No. 12 shovel. No. 14 Bucyrus was for the first ten months of the period engaged on excavation work (drag-line and shovel) on Nos. 3 and 4 diversions, and for the last two months of the period has been on drag-line work with extended jib on No. 1 up-stream diversion. No. 3 Priestman has been engaged throughout the period on the excavation of the main canal outlet for the swamp area in Block IV, Purua Survey District.

Wairua River Diversion.—These diversions at the rapids at Ruatangata are the key to the works and have first call on all available plant. Diversions 1 and 2 were practically complete at the end of last year. The slip in No. 2 diversion has increased in proportions, and still continues to creep. A considerable amount of spoil was removed from the toe during the year, but further work is still necessary. Floods will, it is hoped, remove all clay and silt deposit, and the rock boulders will be removed as they are bared. The floods during May caused considerable erosion in the by-pass at the intake to diversion 2, and large quantities of debris were washed into the cut. This has been removed, and the river is now flowing through the cut. The rock-excitation in No. 3 diversion proved most difficult work, and occupied the greater portion of the year. The full length of the cut was in the basaltic lava-flow. In parts the bottom grade lay under the flow, exposing the pug substratum, thus giving most unstable foundations for the shovel-track. The river was diverted through the cut at the end of the period, but a portion of the bar at the entrance remains, and will be removed shortly. No. 4 cut is located in deeper country and out of the line of the main lava-flow. Boulders were encountered in the surface excavations, but the substratum proved to be rubble and clay with "greasy backs." The top stratum has been removed and the river diverted through the cut. Conditions for scouring are favourable—the lagoon at the lower end forming an ideal silt-depositing ground—and the winter floods will now be used in opening out the waterway. Detail surveys are now in hand in connection with the flood spillway down the old channel, where the flood-carrying capacity can be considerably increased by grading the rock bars. The whole diversion is now open to the river-flow, and some slight benefits will result from this improvement in the flood-discharge capacity, but the maximum benefits will not be felt until the final grade depths are obtained throughout. A total of 70,575 cubic yards, over 80 per cent. of which has been rock, with the remainder rubble, clay, &c., have been excavated during the year on these diversions. In addition some 28,500 cubic yards of spoil from former work has of necessity been rehandled. Charging the whole cost of the excavations against the new work the unit cost for the year is 5s. 0.12d. per cubic yard.

Up-stream Diversions.—The excavation of No. 1 diversion was commenced in February last, and is being carried out by No. 14 Bucyrus, using a $\frac{3}{4}$ yard bucket and a 50 ft. boom drag-line equipment.

Dredge Cut, Block IV, Purua Survey District.—During the year No. 3 Priestman has been engaged continuously on the excavation of the main canal through this area. The work is located in timber country, with a hard yellow clay substratum which has proved difficult of excavation. For the period under review a distance of 117 chains was completed, a total of 77,514 cubic yards of spoil being moved at a unit cost of 7.89d.

Output.—The total of all excavations for the year amounted to 176,589 cubic yards, making the total of all excavations to date 384,588 cubic yards.

Surveys.—Detail surveys of the canal in Block IV, Purua Survey District, have been completed, and the location of the waterway decided upon. Surveys of the inland swamp areas are being undertaken as opportunity offers, and considerable data is now available in connection with the areas in Blocks XIV and XV, Hukerenui Survey District, and Block IV, Purua Survey District. These surveys demonstrate very clearly the tortuous courses of the existing creeks and the general irregularity of the surface of the various swamp areas. These conditions call for extensive investigation before the various outfalls can be definitely located. The necessary surveys are well in hand, and will be completed before the main river-works are out of hand.

Plant.—No additions to plant were made during the year. Despite the heavy nature of the excavations the various machines continue to give good service, and every effort is made to keep all plant in first-class order. A stock of likely spare parts is always on hand, and the smithy and fitting-shops are well equipped to handle all ordinary repair jobs. The drilling and compressor plants have been continuously engaged on heavy duty. These are well maintained and given a thorough overhaul periodically, with the result that delays are reduced to a minimum.

Buildings.—No additions have been made to the buildings, which are all of a temporary nature. A small rent charge is made for all huts occupied by workmen, the amount thus received during the year being £131 11s. 2d.

Stores.—A complete system of stores record is kept, and monthly checks made regarding the issue of motor-spirit, explosives, coal, &c.

Works Expenditure.—The total expenditure during the period under review was £20,760, and of this amount £10,121 was paid in wages.

The local officer in charge is Mr. V. C. Bosselman, B.E.

WAIHI DRAINAGE AREA (22,720 ACRES), TAURANGA COUNTY.

The scheme of works as laid out for this area was practically completed at the close of the period. Future charges against the area will be for minor construction work and general maintenance of existing works. The area has now reached a sufficient state of development to allow of a reliable estimate being made of the value of the improvements effected.

The settled areas of the swamp proper are progressing well, and an increasing benefit to the higher private lands is apparent. The areas set aside for flax-growing are rapidly proving themselves remarkably well adapted for this purpose, and it is hoped at an early date to lease further areas for cultivation and milling.

The rain-gauge at Pongakawa showed that a total of 49.52 in. of rain fell during the period, the wettest month being July, with a fall of 10.90 in., and the driest December, with a fall of 0.75 in.

Kaikokopu Stream.—The widening and deepening of this channel was continued throughout the period, and at the end of the year was completed as far as the main road. As a result greatly improved outlets have been provided for the several drains in the Waewaetutuki Block, and the danger of overflow in the channel itself has been considerably lessened. The continuation of this work to the railway should be put in hand when a suitable machine is available. This latter work is essential to the lands in the vicinity, as it is absolutely impossible to provide satisfactory drainage by a hand-dug channel.

Pongakawa Stream.—Further widening and deepening of this stream was carried out with an American steel dredge, covering a distance of 81 chains. This completed the scheme for straightening and improving the Pongakawa Stream between the main road and the estuary. Straightening and improvement by hand-work was carried out for a distance of approximately a mile southwards from the railway. The area of swamp land in this latter area is very limited, being really a small valley in between the hills. The dredging of a channel would have been out of the question owing to the excessive cost per acre, and, as stated above, improvements have been carried out by hand for about a mile. The swamp on each side of the stream is peaty, and the area is being watched very closely to see whether the continuance of the improvements to the stream is justified.

Leasehold Block East of Pongakawa Stream.—The dredging of a 30 ft. canal through the middle of this block was completed early in the period. A shallow channel with a stop-bank on either side was dredged from the Pukehina Canal to the sandhills along the line of the boundary between Sections A 2 and A 3. Plant then deepened the northern end of the Pukehina Canal, completing the dredging in this block.

Dredges.—Priestman No. 5 was employed throughout the year in deepening and widening the Kaikokopu Stream. Progress was rendered somewhat slow on account of the amount of heavy timber encountered and the high banks which had to be lowered to allow dredge to pass. Altogether plant covered a distance of 128 chains and removed a total of 70,800 cubic yards of spoil.

No. 25 American steel dredge was in commission for only four months of the total period, carrying out final widening and deepening of the Pongakawa Stream. Plant was then thoroughly overhauled and laid up, having completed her schedule of work on the area. The distance covered during the period worked was 71 chains, and 39,013 cubic yards of material was excavated.

No. 26 American steel dredge completed the dredging and improvement of the Pukehina Canal in the Leasehold Block and the erection of the stop-banks from this canal to the sandhills. This completed the work of this plant on the area, and after overhaul and painting she was laid up in the Pongakawa Stream. During the nine months worked a distance of 119 chains was covered and 73,031 cubic yards of spoil lifted.

Late in the period a Sanderson weed-cutting launch was tried out in the Wharere and Pongakawa Streams, good results being obtained. On completion of the cleaning of these canals the plant was transferred to other works.

The following table shows the amount of spoil dredged and the cost per cubic yard for the last nine years :—

	Cubic Yards.	Cost per Cubic Yard.
1917-18	55,538	4.57d.
1918-19	20,780	7.67d.
1919-20	44,250	9.29d.
1920-21	63,495	7.77d.
1921-22	77,535	6.17d.
1922-23	164,527	6.97d.
1923-24	241,504	7.54d.
1924-25	252,618	6.90d.
1925-26	184,344	6.14d.

Roads.—The only roadwork carried out during the year was filling and grading over a distance of 20 chains on the west bank of the Pongakawa Stream, and the final grading of the Arawa Road.

Drains.—Two new drains were constructed in the Pukehina Block, No. 1 drain being a continuation of the Pukehina Canal to the corner of Section M 2, and No. 2 drain, about half a mile south, runs roughly parallel to No. 1. A new drain was commenced to run southwards midway between the Pongakawa and Wharere Canals, and this will be completed early in the coming period. A considerable amount of deepening has been necessary in the Central, Eastern, and Punene drains, and these are now in first-class order. Costs of this hand-work have been considerably increased by the large amount of timber encountered. All drains have been periodically maintained to their full efficiency.

Bridges.—Only one sill bridge was erected during the year.

Buildings.—In April a fire occurred at Pongakawa headquarters, a wooden building used conjointly as a workshop, store-shed, and office being totally destroyed. All office records were lost, including a great deal of valuable data collected over a number of years. To replace this a corrugated-iron store, shed, and workshop were erected, also two separate huts to serve as an office and a benzine-store.

Fencing.—A fire-break along the main swamp road from the Pongakawa Station eastwards was cleared and fenced off to serve as a protection to the large area of valuable flax northwards.

Stop-banks.—During the period a stop-bank was erected for a distance of 45 chains between the Kaikokopu Stream and the Waewactutuki Hills.

The following is a summary of the various works performed during the year :—

	M.	ch.	Cub. yd.
Canals dredged	3	78	182,844
New drains	5	12	21,944
Drains widened and deepened	5	77	10,870
Drains cleaned	24	37	..
Roads graded	1	20	..
Fencing	1	70	..
Stop-banks erected	0	45	2,700

Future Works.—The works to be carried out during the present year comprise completion of Tapsell's drain; minor stop-banking on north end of Kaikokopu; widening and deepening Kaikokopu between main road and railway; construction of flood-gates; and general maintenance of existing works.

The total expenditure during the year under review was £10,273 10s. 4d., and of this amount £3,847 14s. 9d. was absorbed by day labour (including dredge crews) and £3,374 5s. in piecework contracts.

I have, &c.,

O. N. CAMPBELL, Chief Drainage Engineer.

The Under-Secretary for Lands, Wellington.

SWAMP LAND DRAINAGE ACCOUNT.

RECEIPTS AND PAYMENTS ACCOUNT FOR YEAR ENDED 31ST MARCH, 1926.

<i>Receipts.</i>		£ s. d.		<i>Payments.</i>			
				£ s. d.		£ s. d.	
Balance as at 1st April, 1925 ..	..	32,865	17 3				
Debentures raised under Swamp Land							
Drainage Act, 1915 ..	..	35,000	0 0				
"Thirds" ..	..	11	19 4				
Rents ..	..	215	2 2				
Flax royalty ..	..	249	13 8				
Interest on mortgages ..	..	12	19 11				
Interest on investment ..	..	632	12 0				
				Kaitaia Drainage District—			
				Drainage-works, &c. .. 11,196 16 9			
				Loose tools, &c. .. 50 7 3			
				Fuel and stores .. 2,841 15 7			
				Management and engineering expenses .. 1,266 13 7			
						15,355 13 2	
				Waihi Drainage District—			
				Drainage-works, &c. .. 8,030 6 4			
				Loose tools .. 43 0 0			
				Fuel and stores .. 1,081 19 9			
				Management and engineering expenses .. 738 17 11			
						9,894 4 0	
				Hikurangi Drainage District—			
				Drainage-works, &c. .. 13,454 10 4			
				Loose tools .. 71 1 5			
				Fuel and stores .. 5,456 8 8			
				Management and engineering expenses .. 1,057 17 7			
						20,039 18 0	
				Poukawa Drainage District—			
				Drainage-works, &c. .. 91 5 0			
				Management and engineering expenses .. 23 11 4			
						114 16 4	
				Mangawai Drainage District—			
				Drainage-works, &c. 5 2 7			
				Plant and machinery 1,647 14 7			
				Management charges on Consolidated Stock .. 5 15 11			
				Stamp duty on transfers, Consolidated Stock .. 43 15 0			
						49 10 11	
				Interest on debentures 9,378 18 9			
				Cash in Public Account, 31st March, 1926 .. 12,430 6 0			
				Imprests outstanding .. 72 0 0			
						12,502 6 0	
						£68,988 4 4	
						£68,988 4 4	

RAINFALL & RIVER GAUGE

—RECORD—

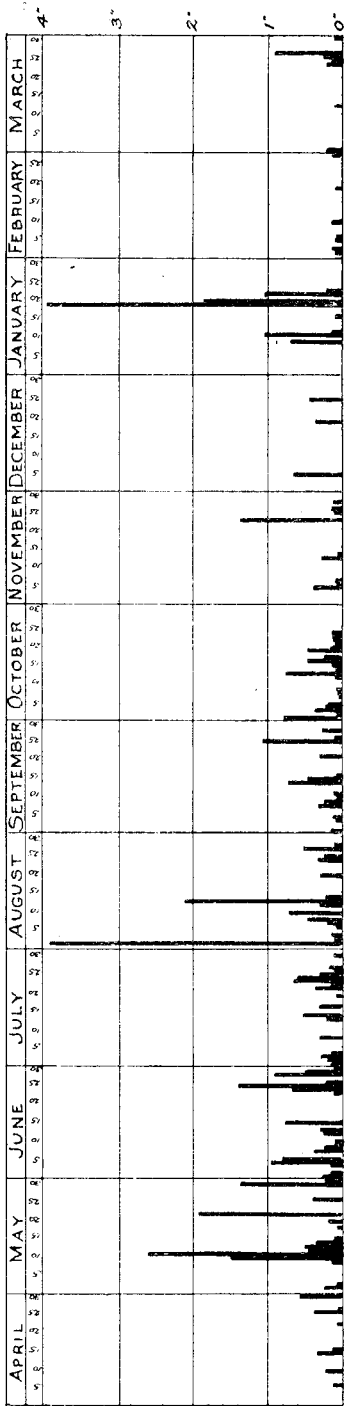
**FOSTER'S BRIDGE
KAITAIA RIVER**

APRIL 1ST 1925 — MARCH 31ST 1926

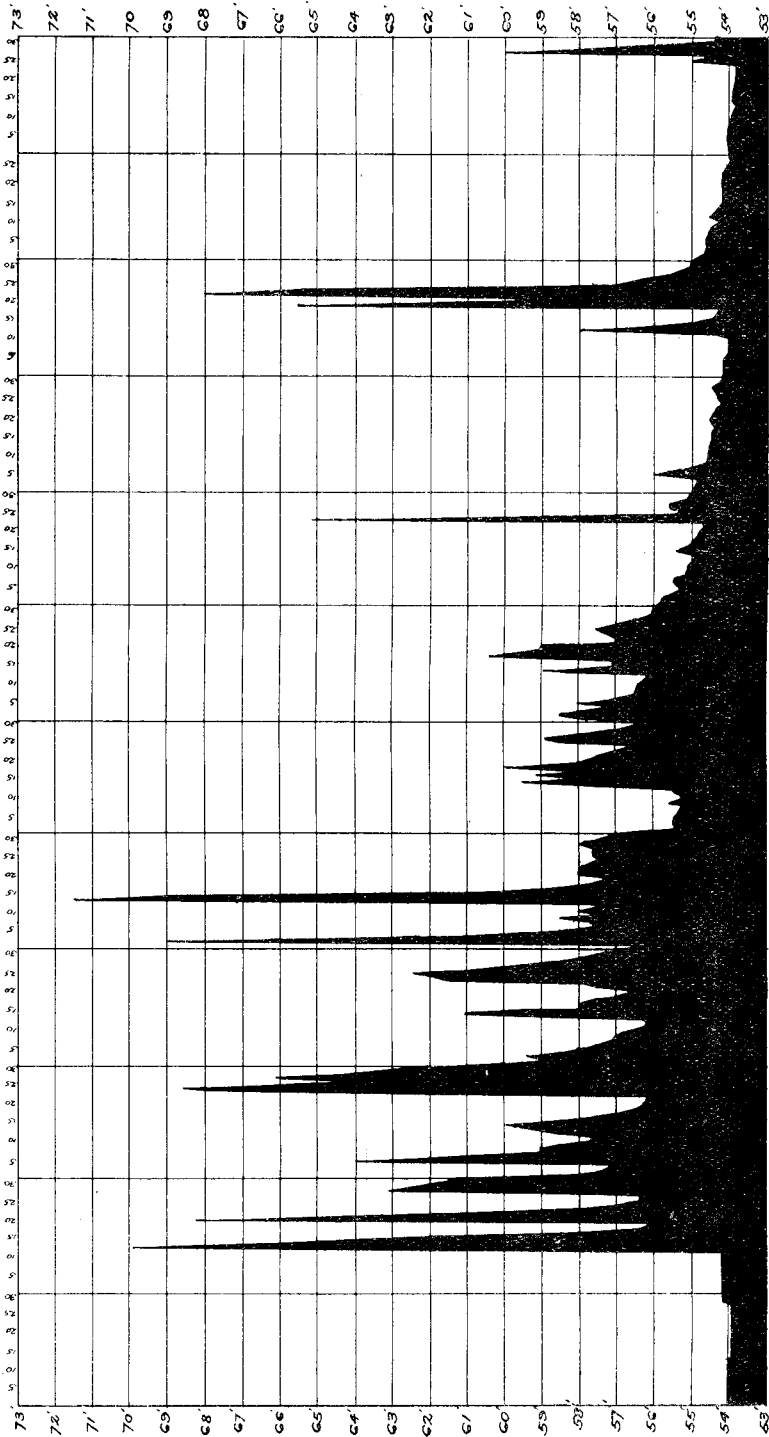


O. N. CAMPBELL,
CHIEF DEPARTMENT ENGINEER

Year	INCHES
1925-6	50
1924-5	40
1923-4	32
1922-3	22
1921-2	10
1920-1	2
1919-20	2
1918-9	2



—RAINFALL—



—RIVER GAUGE—




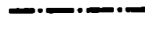

Approximate Cost of Paper.—Preparation, not given; printing (750 copies), £56.

By Authority: W. A. G. SKINNER, Government Printer, Wellington.

Price 2s.]

RANGAUNU BAY

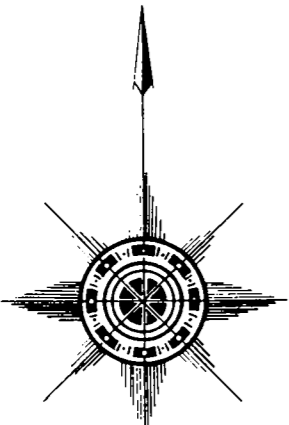
REFERENCE.

- Boundaries of Kaitia drainage area - 
- Drains now in operation - 
- Drains under construction - 
- Dredged channels - 
- Stop-banks - 

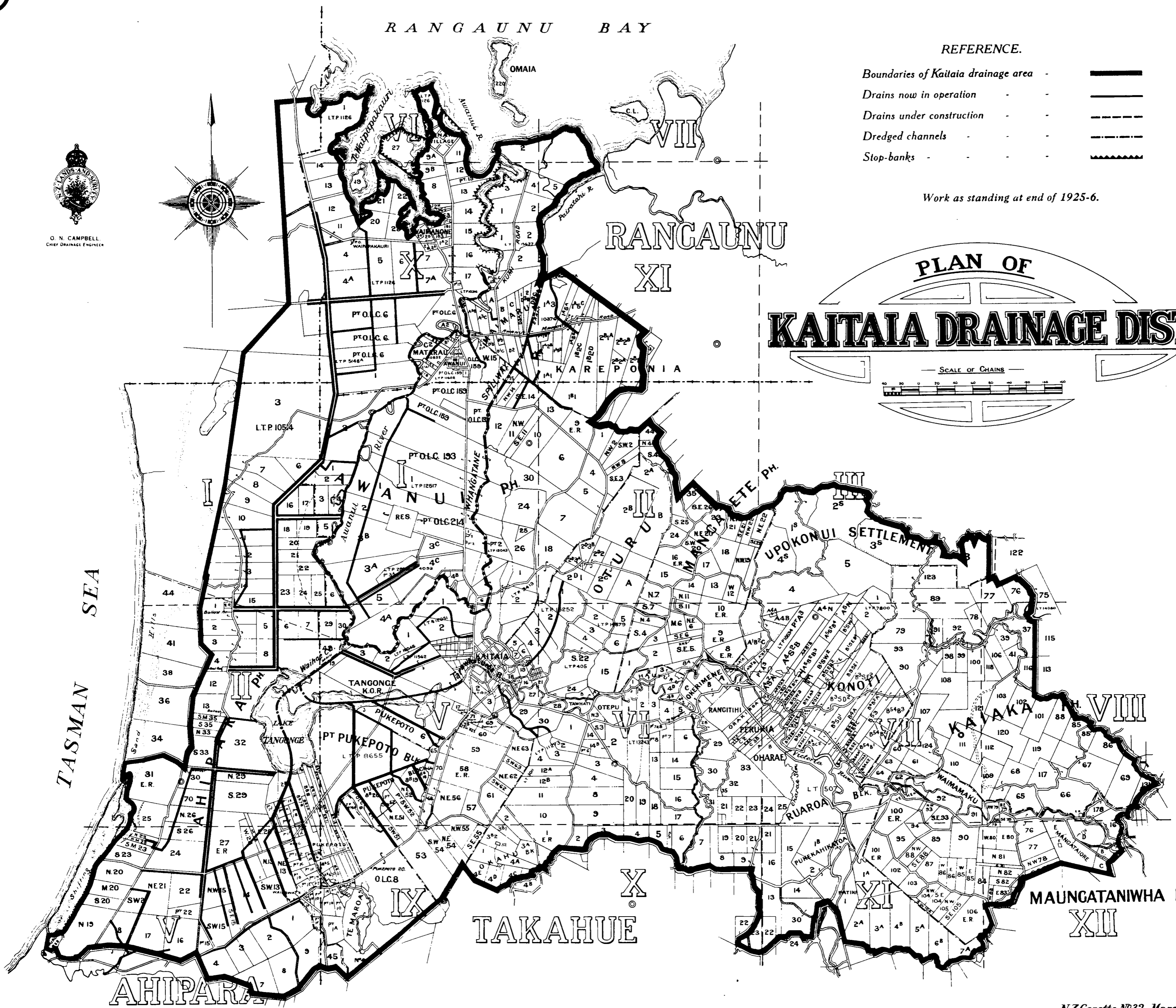
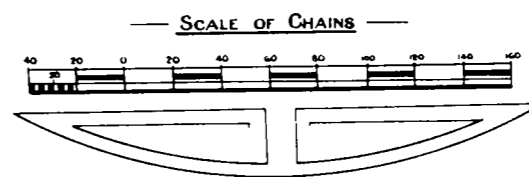
Work as standing at end of 1925-6.

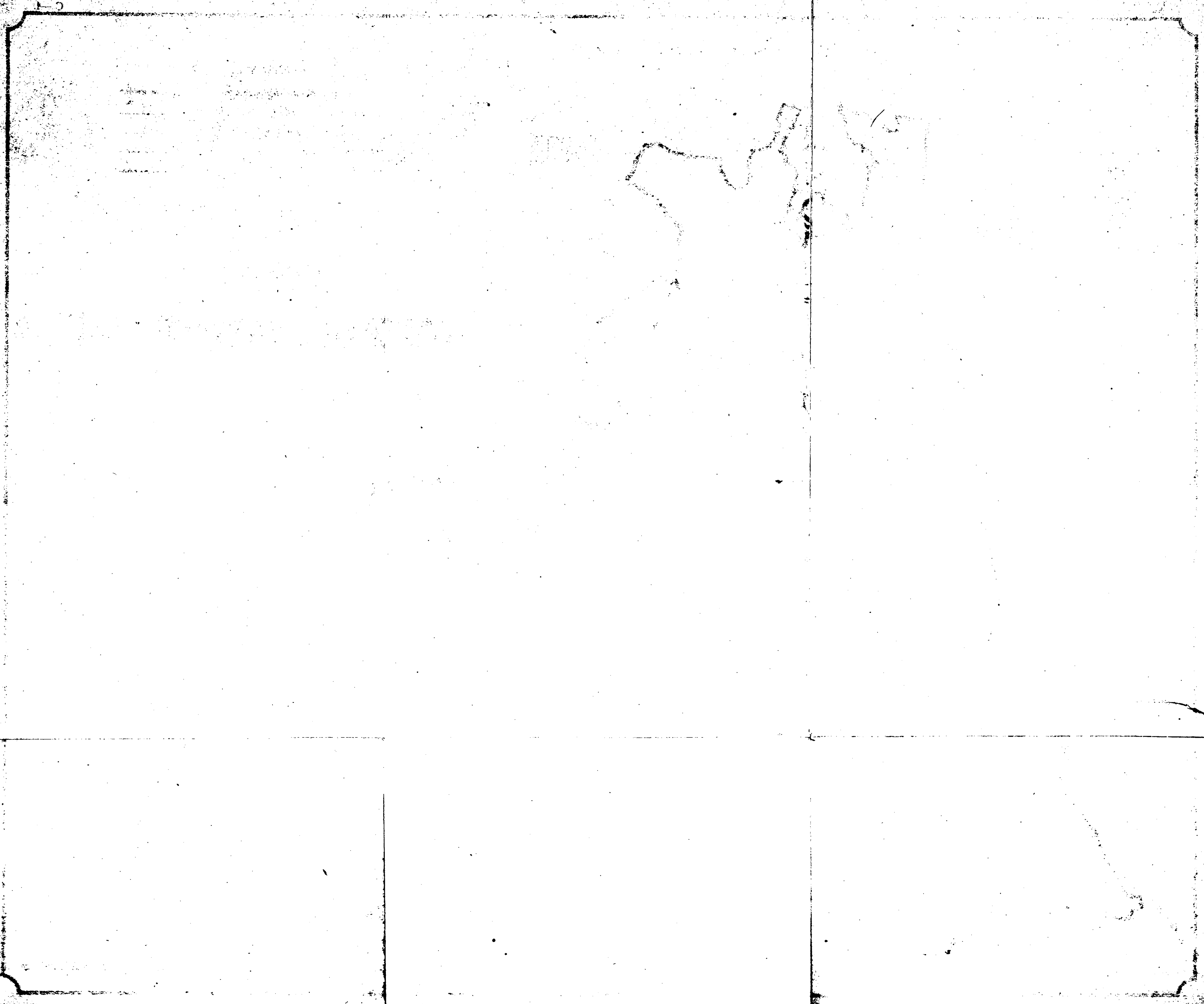


O. N. CAMPBELL, CHIEF DRAINAGE ENGINEER.



PLAN OF KAITIA DRAINAGE DIST





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O. N. CAMPBELL
Chief Drainage Engineer



REFERENCE.

- Completed drains - - - - -
- Proposed new drains - - - - -
- Existing drains to be deepened - - - - -
- Proposed new roads - - - - -
- Existing roads - - - - -
- Existing stop-banks - - - - -

