

1925.

## NEW ZEALAND.

DEPARTMENT OF LANDS AND SURVEY.

## SWAMP DRAINAGE.

REPORT FOR THE YEAR ENDED 31st MARCH, 1925, TOGETHER WITH STATEMENT  
OF ACCOUNTS.

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

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SIR,—

Department of Lands and Survey, Wellington, 12th June, 1925.

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 all operations and transactions under his control.

The various projects have been vigorously prosecuted, and the machinery is standing up to hard work in a satisfactory manner.

Illustrative plans are also attached.

I have, &amp;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 (39,665 ACRES), MONGONUI COUNTY.

The principal works carried out during the year have been the completion of the Waihoe channel, widening and deepening of the Awanui River, excavation of the Whangatane spillway, improvement and maintenance of existing drains, and excavation of new drains by hand.

Rainfall records have been kept at Kaitaia, and readings taken daily showing water-level on gauges in the Awanui River. The total rainfall for the year was 48.89 in. Rain fell on 126 days, the wettest month being May, with 10.34 in., and the driest March, with 0.51 in. The highest water-level recorded at Foster's Bridge was 72.3 ft. and the lowest 53.9 ft. At the Dairy Factory Bridge the highest water-level was 80.5 ft., and the lowest 64.8 ft. Two severe floods were experienced during May, following rainfalls of 2.77 in. and 2.36 in. respectively for the preceding twenty-four hours. Large areas in the vicinity of Kaitaia, Pukepoto, and Waipapakauri were inundated, demonstrating the necessity for works now in hand, and further improvement in channels to carry the run-off following

even a moderate rainfall; but it is doubtful whether the rainfall recorded in Kaitaia is a true indication of the amount of fall in other parts of the watershed, particularly in the high country, and accurate information on this point could be obtained only by the reading of gauges in other localities.

Graphs are attached showing rainfall and gauge readings throughout the year.

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

Year.	Rainfall for Year.	Wettest Month and Rainfall.		Driest Month and Rainfall.	
	Inches.		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

The average for the past seven years was 46·35 in.

*Waihoe Channel.*—Dredge No. 10 (Priestman) completed this channel early in the year, and was then taken out and floated during a flood some miles down-stream to commence work in the Awanui River. This channel, extended by hand drains, has carried off all water previously held in the Tangonge basin, which is now dry at normal water-level in the river, and provides storage for flood-waters during heavy rain. The only work done in this channel by dredge was the removal of a small quantity of silt, and the throwing-out of a dam erected at the lower end to impound enough water for working higher up.

*Awanui River.*—Dredges No. 7 and 10 (Priestman) were engaged in widening, deepening, and straightening this channel. A distance of 138·6 chains was dredged, including five diversions to cut off bends in the original channel, and approximately 103,489 cubic yards of spoil was removed by the dredges. An extra diversion was laid off and excavated to facilitate the refloating of Dredge No. 7, which had sunk in the bend of the river, and to improve the channel by cutting off this bend. Owing to the sinking of No. 7 dredge, and the breaking of main casting on No. 10 dredge, operations were delayed for about two months. Spoil to the amount of 3,550 cubic yards was removed from high banks with scoops so that dredge chutes could operate, and 3,000 cubic yards of spoil was removed by scooping from cut No. 3A to enable dredges to work through this cutting. The forward dredge is now engaged in cut No. 3, at a point 91 chains from the Awanui Bridge, where the work in hand finishes. Other work in this channel consisted of the ring-barking of willows, which had commenced to grow in places previously cleared by snagging. The willows were treated with a chemical which has given satisfactory results and apparently killed the young growth. A breastwork was erected at the Kaitaia Hotel, to prevent erosion at this point, and some timber in the river-bed was loosened with explosives and hauled out.

*Whangatane Spillway.*—Dredge No. 22 (Bay City plant) was engaged in excavating this channel. A distance of 99 chains was dredged, and approximately 46,300 cubic yards of spoil removed. Bridges required over the channel were erected as the excavation proceeded, and bullock-teams were employed in scooping back spoil in the high country to enable spoil dredged to be disposed of. Spoil to the amount of 1,400 cubic yards was removed by scoop. Flood-waters having broken into this channel at the intake to the Kaitaia River, a substantial dam was erected at the point of danger, and this has prevented any further overflow. Raupo and other growth in the lower end of the channel was cleared, as this portion is now overtaxed during heavy rain owing to the flood-waters being rapidly carried down over the dredged part. This causes congestion in the low country where the channel is incomplete.

*Dredges.*—The three dredges Nos. 7, 10, and 22, employed on works as above, have removed a total of 149,789 cubic yards, the average cost for the year being 10·55d. per yard.

The following figures show comparison of output and cost per cubic yard for the past four years:—

			Spoil removed:	Cost per
			Cubic Yards.	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.

*Drains.*—The following new drains were constructed: Church Gully drain, extension, 42·5 chains; Pukepoto main outfall, extension to connect with Waihoe Channel, 60 chains; Tarawahakaroa Stream, extension to connect with Waihoe Channel, 151 chains.

The following drains were deepened and improved: Bell's Road drain, 160 chains; Wairoa Stream, 53 chains; Pukepoto main outfall, 110 chains; Waipapakauri outfall, 130 chains.

In addition to the above, contracts were let early in March for the clearing and deepening of 215 chains of drain, and the clearing only of 815 chains of drain. These works had been approximately half completed by the end of the period under review, and the contract time for the completion of this year's clearing of drains is 30th April.

*Roads.*—No road formation was undertaken this year, the only work done in connection with roads being the erection of 40 chains of fencing on Bell's Road, and the clearing and deepening of some road drains included in above statement.

*Stop-banks.*—No new stop-banks were erected. Eight miles of existing bank was maintained and repaired as required, and the flood-gates frequently inspected and kept in repair.

*Bridges.*—Two pile bridges were erected, one to give access to property severed by cut No. 30 in the Awanui River, and one on the Quarry Road where Whangatane spillway cuts through.

The following summary gives particulars of the works carried out during the year: New drains, 3 miles 13 chains; deepening drains, 7 miles 3 chains; cleaning drains, 5 miles 25 chains; dredged channels, 2 miles 78 chains; stop-banks kept in repair, 8 miles; fencing, 40 chains. Spoil excavated by dredges, 149,789 cubic yards; spoil excavated by scoops, 7,950 cubic yards; pile bridges, 2; breastwork, 1.

*Works Expenditure.*—The total expenditure for the year as shown in the books at the Auckland Office was £12,476 17s. 7d., the principal items being—day labour, £4,866; piecework contracts, £1,922. The local officer in charge is Mr. T. S. McMillan, Assistant Engineer.

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

The development of this swamp is well advanced. Works on the upper and higher portions are well on to completion, and areas already settled as dairying propositions are coming in well.

The flax-growth on the low-lying areas is well ahead of anticipation, and the full development of these areas for flax purposes is well warranted. It is becoming apparent that practically the whole of the lands will come naturally into flax directly the surface and more or less stagnant waters are removed. A flax lease of 440 acres has already been disposed of, and further areas will be made available in the near future.

The rain-gauge installed at the Pongakawa Office showed that a total of 72.85 in. of rain fell during the year, the wettest month being May, with a fall of 12.53 in., and the driest being March, with a fall of 1.90 in. The heaviest daily fall was 4 in. recorded at 8 a.m. on the 27th December, 1924.

*Wharere Canal.*—The deepening of this canal was continued northwards to the Waihi Estuary and was completed early in July. Further dredging was carried out a short distance seawards from the junction of the Wharere Canal and Kaikokopu Stream.

*Kaikokopu Stream.*—About the middle of July the widening and deepening of this channel was taken in hand, and by the end of the period 110 chains had been completed. This work will be continued southwards to Waerenga Road by the Priestman dredge, which will then turn and finally deepen the channel on the way back to the estuary. A Monaghan walking-dredge to be shortly transferred from the Rangitaiki works will complete the widening and deepening of the Kaikokopu Stream from Waerenga Road to the railway.

*Pongakawa Stream.*—An American steel dipper dredge has been employed widening and deepening the stream during the year, and completed a distance of 148 chains. The result of this dredging is the further lowering of the water-level at the Main Road bridge, so that water-level is now nearly 11 ft. below the old level of some years three ago. The spoil removed from this stream has been deposited on either side, and will be a valuable asset in the future for roading access purposes.

The drainage of the area of swamp between the Swamp Road and the old Main Road, containing approximately 800 acres, has been investigated, but owing to the excessive cost of the works required it has been decided to leave this area in its present state. The cost of the works would be so heavy that the land could not possibly carry the rating necessary to repay the money spent as well as give the owner a return for his outlay in internal drainage and other necessary improvements.

*Leaschold Block East of Pongakawa Stream.*—A canal 30 ft. wide is now practically complete through the centre of this block, 128½ chains having been formed during the year. Very sandy country was traversed for the most part, but the dredge is now working in richer country consisting of approximately 3 ft. of peat on a sandy bottom. A dam was erected across the mouth of this canal in June, thus doing away with tidal influence and considerably augmenting the progress of the work.

*Dredges.*—Three dredges, No. 5 (Priestman) and Nos. 25 and 26 (American Steel), have been kept working continuously throughout the year.

No. 5 Priestman dredge carried on operations on the Wharere Canal, and by July had completed the deepening to the Waihi Estuary. The plant was then headed up the Kaikokopu Stream, widening and deepening the existing channel. In August the dredge was brought down to the estuary and beached, and several parts of the pontoon which were in a bad state of repair were replaced. Dredging was resumed in October, and although very hard country was experienced good progress was maintained. During the period the machine covered a distance of 170 chains, removing 55,190 cubic yards of spoil.

No. 25 American Steel dredge was engaged during the whole period in widening and deepening the Pongakawa Stream. Owing to the crank-shaft of the 75 h.p. engine breaking just at the latter end of last year, the plant was laid up during April and May while a new shaft was procured and fitted. Apart from this a good year's work has been carried out: 148 chains were completed and 103,606 cubic yards of spoil removed.

No. 26 American Steel dredge carried on dredging the new Pukehina Canal through the leaschold block east of the Pongakawa Stream. The country here is very sandy, and caused such great wear on the bucket that towards the end of August a new one had to be fitted. The dredge will complete this canal early in the coming period, and will then construct a stop-bank across the block from the Pukehina Canal to the sandhills. During the year a distance of 128½ chains was completed, 93,822 cubic yards of spoil being moved.

The following table shows the amount of spoil dredged and cost per cubic yard for the last eight 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.

*Roads.*—The Wharere East Bank Road was formed for a distance of 53½ chains with a top width of 20 ft., and the spoil-banks on either side of the Pongakawa Stream were spread to a top width of 12ft. for a distance of 98 chains from the Main Road. No other roadworks were carried out during the period.

*Drains.*—A new drain was formed from the Wharere Canal in a south-westerly direction through the block of country lying between the Wharere Canal and the Kaikokopu Stream, which block was recently leased for flax-cultivation, and most beneficial results have been obtained.

Another drain, running parallel with the central drain, was formed from the Pongakawa Stream southwards to the Main Road, and materially assisted in carrying away the water from the hill country south of the railway. The deepening and widening of the central drain is well in hand, and should be completed early in the coming period. A drain and stop-bank was constructed from the Wharere Canal to the Pongakawa Stream close to the Waihi Estuary, and when No. 25 dredge (American Steel) completes the banks down the Pongakawa Stream the tide will be kept out of a block of approximately 300 acres, which will be drained by means of a flood-gate. The outlet to the sections already thrown open for selection (Sections 35-38 drain) was widened and deepened, and ample fall for drainage purposes is now available for the settlers. In the Waewaetutuki Block the widening and deepening of Mend's and Wilson's drains was completed, and a large area of swampy country derived direct benefit. An incredible amount of timber was encountered in Wilson's drain, necessitating a continual use of explosives. No. 2 drain in this block was also constructed, but will not be finally deepened at the eastern end until the widening and deepening of the Kaikokopu Stream is completed.

Towards the end of May the whole district was swept by a severe storm lasting nearly a week; 11 in. of rain fell, and a tremendous amount of water had to be carried off by the drainage system; yet, despite the severity of the test, good results were obtained, and although many of the drains were running bank-high only in one or two isolated places were they overflowing across the surrounding country.

*Bridges.*—During the year three sill bridges were erected on the works. The following is a summary of the various works performed during the year :—

				M.	Ch.	Cub. Yard.	
Canals dredged	..	..	..	..	5	46½	252,618
New drains	..	..	..	..	3	77	21,752
Drains widened and deepened	..	..	..	..	9	39	29,407
Cleaning drains	..	..	..	..	19	22	..
Road-formation	..	..	..	..	3	9½	..
Sill bridges erected (number)	..	..	..	..	..	..	3

The major works to be carried out during the coming year are (1) widening and deepening of the Kaikokopu Stream, (2) completion dredging Pongakawa Stream, (3) stop-banking Waihi Estuary.

The total expenditure for the year was £11,860; of this amount £4,137 was expended in day-labour (including dredge crews) and £3,583 in piecework contracts. The officer in charge is Mr. D. S. B. Heather, Acting Engineer, whose headquarters are at Pongakawa.

#### POUKAWA DRAINAGE AREA (13,567 ACRES), HAWKE'S BAY COUNTY.

Operations have not been commenced on this area, as no decision has been reached with regard to the Native lands included in the drainage area.

A dredge at the Rangitaiki works has been dismantled, and when overhauled will be available for this area when required. The dredge pontoon was inspected recently, and was found to be in fair order, although the caulking will require renewing, and some of the timbers for the foundation have warped and will need to be replaced.

The rainfall for the year was 26.57 in., rain falling on ninety-seven days, and the average for the past eight years was 28.93 in.

The expenditure for the year was £103,3s. 9d.

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

Although an extremely bad winter was experienced (during which there were two disastrous floods), followed by a very wet early summer, the various operations have been vigorously prosecuted, and the progress made has been satisfactory. During the year rain fell on 160 days, the total fall being 54.53 in. April, 1924, was the wettest month, with a fall of 14.12 in., spread over seventeen days. January, 1925, was the driest month, with a fall of 0.86 in., spread over seven days.

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

*Wairua River Diversions.*—Excavating-machines : No. 12 Bucyrus, equipped as a steam-shovel, and No. 14 Bucyrus, working with automatic skips over the 15 ft. extension to the drag-line boom, have been concentrated during the whole of the year on the rock excavation of the No. 2 cut. No. 13 Bucyrus, working solely as a drag-line, assisted with the above operation till the middle of October, 1924. From this date No. 13 concentrated on the No. 4 cut till the middle of February, 1925, thence returning to assist in making the river-crossing between cuts Nos. 2 and 3, and at the middle of March, 1925, this machine was moved to the mouth of the No. 2 cut to assist in the removal of the big slip at that point.

No. 3 Priestman has, since the end of October, 1924, been continuously engaged on the excavation of the dredge cut through Block IV, Purua Survey District.

No. 2 cut : The excavation of this cut has now, except for the removal of the big slip at the mouth, been completed, the main working-face, as at 31st March, 1925, being half-way across the river-bed between cuts Nos. 2 and 3. The material met with has been a solid mass of rock except between pegs 17c and 20c, where massive boulders were encountered tightly wedged into the grey pug. Between these chainages the floor of the cutting was very treacherous, causing great trouble in keeping a travelling-track for the steam-shovel. The rapidity of the rock-drilling operations being the key to the rate of excavation, as many drillers as possible have been at all times concentrated on the working-face. For the latter half of the year the drillers have worked a regular ten-hour shift, and when there has been sufficient rock shot out the excavating-machines have at times worked an eleven-hour shift. The cutting has been excavated at least 1 ft. below plan grade ; and for a depth of another 2 ft. the rock floor has been well shattered by the shots. The operations on this cut were hindered on two occasions by serious floods, the first reaching its maximum height on the 7th April, 1924, and the second on the 26th May, 1924. Both these caused the river to rise so high that for just about two weeks on each occasion the flood-waters overtopped the bank on the river side of the cut. As soon as the water dropped to bank-level again we were at once able to get Nos. 13 and 14 working, but on each occasion another week elapsed before the No. 2 lagoon was low enough to allow of our pumping out to restart No. 12.

In order to facilitate the excavation of the river-bed between Nos. 2 and 3 cuts, No. 13 machine drag-lined a by-pass, 30 ft. wide and some 4 chains in length, leaving the river 2 chains above the crossing between the two cuts, and entering the No. 2 cut on the right side opposite peg 24c. The jobs of building protective dams both behind No. 12 machine and across the river were carried out expeditiously by means of the excavating-machines, and the water was turned through the by-pass early in March, 1925. The excavation of the river-bed crossing is now well in hand, No. 14 machine building its spoil-bank ahead of itself (and, of course, in the old river-bed), and using this all the time as a travelling-road. For the last two weeks of the year No. 13 machine has been at the mouth of this cut, concentrating on the big slip there, and, although there is a large percentage of very massive stone to cope with, good progress has been made towards removing the obstruction.

No. 3 cut : Except for a bar of about a chain at each end this cut was stripped previous to June, 1923. No. 13 machine has now completed the stripping of the clay bar at the bottom end of the cut, as much as possible of the spoil thereby being dumped at once to form a portion of the protective dam across the river. This machine has also " prospected " over the entire length of the cut with a view to finding a working-face suitable for the drag-line. Results, however, proved unfavourable, everything tending to show that this cut is going to be just as hard a proposition as the No. 2 cut.

No. 4 cut : Except for a bar  $\frac{1}{2}$  chain wide at the mouth, this cut was stripped for an average depth of 11 ft. up to the 7.5c peg, prior to June, 1923. No. 13 Bucyrus has now excavated the cut to the full depth and width as far as the 2c peg, and for full depth and a half width from 2c to 6c ; also, the stripping has been carried on to 8.2c. The material met with has been very stiff clay and rubble, with a fair proportion of massive blue-metal boulders : all, however, proved quite workable with the drag-line.

*Relief to Swamp Proper.*—It is hoped that the No. 3 cut will be finished by the end of December next, and, though No. 4 cut will not be completed, every endeavour will be made to have it sufficiently far advanced to provide a passage for flood-waters during the following winter.

*Output.*—During the year 39,238 cubic yards and 12,974 cubic yards of stiff clay and rubble have been excavated, at a total cost of £11,421, or 4/4.49 per cubic yard.

The total excavation on the Wairua River diversions to date amounts to 173,764 cubic yards, at a total cost of £46,868, or 5/4 per cubic yard. The total excavation on the whole project of reclaiming the Hikurangi Swamp to date amounts to 207,999 cubic yards.

*Dredge Cut, Block IV, Purua Survey District.*—Drainage of this arm of the swamp is being carried out by means of a Priestman dredge, cut generally following the existing waterway, the Aritu Stream, some  $4\frac{1}{4}$  miles in length, and entering the Wairua River near the outlet of spillway No. 9. Beyond the 2-mile peg (the traverse chainage increasing towards the river) the existing creek is very tortuous, and numerous diversions have therefore been adopted for the line of the dredge-cut so as to make a permanent and satisfactory job. The necessary timber for the pontoon was landed at the erection site towards the end of last period, and a start was made on the building of the pontoon at the end of April, 1924. This was carried out by day labour. In the meantime the dredge machinery, on transfer from the Rangitaiki works, was thoroughly overhauled at Thames prior to being forwarded to Whangarei. At the end of October, 1924, the dredge was in working-order, and at once commenced operations on the cut, a ten-hour shift being worked. For the first 20 chains the machine had easy going, but since then a great proportion of hard stiff clay has been encountered. To date the machine has lifted 34,235 cubic yards of spoil, at a cost of 5.39d. per cubic yard.

*Surveys.*—An engineering survey is at present being made for the possible location of a dredge-cut that will drain the Apiriki arm of the swamp. To date all information has been collected for a distance of  $4\frac{1}{2}$  miles up the Apiriki Creek—that is, to the south-eastern boundary of Section 10A, Block XIV, Hukerenui Survey District. As soon as the weather breaks for the winter it will be impossible to carry on with investigations in this locality. The engineering surveys necessary for the location of the best outlet for the Hikurangi arm of the swamp will then be undertaken.

*Excavating Plant.*—Even though the Bucyrus machines encounter at all times a very heavy task, they are standing up to their jobs very well. All necessary repairs, with the exception of those of a large order, to the engines, buckets, skips, &c., are carried out expeditiously and economically in the fitting and repair shops. To cope with renewals that are now required after three years of hard wear, a considerable number of spares for these machines were indented from America during the period.

*Rock-drilling Plant.*—Drilling operations with the Ingersoll-Rand plant have been carried out on an intense scale during the period, the compressed air for the jack-hammers being supplied by a battery of four compressors. Every endeavour is made to keep this plant at the highest point of efficiency. The operator of the machines keeps an accurate record of time run, fuel, oil, &c., which record shows definitely when any particular machine needs overhauling. Thus it is that each machine is taken down in turn and all wear and slackness adjusted. During the year an exhaustive test was made to arrive at comparative results of the performance of the air-compressors with various motor-spirits as fuel, and it was found that results were practically uniform.

*Buildings.*—All buildings that have been erected in connection with the works are of a temporary nature. During the year two huts, one 10 ft. by 10 ft., the other 16 ft. by 10 ft., were erected to accommodate the gang building the pontoon for No. 3 Priestman, and two huts, 9 ft. by 9 ft., were mounted on the pontoon as living-quarters for the dredge crew. A small rent charge is made for all huts occupied by workmen, the amount received during the year being £131.

*Stores.*—A complete system of stores record is kept, and all stores, such as motor-spirit, kerosene, gelignite, &c., are checked and balanced at least once a month. A complete stock-taking of all plant, machinery, tools, and stores is made every year, the total amount on charge being in the vicinity of £37,500.

*Works Expenditure.*—The total amount expended during the year was £20,696; of this amount the sum of £8,553 was paid in wages.

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

The following operations were carried out under the authority of the Swamp Drainage Amendment Act, 1922 :—

#### MANGAWAI DRAINAGE (1,050 ACRES) RODNEY COUNTY.

No work was carried out in this area during the past year, but there is a possibility that more drain-cutting will be necessary in the near future.

#### HARIHARI SWAMP (952 ACRES), WESTLAND COUNTY.

Construction work on this swamp ceased at the end of August, all work under the scheme of drainage for the area being then completed. During the portion of the year that work was in progress,  $40\frac{1}{2}$  chains of small catchwater drains were constructed, and 2 miles  $77\frac{1}{2}$  chains of previously constructed drains were enlarged and deepened. All drains are now up to required dimensions, and bedded below the peat. On inspection during October, the drains were all working well, and the area bore a decidedly healthy appearance.

The subdivisional survey preparatory to opening the area for settlement has been left in the hands of the Commissioner of Crown Lands, Hokitika.

The expenditure for the year was £1,173 13s. 11d.

The work was done under the supervision of Mr. J. S. Strawbridge, Land Drainage Engineer.

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, 1925.

<i>Receipts.</i>		£	s.	d.	<i>Payments.</i>			
Balance as at 1st April, 1924 .. .. .	..	5,859	17	8	Kaitia Drainage District—			
Debentures raised under Swamp Land Drainage Act, 1915 .. .. .	..	90,000	0	0	Drainage-works, &c. ..	8,538	19	11
“Thirds” .. .. .	..	7	2	9	Loose tools .. .. .	53	6	2
Rent of dwellings .. .. .	..	190	9	4	Fuel and stores .. .. .	2,741	5	5
Flax royalty .. .. .	..	16	8	7	Management and engineering expenses .. .. .	1,029	19	3
Interest on mortgage .. .. .	..	5	13	3				
								12,363 10 9
					Waihi Drainage District—			
					Drainage-works, &c. ..	9,091	18	2
					Loose tools .. .. .	49	17	9
					Live-stock .. .. .	50	0	0
					Fuel and stores .. .. .	1,653	5	8
					Management and engineering expenses .. .. .	786	14	5
								11,631 16 0
					Hikurangi Drainage District—			
					Drainage-works, &c. ..	12,511	5	2
					Loose tools .. .. .	112	5	7
					Fuel and stores .. .. .	4,933	7	1
					Management and engineering expenses .. .. .	1,099	0	8
								18,655 18 6
					Poukawa Drainage District—			
					Drainage-works, &c. ..	91	5	0
					Loose tools .. .. .	0	11	9
					Management and engineering expenses .. .. .	12	8	2
								104 4 11
					Harihari Drainage District—			
					Drainage-works, &c. ..	1,058	4	0
					Management and engineering expenses .. .. .	115	9	11
								1,173 13 11
					Plant and machinery .. .. .			1,712 0 2
					Interest on debentures .. .. .			16,195 10 11
					Charges and expenses raising loans .. .. .			1,376 19 2
					Cash in Public Account, 31st March, 1925 .. .. .	7,865	17	3
					Investment Account .. .. .	25,000	0	0
								32,865 17 3
								<u>£96,079 11 7</u>
								<u>£96,079 11 7</u>

## BALANCE-SHEET AS AT 31ST MARCH, 1925.

<i>Liabilities.</i>			<i>Assets.</i>			
	£	s. d.	£	s. d.	£	s. d.
Debentures issued under Swamp Land Drainage Act, 1915..	421,000	0 0	Kaitaia Drainage District—			
Public Works Fund—Land Improvement vote ..	4,563	19 7	Drainage-works ..	137,549	2 3	
Consolidated Fund—Accumulated interest on amounts expended out of Public Works Fund ..	1,922	0 2	Interest Account (proportion chargeable to district) ..	33,223	8 8	170,772 10 11
Sundry creditors, for interest on debentures accrued but not due ..	6,988	7 3	Waihi Drainage District—			
Sundry creditors, for interest on debentures due and unpaid ..	4	18 8	Drainage-works ..	63,795	9 0	
Sundry creditors—Miscellaneous ..	4,125	8 8	Interest Account (proportion chargeable to district) ..	14,500	7 5	78,295 16 5
			Poukawa Drainage District—			
			Drainage-works ..	2,902	9 7	
			Interest Account (proportion chargeable to district) ..	1,154	10 2	4,056 19 9
			Hikurangi Drainage District—			
			Drainage-works ..	64,007	12 11	
			Interest Account (proportion chargeable to district) ..	12,986	18 6	76,994 11 5
			Mangawai Drainage District—			
			Drainage-works ..	1,872	13 2	
			Interest Account (proportion chargeable to district) ..	256	2 5	2,128 15 7
			Harihari Drainage District—			
			Drainage-works ..	4,354	15 1	
			Interest Account (proportion chargeable to district) ..	348	8 9	4,703 3 10
			Buildings ..			2,483 11 1
			Plant and machinery ..			59,582 0 11
			Loose tools ..			816 11 7
			Live-stock ..			163 7 0
			Fuel, &c. ..			2,655 18 9
			Stores on hand ..			2,487 18 2
			Sundry debtors—Advances on mortgage ..			260 0 0
			Sundry debtors—Interest on mortgage ..			3 4 11
			Sundry debtors for rent ..			4 13 0
			Sundry debtors for interest on investments ..			263 14 0
			Sundry debtors—Miscellaneous ..			60 19 9
			Cash in Public Account ..	7,865	17 3	
			Investment Account ..	25,000	0 0	
						32,865 17 3
						<u>£438,604 14 4</u>
						<u>£438,604 14 4</u>

J. B. THOMPSON, Under-Secretary.  
J. H. O'DONNELL, Chief Accountant.

*Approximate Cost of Paper.*—Preparation, not given; printing (725 copies, including plans, &c.), £57.

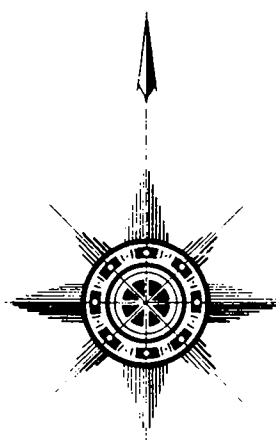
By Authority: W. A. G. SKINNER, Government Printer, Wellington.—1925.

Price 2s.]



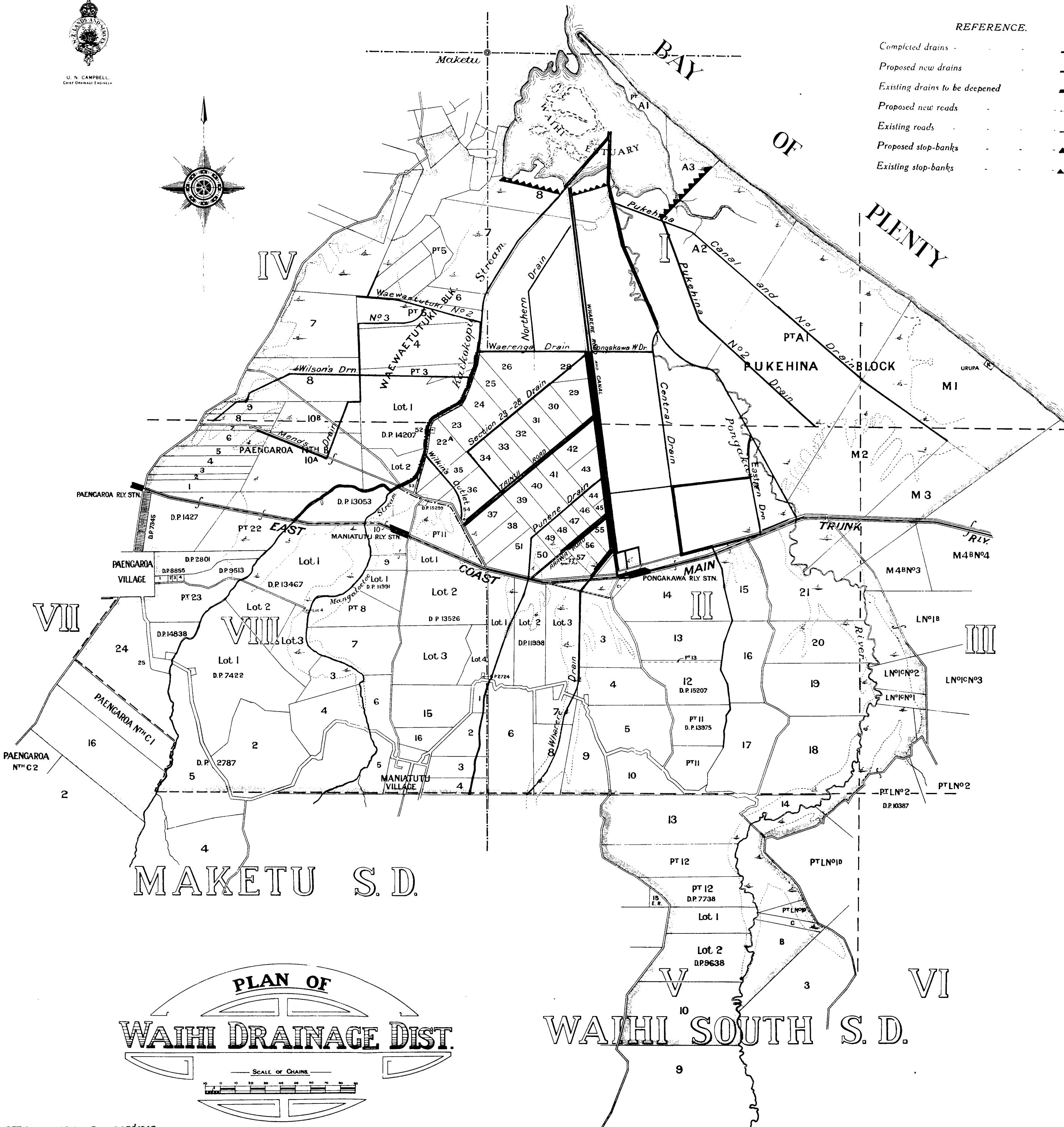


G. N. CAMPBELL,  
CHIEF DRAINAGE ENGINEER

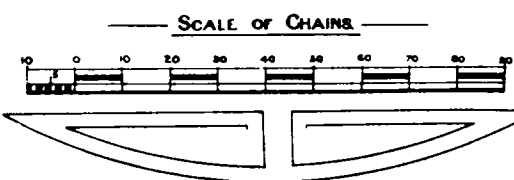


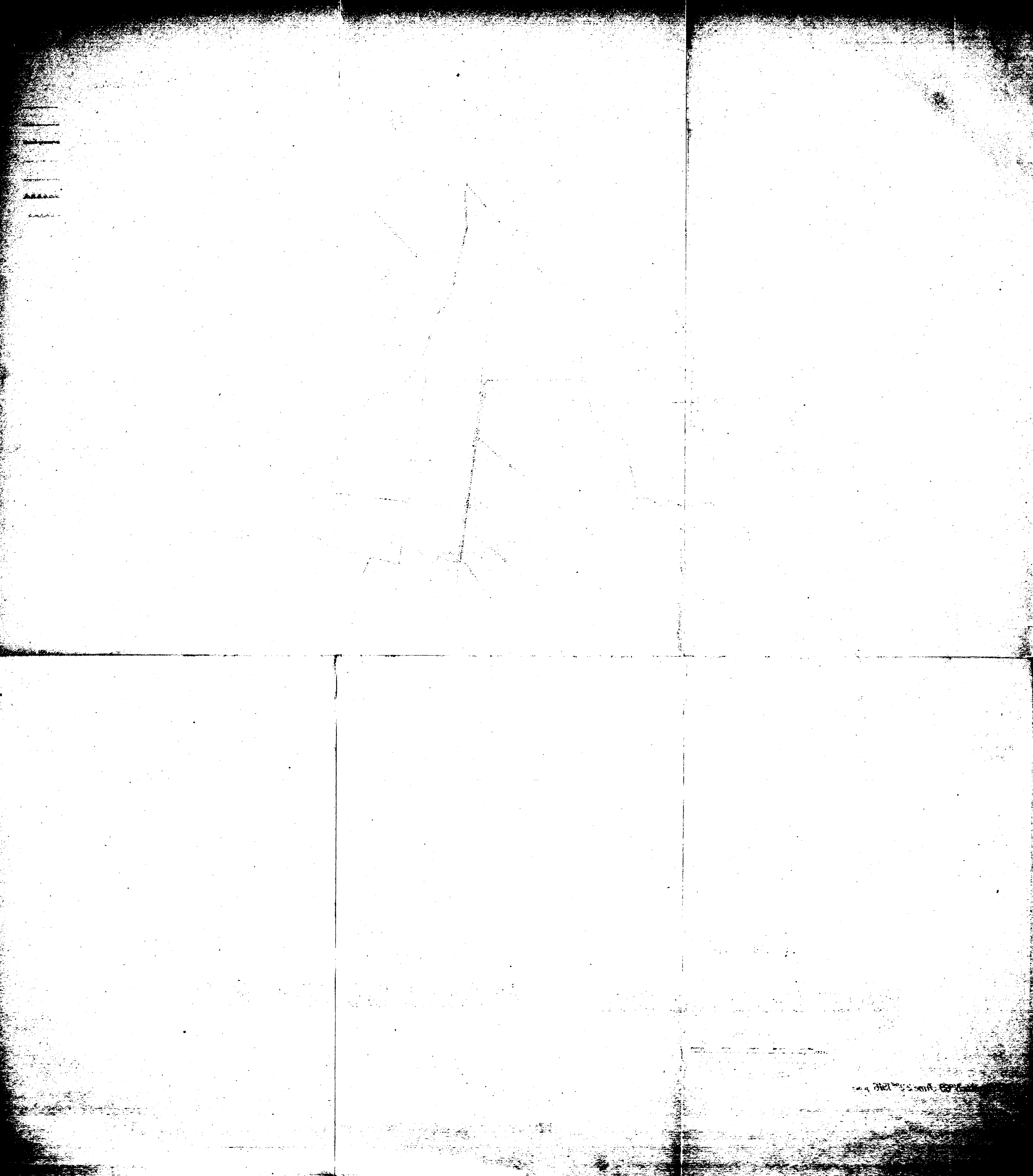
REFERENCE.

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



**PLAN OF  
WAIHI DRAINAGE DIST.**





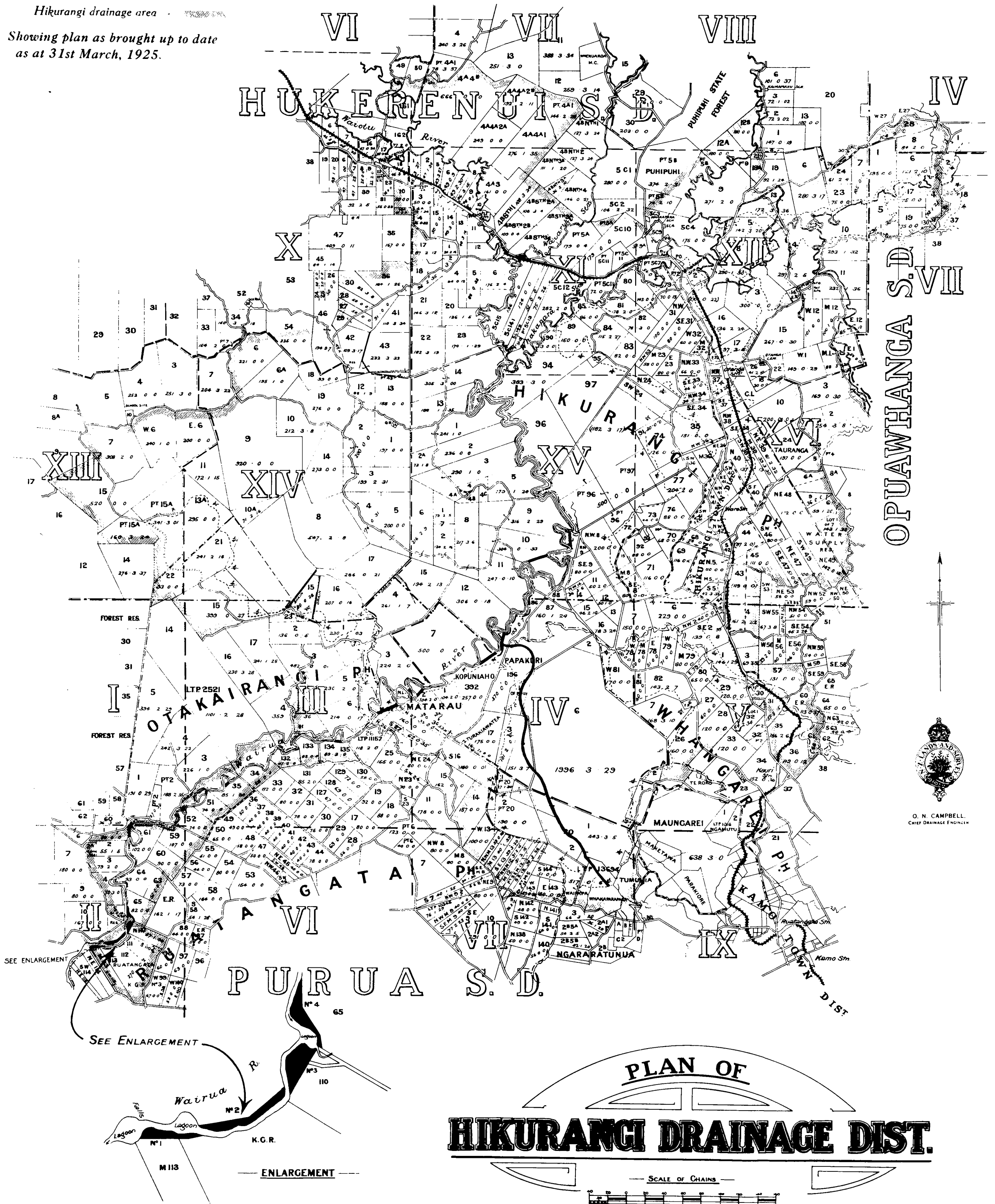
REFERENCE.

Proposed work shown thus : ————

Work in hand .. .. ————

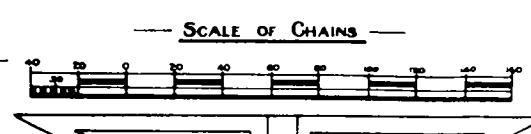
Hikurangi drainage area - - - - -

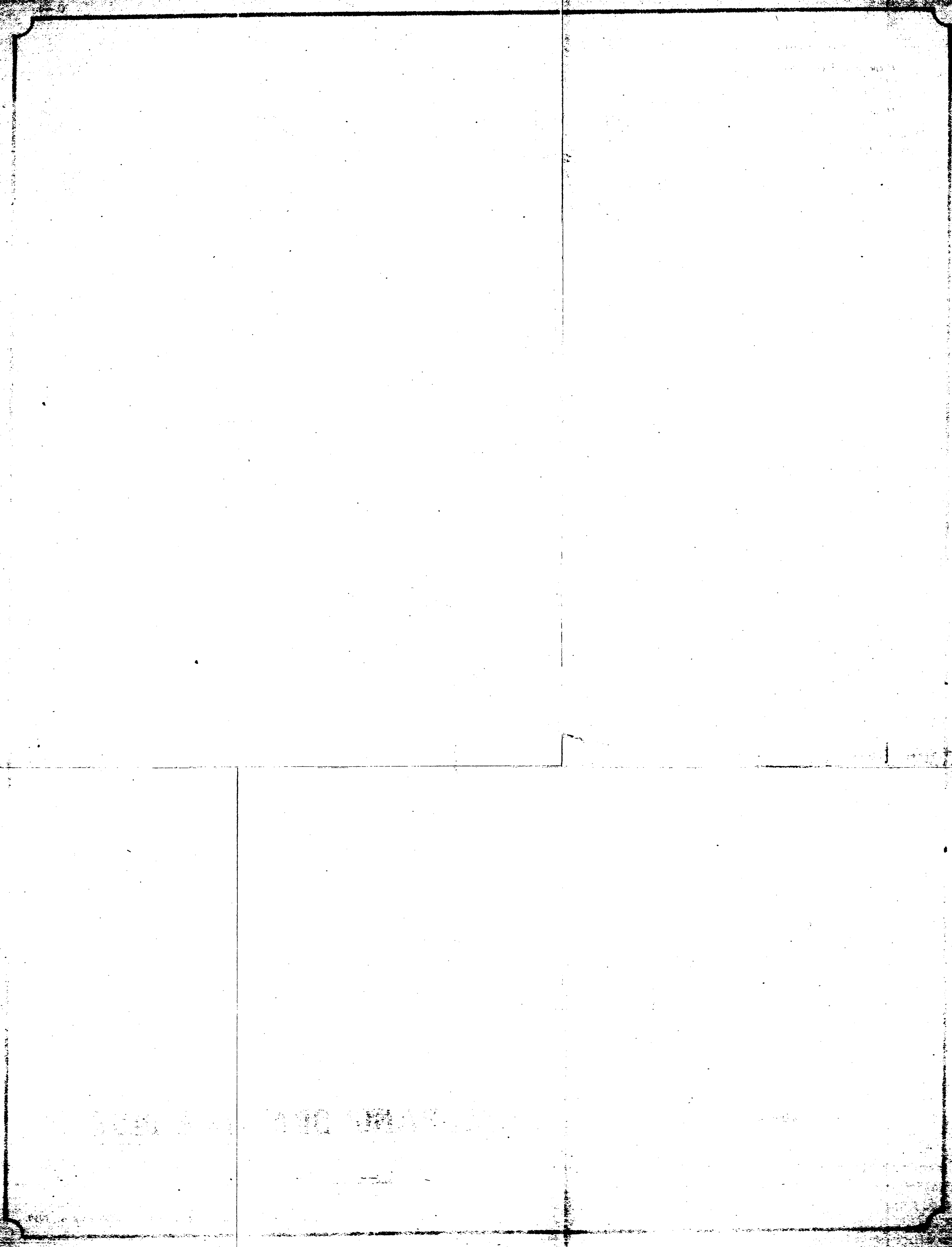
Showing plan as brought up to date as at 31st March, 1925.



OPUAWHANGA S.D. VII

PLAN OF HIKURANGI DRAINAGE DIST.







RANGAUNU BAY

REFERENCE.

Boundaries of Kaitaia drainage area

Drains now in operation

Drains under construction

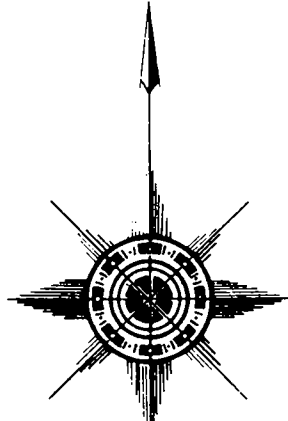
Dredged channels

Stop-banks

Work as standing at end of 1924-25.

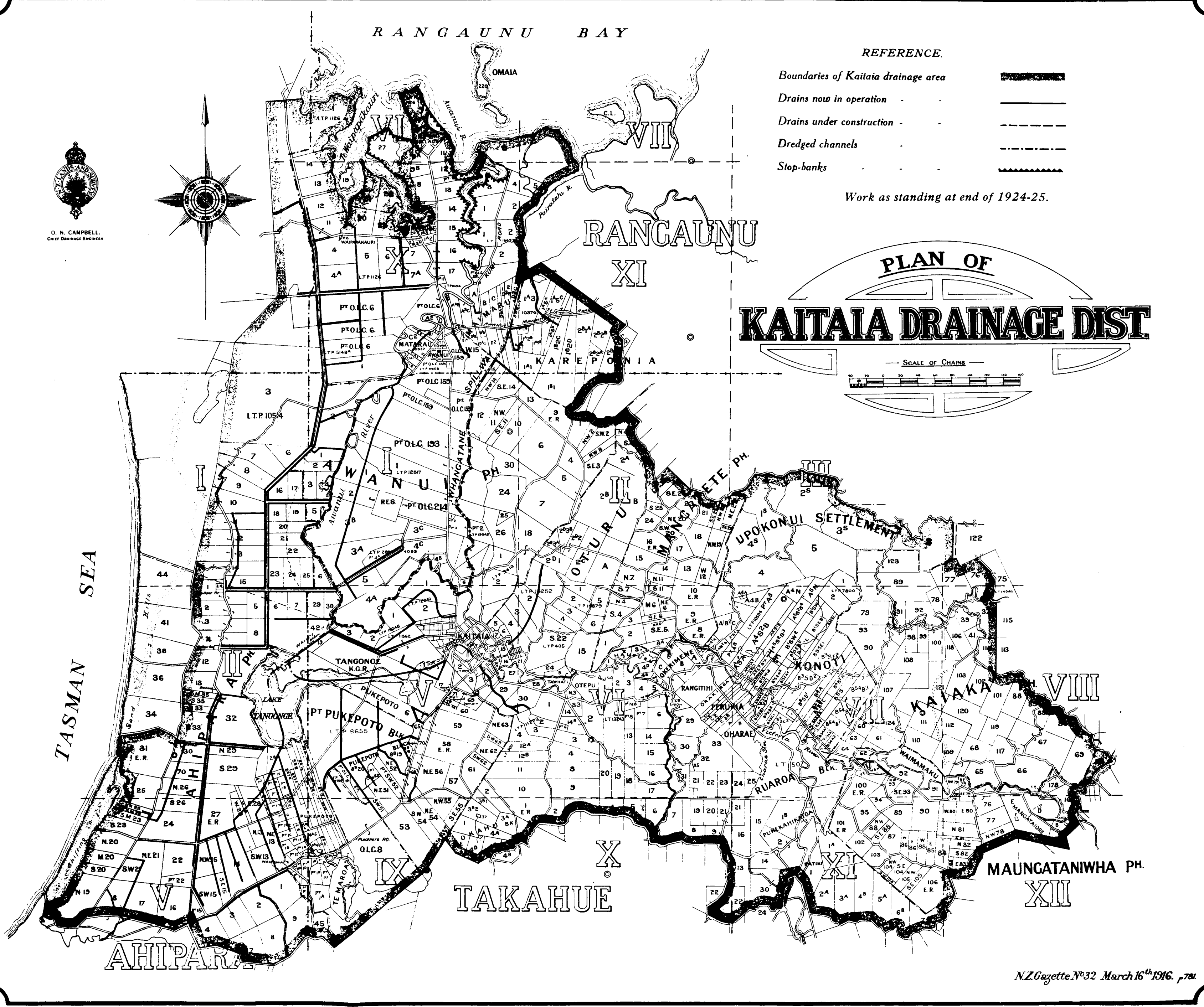
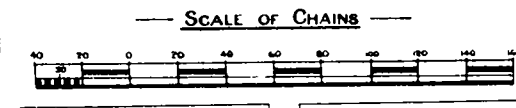


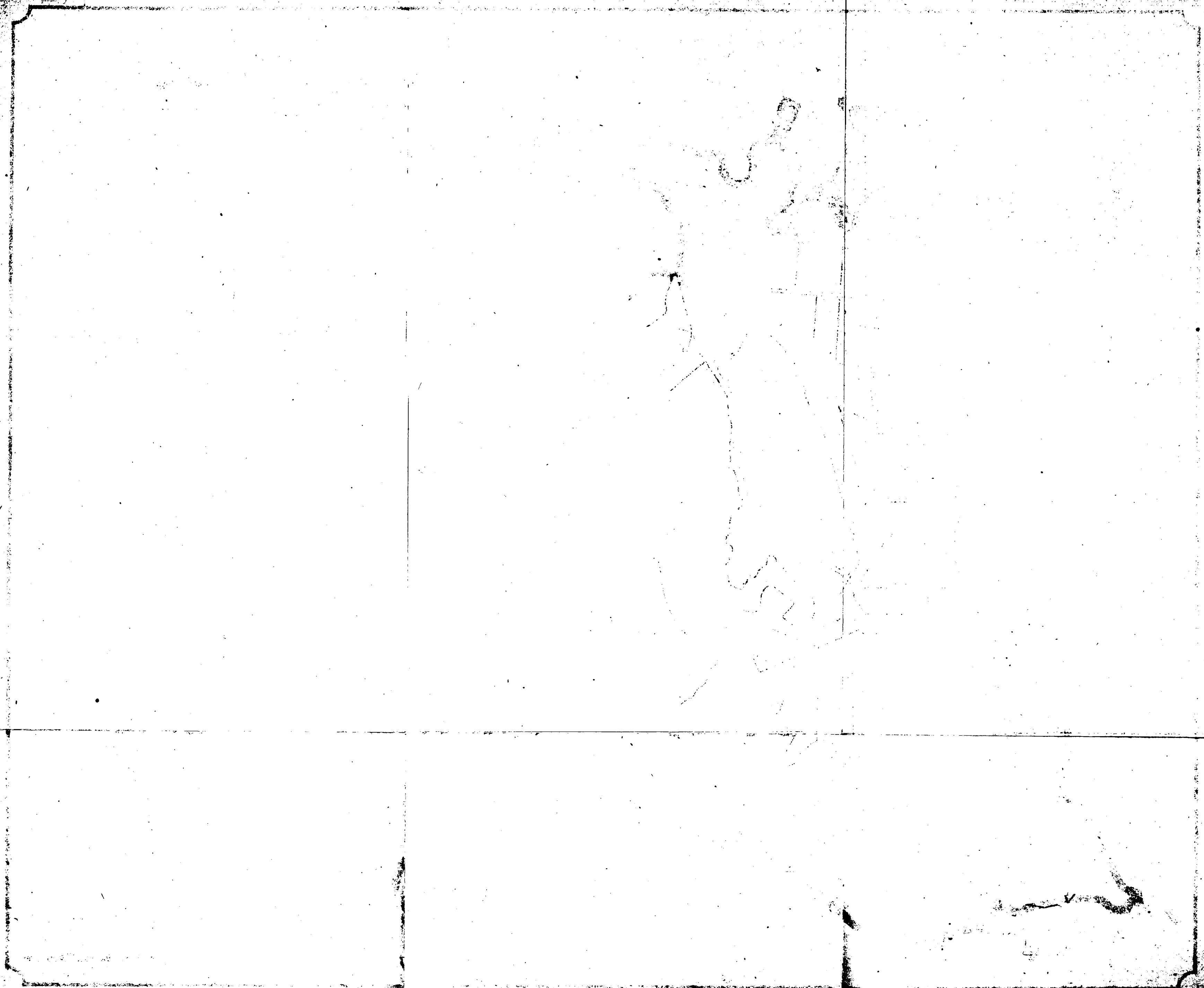
O. N. CAMPBELL, CHIEF DRAINAGE ENGINEER



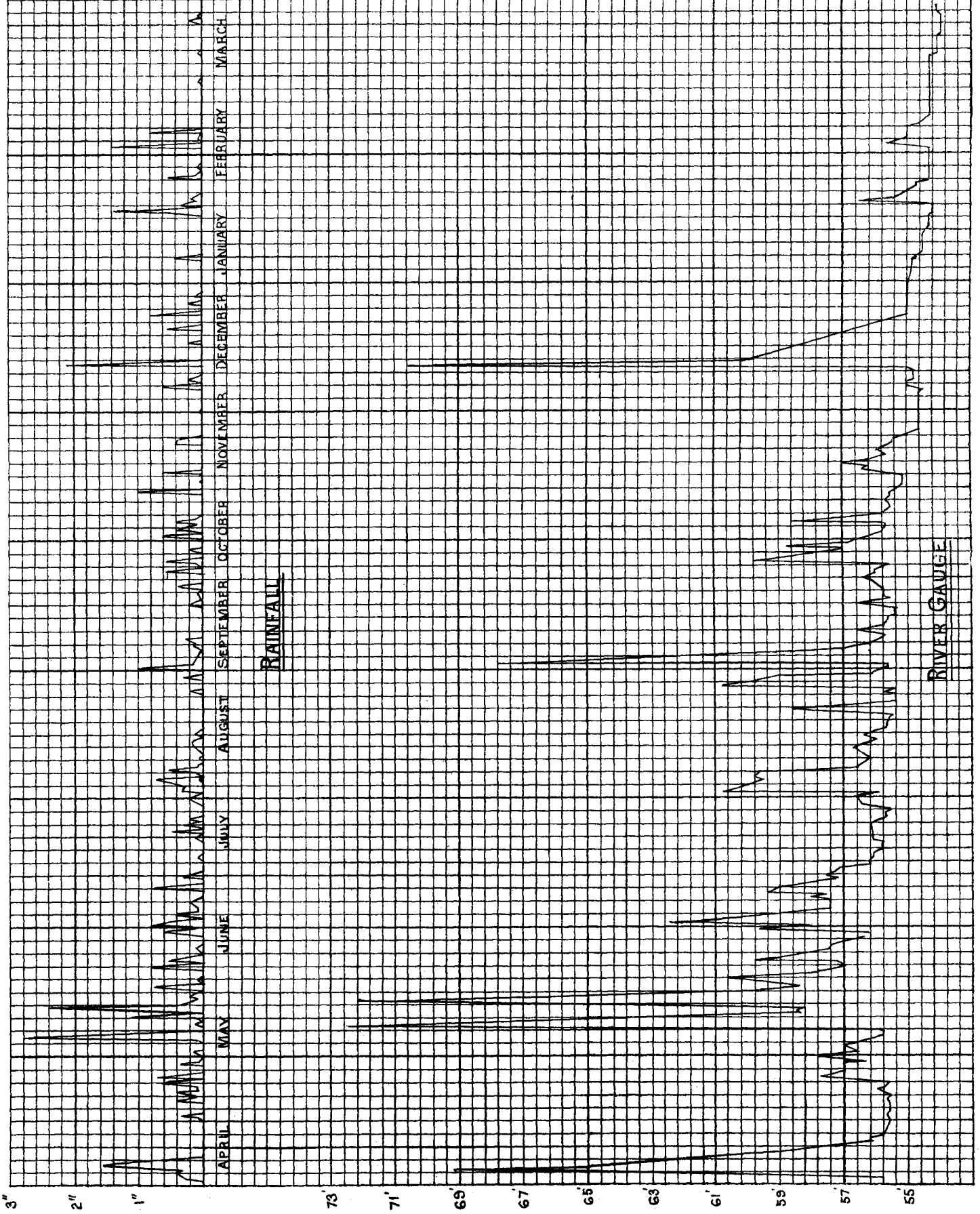
RANGAUNU XI

PLAN OF KAITAIA DRAINAGE DIST





RAINFALL & RIVER GAUGE CHARTS  
 AT  
FOSTERS' BRIDGE KAITAIA RIVER  
 FROM  
APRIL 1<sup>ST</sup> 1924 TO MARCH 31<sup>ST</sup> 1925



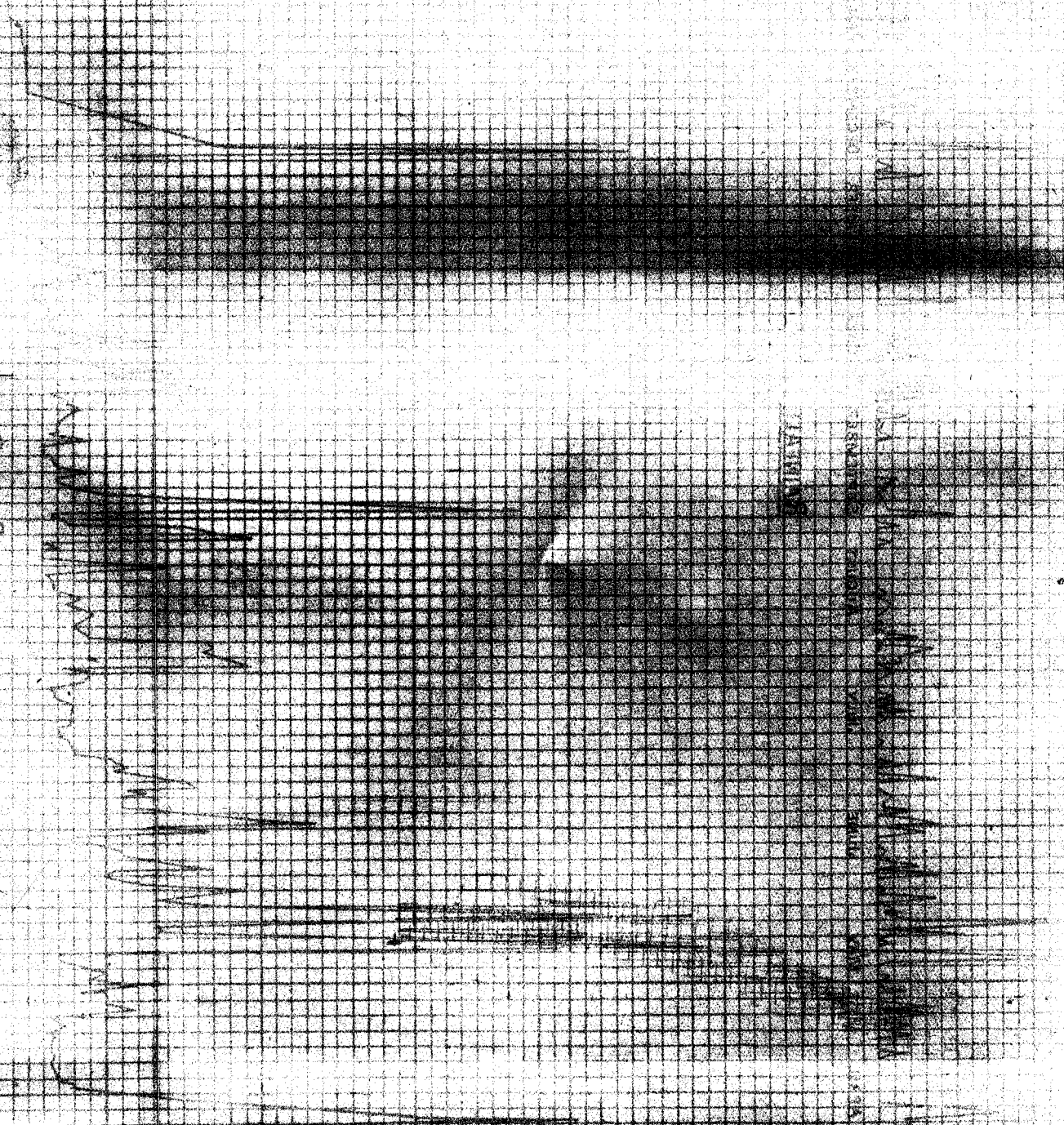
RAINFALL

RIVER GAUGE



RAINFALL & RIVER GAUGE CHARTS  
AT  
FOSTER'S BRIDGE KATHIA RIVER

DATE: \_\_\_\_\_



DISCHARGE

RAINFALL

DATE

TIME

PLACE

NO.

SCALE

UNIT