



WATER RESOURCES
OF THE
LOWER HUNTER VALLEY
INCLUDING THE KARUAH VALLEY

SURVEY OF THIRTY N.S.W. RIVER VALLEYS
REPORT N^o 4 — AUGUST 1966

WATER RESOURCES OF THE LOWER HUNTER VALLEY
(INCLUDING THE KARUAH VALLEY)

PREFACE

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MINISTER FOR CONSERVATION


NEW SOUTH WALES

In accordance with the policy of the New South Wales Liberal-Country Party Government announced prior to its election to office at the May, 1965 State Elections, I directed the Water Conservation and Irrigation Commission to undertake a survey of the State's water resources on an individual valley basis to enable the formulation of a balanced and soundly based programme of water conservation.

The survey will cover thirty major river valleys of the State and when completed will represent the largest and most comprehensive study of its type ever undertaken in Australia.

In the survey studies will be made of the physiography, climate, groundwater potential and surface water resources of each valley. In addition to reviewing current water requirements, assessments will be made of possible future water development.

As the overall survey will not be completed for some time it has been decided to prepare and issue separate reports for individual valleys. This report on the water resources of the Lower Hunter Valley, including the Karuah Valley, is the fourth report to be completed.



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15TH AUGUST 1966.

WATER RESOURCES OF THE LOWER HUNTER RIVER VALLEY
INCLUDING THE KARUAH RIVER VALLEY

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WATER RESOURCES OF THE LOWER HUNTER VALLEY
(INCLUDING THE KARUAH VALLEY).

1. INTRODUCTION.

Water is a basic essential for the existence of mankind. Although there is an abundance of this resource upon the Earth, totalling more than 320 million cubic miles, only a very small proportion of it is in a form and in locations where it is readily available for man's use.

By far the greatest part of the water upon the Earth, over 99 percent, is contained either in the oceans where it is too saline for use without expensive treatment, or in the polar ice caps where it is too remote from populated areas to be of any benefit. Underground water comprises approximately 0.8 percent of the Earth's total water resources, and the surface water contained in rivers and lakes, which is the most convenient supply for man's consumptive use, has the smallest natural storage amounting to only approximately 0.004 percent of the Earth's total.

The world demand for fresh water is increasing. The increase is due not only to increasing population but also to a rising per capita consumption of water occasioned by improving living standards and growing industrial activity. The production of one ton of food requires the use of 1,000 tons of water; one ton of steel requires 300 tons of water; and one ton of paper requires 60 tons of water.

The two main sources of usable water, surface and underground, are being continually replenished naturally by rainfall, but in Australia the rate of replenishment is low compared with that in other continents and the need for careful water use is correspondingly great. Rain is produced when moist air ascends, is cooled, and releases its moisture as precipitation; Australia's low rainfall is the result of two factors concerned with this process.

Firstly, the Australian continent lies in a latitudinal belt where the great circulating air masses of the world are generally descending, and therefore are relatively dry. Secondly, its low topographic relief provides little obstacle to the passage of air masses, which can traverse the greater part of the continent without being forced to rise

and shed their moisture. The average annual Australian rainfall of some 18 inches can be compared with the approximate average rainfalls of 23 to 26 inches in Africa, Asia, Europe and North America, and over 50 inches in South America.

Consideration of surface water supplies shows even more markedly Australia's unfavourable position in comparison with the other continents. The natural processes of evaporation, seepage, and consumption by vegetation use a large part of the total rainfall, and the usable residue appearing as runoff and entering Australian rivers and streams amounts to only about one ninth of the total rainfall, or an average of 2 inches per annum. In Africa the corresponding figure for average annual runoff is approximately 7 inches, in Asia and Europe 9 inches, in North America 11 inches, and in South America some 19 inches.

The rate of replenishment of water supplies by rainfall is variable, and it has been necessary for man to construct works to provide artificial storages for surface water so that a relatively constant drawoff can be made from the varying natural supply.

Australian streamflows exhibit marked variability, with occasional very high flows and extended periods of very low flows. Records of streamflow in New South Wales show that every stream has at some time either completely ceased flowing or has been reduced to a small trickle; the conservation of surface water supplies in this State is therefore a task of prime importance.

The average annual rainfall over the total catchment of the Hunter River below Maitland and the Karuah River is approximately 40 inches, and the average annual surface water resources have been assessed at about 1,030,000 acre feet. On the basis of available water per square mile of catchment area, these resources are considerably greater than the average values for both Australia and New South Wales, but in common with the rest of the continent the available surface water supply varies considerably from year to year. It is essential that

this supply be effectively conserved and wisely used if the population, industry and agriculture of the region is to continue to increase.

2. PHYSIOGRAPHIC FEATURES.

The catchment area of the Lower Hunter and Karuah River Valley: treated in this report embrace, an area of about 2,000 square miles, and is shown at Figure 1. The area comprises some 1,150 square miles drained by the Hunter River and its tributaries downstream from Maitland, and some 850 square miles drained by the Karuah River and some minor streams flowing into Port Stephens. (The Karuah River drainage area considered in this report is only a part of the 1,730 square miles area adopted by the Australian Water Resources Council in its Review of Australia's Water Resources, 1963, as the Karuah River Basin. That Basin included the drainage area of the Karuah River, and also the drainage areas of other streams further north, notably the Myall, Gooloongolok and Wollomba Rivers).

The Lower Hunter River carries runoff from the upper catchment of the Hunter, and downstream from Maitland it is fed by the Paterson and Williams River systems from the north, and by Wallis Creek from the south.

The Paterson River and its main tributary the Allyn River rise in adjacent sections of the southern escarpment of the Barrington Tops area at elevations of about 5,000 feet, and both flow in a generally southerly direction through steep walled narrow valleys. The valleys gradually widen and become less steep in the vicinity of East Gresford where the two streams are separated by a distance of less than two miles. Some eleven miles downstream from East Gresford the Allyn River joins the Paterson River which then maintains its southerly course through Paterson and joins the Hunter River near Morpeth, some twenty eight miles upstream from its mouth at Newcastle.

The Williams River and its main tributary the Chichester River rise in adjoining portions of the southern escarpment of the Barrington and Gloucester Tops, to the east of the Allyn River headwaters, at elevations approaching 5,000 feet. They flow generally south east through steep

walled valleys which gradually widen and become less rugged as the rivers progress. The Williams River is joined by the Chichester River some thirteen miles upstream of Dungog, from where it flows in a southerly direction past Clarencetown and through some ten miles of low-lying swampy country before joining the Hunter River at Raymond Terrace, approximately eighteen miles upstream of Newcastle.

Wallis Creek drains the ranges south of Maitland, which have a maximum elevation of about 1,400 feet, and flows north through Mulbring. It is joined on the left by Fishery Creek and enters the Hunter River at Maitland.

The Karuah River rises as two branches at elevations of over 3,000 feet in the coastal ranges leading up to the Gloucester Tops, and flows in a south easterly direction. The two branches join as they emerge from the steep, heavily timbered headwaters and the river continues to flow south easterly until it is joined by Mammy Johnson's Creek near Stroud Road. From there it flows south, being joined by several minor tributaries during its course and entering the western end of Port Stephens at Karuah.

As shown at Figure 2 the topography of about 25 percent of the valleys is mountainous with land slopes of 15 degrees or more. This mountainous area is mainly in the northern sector, where steep spurs extend south and east from the Mount Royal Range and Barrington and Gloucester Tops, and where steep coastal ranges exist to the north and east of Stroud.

A further 15 percent is classed as steep, with slopes of from 8 degrees to 15 degrees, and comprises generally the foothills of the mountainous spurs in the north and some elevated country near the southern boundary. The remainder consists of approximately equal areas of undulating land (3 degrees to 8 degrees) and flat terrain (less than 3 degrees), which appears as a broad band extending eastwards from Maitland to Newcastle and Port Stephens, with connected areas in the valleys of the Paterson, Williams and Karuah Rivers.

Vegetation varies from dense forest cover in the rugged uplands of the northern part of the catchment, to grasses in the foothills and valleys, sown and planted crops along much of the river terraces, and scrub and poor quality cover on the complex of sand dunes and swamps near the coast.

3. CLIMATIC FEATURES.

RAINFALL.

The catchments of the Lower Hunter and Karuah Valleys are well watered, the annual median rainfall being in excess of 30 inches for virtually the whole of the drainage area. (The median is that value which is experienced or exceeded on 50 percent of occasions). Highest yearly totals occur on the high ground above the 2,000 ft. contour along the northern boundary where median values are close to 50 inches.

The driest portion is in the vicinity of Wallis Creek along the south western boundary. In this area the annual median values fall below 30 inches. The distribution of annual median rainfalls over the catchments is shown at Figure 3 whilst the distributions of the monthly median rainfalls are shown at Figures 4 to 15 inclusive.

On the coastal fringe in the vicinity of Newcastle, the monthly rainfalls tend to be more uniformly distributed than over the rest of the catchments. Inland, the wetter period of the year is from December to April when over 50 percent of the annual average rainfall is usually received. Median rainfalls for each of these months are greater than 3 inches generally and rise to about $5\frac{1}{2}$ inches in January and February over the highlands along the northern border.

Relatively dry conditions are experienced over most of the area from July to October (for some stations July to November). The driest month is usually August when the median exceeds 2 inches only in the extreme northern corner above the 3,000 ft. contour and on the coastal fringe. Median rainfalls are about $1\frac{1}{4}$ to $1\frac{1}{2}$ inches over the western border of the area during this month.

Monthly and annual rainfalls recorded at Carrington, Clarencetown, Cockle Creek, Dungog, Gresford, Kinross, East Maitland, Newcastle, Paterson, Stroud and Wollong are given in Appendices 1 to 11 respectively.

Very heavy rain may occur over the catchments when depressions are located off the Northern or Central New South Wales Coast. Under these conditions, totals of 7 inches in 24 hours are not uncommon. The highest total recorded in the area in a 24 hour period to 9 a.m. was 11.32 inches on 18th June 1949 at East Maitland.

Very high monthly totals can occur throughout the catchments, particularly in the warmer months. At most stations the highest total for an individual month is in excess of 19 inches and the highest monthly total on record for a station in the area is 27.05 inches at Mulbring in June 1950.

The tables at Appendix 12 show on a monthly and annual basis for Carrington, Clarencetown, Kinross, East Maitland, Newcastle, Paterson, Stroud and Wollong the following data:

- (i) the maximum and minimum rainfalls;
- (ii) the 10th, 30th, 50th, 70th and 90th percentile values. (A rainfall observation less than the 10th percentile value can be expected once every ten years on the average. Similarly a rainfall observation less than the 70th percentile value can be expected in 7 years out of 10 on the average or alternatively a rainfall observation greater than the 70th percentile value can be expected on an average of three years in ten).

Although many dry months occur even during summer, it is unusual for a dry spell to persist for more than four months during the period from December to April. Minimum recorded rainfalls for periods up to 12 months at Carrington, Clarencetown, Kinross, East Maitland, Newcastle, Paterson, Stroud and Wollong are shown in the tables at Appendix 13. These tables indicate the minimum cumulative rainfalls commencing in any month of the year and continuing for up to twelve months, which have occurred at the selected rainfall stations.

In the drier part of the catchments monthly rainfall totals are less than $\frac{1}{4}$ inch on 10 percent of occasions even in the summer months. On the coastal fringe, however, the corresponding figure is about $1\frac{1}{4}$ inches. During the wetter period of the year, (i.e., for the five months December to April), at least 11 inches on the coast and 9 inches over the catchments generally, are received on 90 percent of occasions.

In the four months from July to October, on an average of one year in ten, total rainfalls of less than $3\frac{1}{4}$ inches are received over the western border of the area while less than 7 inches are received in coastal areas. The corresponding median rainfalls for the four months are roughly $8\frac{1}{2}$ and $12\frac{1}{2}$ inches respectively.

TEMPERATURE.

Temperature recordings have been taken at a number of places in and near the catchments; however, no representative temperature records are available for the north west corner where the elevation of the country is generally above 2,000 ft. The average monthly and yearly temperatures for two stations are listed in Tables 1 and 2.

- (1) Newcastle, Table 1, which may be taken as representative of the coastal strip;
- (2) Maitland, Table 2, which is representative of the inland portion of the catchment over the lower valleys.

TABLE 1

NEWCASTLE (Elevation 112 feet)

Average Temperature ($^{\circ}$ F.) based on 29 years of record

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average Maximum	77.7	77.7	76.1	72.1	67.1	62.9	61.4	64.1	68.2	71.3	73.9	75.9	70.7
Average Minimum	66.6	67.1	64.7	59.5	53.7	49.5	47.7	48.8	52.6	57.2	61.3	64.3	57.7
Extreme highest on record 112.0° F							Extreme lowest on record 37.0° F						

TABLE 2

MAITLAND (Elevation 19 feet)

Average temperatures (°F) based on 29 years of record

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average Maximum	87.3	86.5	83.0	76.6	69.7	64.4	63.6	67.5	73.5	79.2	83.6	85.8	76.7
Average Minimum	63.7	63.4	60.0	54.6	48.4	44.8	42.9	44.1	48.2	53.0	57.9	61.4	53.5
Extreme highest on record 115.0°F							Extreme lowest on record 28.0°F						

Temperature averages for the high country along the north west border of the area would be roughly 7 to 10 degrees cooler than those quoted for Maitland.

Tables 1 and 2 indicate, that, except for the coastal strip where conditions are generally tempered by sea breezes, the catchments experience warm to hot weather from October to April. During the rest of the year conditions are mild to cool over most of the area with average maxima in the low sixties to mid seventies. Cooler conditions would be expected near the higher country of the north west where average maxima in the cooler months would be around the mid fifties.

Away from the coast during winter, average night temperatures fall to the low forties over the lower valleys while over the higher valleys average minima in the mid thirties would be expected.

Very hot conditions can occur at any time between December and March when west to north west winds bring dry air from central Australia. Temperatures of over 100 degrees Fahrenheit occur over the entire area, the highest on record being 116.8 degrees at Campbell's Hill just outside the western boundary of the region.

On occasions of light winds and clear skies during the months of May to August, very low overnight temperatures are experienced. Except for the coast where temperatures below 35 degrees are extremely rare, temperatures lower than 30 degrees have been recorded; while in the higher valleys it is expected that minimum temperatures around 20 degrees could occur.

FROSTS.

Frost occurrence on the immediate coastal strip is a rare event. Away from the coast, however, frosts occur several times each winter and on occasions are quite severe. Maitland experiences about seven frosts per winter and the phenomenon would be expected to occur more frequently in the sheltered valleys of the higher country to the north west.

Heavy frosts have occurred as early as the middle of May and as late as the end of September. The earliest and latest occurrence of light frosts in the catchments are roughly the middle of April and mid-October respectively.

SUNSHINE.

Estimates of the average number of hours of bright sunshine per day in each month for (a) the coastal fringe and (b) for places in the catchments away from the coast are given in Table 3. These estimates have been based on cloud observations. In general the coastal fringe is slightly more cloudy than the hinterland for all months of the year.

TABLE 3

SUNSHINE

Estimated Duration of Bright Sunshine in Hours Per Day.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
(a) Coastal Fringe	8.1	7.7	7.1	6.2	5.9	5.2	6.1	6.8	7.3	7.5	8.0	8.4	7.0
(b) Inland Areas	8.4	7.9	7.4	6.7	6.4	5.5	6.5	7.1	7.7	7.8	8.3	8.5	7.4

EVAPORATION.

Estimates of the average monthly and annual evaporation (from a sunken pan) for the catchments together with an estimate of the standard deviations are shown in Table 4.

TABLE 4

Estimated Monthly and Annual Evaporation in Inches for
the Lower Hunter and Karuah Valleys

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average	5.6	4.4	3.7	2.9	2.3	1.7	1.5	2.3	3.0	4.1	5.5	6.0	43.0
Standard Deviation	0.8	0.7	0.7	0.4	0.4	0.4	0.3	0.3	0.4	0.6	0.8	0.9	3.8

WIND.

Strong winds occur over the Lower Hunter and Karuah Valleys on occasions. They are usually associated with one of the following conditions:-

- (1) Strong easterly winds associated with deep depressions centred off the coast, north of the catchment. These depressions may originate as tropical cyclones and may be of cyclonic intensity when they affect the catchment. Wind speeds exceeding 60 m.p.h. may be experienced on the coast but they moderate rapidly inland.
- (2) Violent squalls associated with severe local storms such as thunderstorms or frontal squalls. The strongest gusts in the area would be expected to occur under these conditions and gusts may exceed 90 m.p.h. on occasions.

Table 5 gives the extreme wind gusts likely to be experienced in the catchment for various return periods.

TABLE 5.

The Wind Gust to be Expected with Given Return Periods.

Return period (years)	10	20	50	100
Wind gusts equalled or exceeded (m.p.h.)	90	100	105	110

4. GROUNDWATER POTENTIAL.

In the Lower Hunter and Karuah River Valleys, groundwater occurs both in fissured rocks, which are not porous in themselves but contain joints and fractures through which water can percolate, and in unconsolidated sediments which include alluvial silts and sands and aeolian (wind blown) sands. The distribution of the various geological formations is shown in Figure 16, and the discussion is simplified if these groups are considered in two main sections on the basis of the mode of occurrence of underground water.

Fissured Rocks.

Rocks of Carboniferous age occupy most of the northern and more elevated part of the area. They consist mainly of tuffs, sandstones and conglomerates, with volcanic rocks prominent in some sections. Sediments of Permian age form a syncline to the north of Stroud, but the main outcrops of Permian strata occur to the south, near the Hunter River and Port Stephens. These beds include both fresh-water and marine sediments comprised mainly of shales, sandstones and conglomerates with occasional tuffs and several economically important coal seams.

The Carboniferous and Permian rocks are mainly dense and non-porous, and include some very hard strata. Bores on favourable sites yield useful stock supplies of underground water, but relatively few bores have been constructed because dams, creeks and springs have usually provided adequate stock water. However, during the 1964 to 1966 drought a number of successful stock bores were sunk in Carboniferous rocks in the Dungog area. Most have been less than 100 feet deep, the unsuccessful bores usually being on elevated sites where hard strata and deeper water tables have combined to make boring both difficult and costly.

The quality of the waters in the Carboniferous rocks is usually reasonably good, but the marine sequences in the Permian strata sometimes contain very salty water which is too saline even for sheep, whilst the coal measures tend to yield rather acid, sulphated waters.

Unconsolidated Sediments.

Pleistocene and Recent deposits occur in the form of alluvial flats in the valleys of the various rivers, and aeolian sands occupy quite an extensive area between Raymond Terrace and the coast, extending from Tomago to Port Stephens.

Along the upper reaches of the Paterson, Williams and Karuah Rivers there are narrow alluvial flats in which wells could be expected to yield useful stock supplies, with possibly an occasional yield sufficient for limited irrigation; but as the rivers normally provide adequate supplies of water there has been little attempt to exploit underground water sources. However, available data suggests there is little scope for the development of underground water supplies for irrigation in this area, because of the limited extent and depth of the alluvial flats.

Along the lower reaches of the Williams and Paterson Rivers, and the Hunter River below Maitland, there are extensive alluvial plains most of which have been deposited under estuarine conditions, as evidenced by the presence of black sands and muds which sometimes contain shells of marine origin. Some useful irrigation supplies have been obtained from wells and spear points in the Maitland-Morpeth area, but variation in water quality both laterally and with depth is a feature of these estuarine deposits.

The broad natural levees adjacent to the rivers often provide more favourable hydrogeological conditions than the lower lying, somewhat swampy areas behind them, and it is not unusual for quite shallow wells (less than 20 feet deep) located on the levees to provide good quality water, suitable for domestic, garden and stock use, whilst deeper wells or bores yield brackish or even salty water.

Because of the rather limited extent and thickness of these levee deposits, the quantity of good quality water in storage is not great, and it is not surprising that dry seasons, coupled with heavy pumping, have in some instances resulted in the intrusion of saline water into the aquifers making the supplies unsuitable for domestic, irrigation or garden use. The development of large supplies of good quality water from the estuarine alluvial flats is not possible.

The best sources of underground water in the valley are the sand deposits which occupy a large area between the Hunter River (east of Raymond Terrace) and Port Stephens. The maximum thickness of these sands is not known but may be in excess of 200 feet. Some clay bands and iron cemented layers occur but over much of the area the top 60 feet consists of relatively clean wind blown sands of quite uniform grain size. Single spear points yield useful stock and domestic supplies, whilst yields sufficient for irrigation can be obtained from batteries of spear points or gravel packed bores.

The salinity of the waters from the sand beds is usually quite low, but peaty, acid waters are fairly common, and hydrogen sulphide is often present.

The Hunter District Water Board extracts large quantities of water from its two underground Water Reserves, viz. the Tomago Sands located to the east and north east of Raymond Terrace, and the sands near Nelson's Bay and Anna Bay, on the south side of Port Stephens. In 1965 the total usages from these two areas were 5,980 million and 159 million gallons respectively.

The Board has furnished the following information concerning the yields obtained from its underground Water Reserves:-

"The water stored in the sandbeds comes from rainfall at the surface, and at Tomago, where the average annual precipitation is 44 inches, a yield of about 500,000 gallons per day per square mile may be expected. The water bearing sands vary in depth, but the portion developed has a depth to impervious bottom of approximately 60 feet. The area of sand beds (at Tomago) suitable for water supply development is approximately 50 square miles."

The water is sprayed into basins to remove gases such as hydrogen sulphide and is then treated with alum and lime to remove iron.

5. STREAM GAUGING STATIONS.

In the appraisal of proposals involving the use of river water, such as schemes for irrigation development, town and industrial water supplies, or hydro-electricity generation, safer and more economical designs can be prepared if records are available of streamflows over a long period of time. Adequate streamflow records enable proper allowance to be made for severe droughts and major floods, and ensure that the total planned water use for a stream will not exceed the total amount of water available.

Records of streamflow are obtained from gauging stations, where stream heights are recorded either by visual readings on a gauge or by an automatic water level recorder. Each gauging station is calibrated by making a number of actual measurements of discharge at different gauge heights, and the calibrations are kept up to date by continuing to obtain discharge measurements at regular intervals. Continuous records of streamflow are then calculated based on the recorded stream heights and derived calibrations.

Regular recording of stream heights in the Lower Hunter Valley commenced in 1906 on the Hunter River at Belmore Bridge (Maitland). This gauge was initially operated primarily for flood records and not until it was taken over in 1958 by the Water Conservation and Irrigation Commission were continuous flow records kept.

The recording of streamflows in the Lower Hunter Valley began in 1913 when measurements were made on the Chichester River near the site of the present Chichester Dam, and the next streamflow stations to be installed were on the Williams River at Glen Martin in 1927 and at Tilligra in 1931. In 1940 two additional gauging stations were installed on the Paterson River at Lostock and on the Allyn River at Halton. Streamflow records commenced on the Karuah River at Monkerai in 1945.

At present, twelve gauging stations are being operated by the Water Conservation and Irrigation Commission in the Lower Hunter River Valley

and one is being operated on the Karuah River. In addition, flows at Chichester Dam are recorded by the Hunter District Water Board.

The locations of existing and discontinued stations are shown at Figure 17 and pertinent details of each station are given at table 6.

TABLE 6.

Stream	Station	Catchment Area in Square Miles	Type of Gauge	Period of Operation
Hunter River	Belmore Bridge (Maitland)	6,750	Staff gauge	1906 to date
Fishery Creek	Kurri Kurri	32	Float recorder	1958 to date
Wallis Creek	Mulbring *	40	Staff gauge	1954 to 1964
Wallis Creek	Richmond Vale	56	Float recorder	1958 to date
Paterson River	Carrabolla	66	Staff gauge	1965 to date
Paterson River	Lostock *	107	Staff gauge	1940 to 1959
Paterson River	Mount Rivers	132	Staff gauge	1955 to date
Allyn River	Upper Allyn	21	Staff gauge	1965 to date
Allyn River	Halton	79	Pressure recorder	1940 to date
Paterson River	Gostwyck *	373	Staff gauge	1928 to 1946
Williams River	Salisbury	16.5	Staff gauge	1966 to date
Williams River	Tilligra	75	Pressure recorder	1931 to date
Chichester River	Chichester Dam	76	Staff gauge	1913 to date
Chichester River	Dusodie Bridge	83	Staff gauge	1965 to date
Williams River	Dungog	248	Staff gauge	1965 to date
Williams River	Glen Martin	374	Pressure recorder	1927 to date
Williams River	Clarencetown *	380	Staff gauge	1922 to 1927
Karuah River	Monkerai	78	Staff gauge	1945 to date

* Discontinued stations.

The gauging stations now in operation in the Lower Hunter and Karuah Valleys are so located as to measure the runoff from about two thirds of the effective catchment area and to provide reasonable data for use in the investigation of water resources proposals.

The density of the existing gauging station network is about 7 stations per 1,000 square miles, which compares favourably with the present densities per 1,000 square miles for Coastal New South Wales (4 stations), Australia (0.3 station) and America (less than 3 stations).

The Commission intends to expand this network by the installation of three additional stations, one in the Hunter drainage system on the Paterson River and two in the Karuah system on the Karuah River and Mammy Johnson's Creek. Proposals also include the improvement of the standard of recording at several existing stations. The ultimate coverage to be provided should yield ample basic data for general assessment of the surface water resources of the various sub-areas within the valleys, and for the investigation of any future surface water supply works.

6. CATCHMENT YIELDS.

The surface water yield of a catchment is dependent on a number of factors including the catchment topography, size, vegetative cover, land use, and the amount and distribution of precipitation.

The continuous recordings of streamflow which have been obtained in the Lower Hunter and Karuah Valleys have provided a considerable volume of information for the estimation of water yield.

The yields for the complete years of computed records at existing and discontinued gauging stations in the valleys for which records have been obtained over a reasonable period are given in Table 7.

TABLE 7.

Stream	Station	Complete years of computed records	Average Yield over period of complete years of records		
			Ac. Ft. /Annum	Cusecs	Gallons /Minute
Hunter River	Belmore Bridge (Maitland)	8	850,000	1,160	436,000
Fishery Creek	Kurri Kurri	4	3,880	5.3	2,000
Wallis Creek	Richmond Vale	4	13,300	18	6,800
Paterson River	Lostock *	17	104,000	143	53,600
Paterson River	Mount Rivers	10	125,000	171	64,200
Allyn River	Halton	25	96,300	132	49,400
Paterson River	Gostwyck *	17	231,000	316	119,000
Williams River	Tilligra	34	85,400	117	43,900
Chichester River	Chichester Dam	53	112,000	154	58,000
Williams River	Glen Martin	38	301,000	412	155,000
Karuah River .	Monkerai	20	128,000	175	65,700

* Discontinued stations.

At Appendices 14 to 19 details are given of the recorded maximum, minimum and mean streamflows for each month of record at the gauging stations on the Allyn River at Halton, Hunter River at Belmore Bridge, Karuah River at Monkerai, Paterson River at Mount Rivers, Williams River at Glen Martin and Williams River at Tilligra. In addition, details of the total monthly inflows to Chichester Dam are given at Appendix 20.

7. AVERAGE ANNUAL RUNOFF.

In order to arrive at an estimate of the long term average annual runoff of the valleys, streamflow records at the gauging stations have been correlated with the long period (53 years) of flow records of the Chichester River at Chichester Dam. On this basis, it is estimated that the long term average runoff of the Lower Hunter River Valley, including the Karuah River Valley, is of the order of 1,030,000 acre feet per annum, which is equivalent to a continuous flow rate of about 1,400 cusecs or 530,000 gallons per minute.

These surface water resources per square mile of catchment area are about one third greater than the average for Coastal New South Wales, and are equivalent to over five times the average for Australia.

The volume of average annual runoff represents approximately 23 percent of the average annual rainfall over the valleys and may be compared with the estimated runoff statistics shown in Table 8 for the Upper Hunter River Valley as measured at the gauging station at Belmore Bridge (Maitland). This table also shows a dissection of the long term average runoff into the averages for each of the Lower Hunter and the Karuah Valleys.

TABLE 8.

Drainage Basin	Catchment Area in Square Miles	Runoff		
		Acre Feet per Annum	Acre Feet per Annum per Square Mile	Percentage Runoff
Karuah River	850	500,000	590	23%
Lower Hunter River (below Maitland)	1,150	530,000	460	22%
Lower Hunter River (including Karuah River).	2,000	1,030,000	515	23%
Upper Hunter River (above Maitland) *	6,750	800,000	118	8%

* based on long term records at Singleton.

8. VARIABILITY OF STREAMFLOWS.

Streamflows in the Lower Hunter and Karuah Valleys exhibit a high degree of variability. Of the gauging stations with reasonably long periods of records, the one with the most marked variations in annual flow is the Williams River at Glen Martin, where yearly discharges have ranged from about 6 percent to 320 percent of the mean annual value. The smallest variation in annual flows is that exhibited by the Allyn River at Halton, with a range from 12 percent to 230 percent of the mean value.

Monthly flows of course are even more widely variable. The greatest and least monthly variations are exhibited by the same two gauging stations, with the range at Glen Martin being from zero to over sixteen times the mean monthly flow, and that at Halton being from zero to over nine times the mean. The variations in monthly flows are illustrated graphically at figures 18 and 19, where the total flow during each month of records is plotted for the gauging stations on the Hunter River at Belmore Bridge, the Paterson River at Mount Rivers, the Allyn River at Halton, the Williams River at Tilligra and Glen Martin and the Karuah River at Monkerai.

The highest recorded flood at Belmore Bridge occurred in February 1955, when the peak discharge at Maitland was estimated to be 365,000 cusecs (137 million gallons per minute). In most of the streams draining the northern section of the valley, the highest recorded flood occurred in March 1963, and during this flood a peak discharge of 81,000 cusecs (30 million gallons per minute) occurred at Glen Martin.

The most sustained period of low flow on record occurred during the current drought which commenced in 1964. During this drought every major gauged stream in the valleys has completely ceased flowing at some time, with the exception of the Karuah River where a flow of one cusec (370 gallons per minute) was the minimum recorded at Monkerai. The Williams River at Glen Martin failed to flow for 223 consecutive days, from early in December 1964 to the middle of July 1965.

The maximum, minimum and mean flows recorded at selected gauging stations are set out in Table 9, which shows that at all of these stations, flow has ceased altogether at some time during the period of records, and that extremely high flows have also been recorded. The variation in maximum flows per unit of catchment area is from approximately 50 cusecs per square mile for the Hunter River at Belmore Bridge to approximately 490 cusecs per square mile for the Karuah River at Monkerai.

TABLE 9.

Stream	Station	Period of Computed Records	Computed Discharge in Cusecs (Equivalent Discharge in Gallons per Minute)		
			Maximum	Minimum	Mean
Hunter River	Belmore Bridge	January 1958 to December 1965	365,000 * (137,000,000)	0	1,160 (436,000)
Paterson River	Lostock	January 1941 to June 1959	18,500 (6,940,000)	0	143 (53,600)
Paterson River	Mount Rivers	December 1955 to December 1965	35,700 (13,400,000)	0	171 (64,200)
Allyn River	Halton	December 1940 to December 1965	14,000 (5,250,000)	0	132 (49,400)
Williams River	Tilligra	February 1931 to December 1965	26,600 (9,980,000)	0	117 (43,900)
Williams River	Glen Martin	December 1927 to December 1965	81,000 (30,400,000)	0	412 (155,000)
Karuah River	Monkerai	June 1945 to December 1965	38,250 (14,300,000)	0	175 (65,700)

* Maximum occurred in February 1955.

9. PERSISTENCE OF STREAMFLOWS.

Generally, streamflows in the Lower Hunter and Karuah Valleys persist for reasonable periods after the occurrence of heavy rain and it therefore appears that the valleys have groundwater storages of sufficient capacity to sustain flows for some time without the occurrence of significant rainfall.

Flow duration graphs indicating the persistence of dry weather flows at the gauging stations on the Allyn River at Halton, the Hunter River at Belmore Bridge, the Karuah River at Monkerai, the Paterson River at Mount Rivers, the Williams River at Glen Martin and the Williams River at Tilligra appear at Figures 20, 21, 22, 23, 24 and 25 respectively. The flows corresponding to various frequencies at each of these stations are set out in Tables 10 to 15 inclusive.

So that the flow characteristics of the various streams can be compared directly, a composite flow duration graph has been prepared and is at Figure 26. The curves plotted on this graph show the flows expressed as cusecs per square mile of catchment area, and they indicate that the headwater reaches of the streams draining the northern part of the area possess the best low flow persistence characteristics, the most favourable being the Karuah River at Monkerai. On the Williams River, low flows appear to be more persistent at the upstream gauging station at Tilligra than they are at Glen Martin on the lower reaches.

At Belmore Bridge the Hunter River, which drains a hinterland much drier than the catchments of the coastal streams, exhibits poorer persistence except at extreme low flows. However, it should be noted that the flow in the Hunter River has been regulated since 1958 by releases from the headwater irrigation storage at Glenbawn Dam. Had this regulation not been available the natural low flow persistence would not have been as favourable as indicated at Figure 21.

TABLE 10.

ALLYN RIVER AT HALTON.

Percent of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gals./Min.
10	225	84,000
30	56	21,000
50	25	9,400
70	11	4,100
90	3	1,100
95	1	370
96	0	0
100	0	0

TABLE 11

HUNTER RIVER AT BELMORE BRIDGE

Percent of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gals./Min.
10	2,250	840,000
30	690	260,000
50	360	140,000
70	180	68,000
90	50	19,000
95	25	9,400
100	0	0

TABLE 12

KARUAH RIVER AT MONKERAI

Percent of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gals./Min.
10	285	110,000
30	53	20,000
50	26	9,800
70	12	4,500
90	7	2,600
95	6	2,200
100	0	0

TABLE 13

PATERSON RIVER AT MOUNT RIVERS

Percent of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gals./Min.
10	227	85,000
30	84	31,000
50	42	16,000
70	19	7,100
90	4	1,500
95	1	370
96	0	0
100	0	0

TABLE 14
WILLIAMS RIVER AT GLEN MARTIN

Percent of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gals./Min.
10	645	240,000
30	148	55,000
50	54	20,000
70	24	9,000
90	8	3,000
95	3	1,100
97	0	0
100	0	0

TABLE 15
WILLIAMS RIVER AT TILLIGRA

Percent of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gals./Min.
10	185	69,000
30	39	15,000
50	18	6,700
70	10	3,700
90	3	1,100
95	1	370
97	0	0
100	0	0

10. OCCURRENCE OF FLOODING.

The extensive river flats along the lower portions of the Hunter, Williams and Paterson Rivers were built up under estuarine conditions and are now exposed only as a result of a fall in sea level several thousand years ago. The channels which the rivers have cut in the previously submerged valley floors are not large enough to accommodate

the high flow rates occurring periodically as a result of heavy rains on the catchments, and these flows consequently spill over the banks, flooding large areas of the river flats.

Records of flood levels on the Hunter River at Belmore Bridge (Maitland) have been compiled for the periods 1855 to 1879, 1889 to 1898 and 1906 to 1965, a total of 93 years, and these records indicate that medium or major floods exceeding a gauge height of 25 feet have occurred on the average about 3 times in every 4 years. A diagram indicating the magnitudes of these floods is at Figure 27.

From this diagram it can be seen that more floods have occurred in the winter months of June and July than in any other season, while the spring and early summer months have been relatively flood free.

The most severe sequence of floods occurred in the period 1949 to 1956 when 19 floods were experienced in 8 years, and a secondary grouping is evident in the 6 years from 1926 to 1931 when 10 floods were recorded.

The highest recorded flood at Belmore Bridge occurred in February 1955 and reached a peak gauge height of 40 feet $4\frac{1}{2}$ inches. The maximum discharge passing Maitland in this flood has been estimated at 365,000 cusecs (137 million gallons per minute).

During this flood, levees around and near Maitland were overtopped and breached, resulting in severe damage to residential, commercial and industrial areas in the city, and also to communications and essential services. The water supply was disrupted because of pollution, and the railway line was closed for five weeks.

In the rural areas high velocity flows through levee breaches caused severe scouring in some areas and there was heavy deposition of silt in others. Deposits of mud and silt up to six feet deep were common on farm lands and roads, and in addition to destroying existing crops and farm installations, these deposits of relatively infertile coarse grained material affected production levels for some considerable time after the flood.

Downstream from Maitland there was extensive inundation of farming lands and settlements, with damage to crops, fences, buildings, levees, roads and communications being caused by both water and silt. Record

flood levels occurred at locations as far downstream as Newcastle Harbour.

Floods generated within the Lower Hunter Valley and the Karuah Valley have generally not been as serious as those occurring in the lower Hunter River as a result of heavy rain over its upper catchment. This situation is due in part to the heavier vegetative cover in these higher rainfall areas closer to the coast, with consequent greater absorptive capacity and lesser erosion hazard. In addition, while concentrated flood damage occurs in the areas of heavy residential and industrial development along the Hunter River, particularly in Maitland, there is much less similar development in flood prone areas along the Paterson, Williams and Karuah Rivers.

Floods in these streams, while they have interrupted communications systems and services, have caused only relatively minor damage to towns and residential areas. They have, however, caused widespread inundation of farming lands, particularly along the lower reaches of the Paterson River, where poorly designed levee systems and inadequate drainage have resulted in extended periods of inundation.

The highest floods recorded in the Paterson, Allyn, Williams and Karuah Rivers occurred in March 1963. Peak gauge heights registered included 24'-0" at Mount Rivers on the Paterson River, 23'-8" at Halton on the Allyn River, 28'-6" at Dungog and 38'-0" at Glen Martin on the Williams River, and 16'-7½" at Monkerai on the Karuah River.

A number of schemes for alleviation of flooding in the Lower Hunter Valley have been investigated over the years, but only since the constitution of the Hunter Valley Conservation Trust in 1950 has a unified approach been made to the problem. The year 1958 saw the completion of Glenbawn Dam, a storage reservoir on the Hunter River headwaters serving the dual purposes of providing a controlled flow in the river during dry periods and of impounding water during floods to give a measure of flood relief. Other work which has been and is being undertaken in the Hunter River Valley includes afforestation, soil conservation measures and river bank protection in the upper catchment,

and restoration of levees, construction of floodgates, drains, spillways and control banks, dredging of waterways, river training and improvement, and river bank protection in the lower river area.

It has been generally agreed that the provision of complete protection against floods in the Lower Hunter River Valley would be an economically impossible task. However, considerable mitigation of flood damage can be achieved by properly designed and constructed works which will provide large areas with complete protection against minor floods, and which will promote rapid drainage of floodwaters from inundated areas in major floods.

11. DROUGHT PERIODS.

The term "drought" has no universally accepted definition, but is often used to describe a condition when, for an extended period, the soil moisture is insufficient to meet the requirements of most crops during the growing season. A shortage of water for domestic, municipal or industrial use is also commonly regarded as a drought. Diminished rates of streamflow and below average precipitation are the prime indicators of drought conditions.

A diagram showing the annual rainfalls recorded at East Maitland from 1903 to 1965 is appended at Figure 28. From the diagram it can be seen that the lowest calendar year rainfall at East Maitland occurred in the year 1944 when 19.05 inches were recorded, the next lowest being the year 1905 with 20.94 inches.

The longest sequence of below average falls was experienced in the seven years from 1935 to 1941, and the lowest five year period was from 1904 to 1908. Another protracted sequence of low rainfall years occurred from 1915 to 1920..

At all gauging stations in the valleys streamflow has either completely ceased or else has been reduced to a trickle at some time during the period of records. The worst recorded sequences of low flows occurred

in the summers of 1941/1942, 1957/1958 and 1964/1965; the most severe of these periods, considered over the whole valley, was in 1964/1965.

As indicated in Table 16 minimum recorded twelve monthly flows occurred during the years of 1964 and 1965 at all major streamflow stations in the valleys.

TABLE 16.

Stream	Station	Period of Records	Minimum Recorded Twelve Monthly Flow				
			Period	Ac. Ft.	Average Discharge		Percent of Average
					Cusecs	Gals./Min.	
Hunter River	Belmore Bridge	1958 to date	Dec. 1964 to Nov. 1965	70,000	96	36,000	8%
Paterson River	Mount Rivers	1955 to date	July 1964 to June 1965	10,000	14	5,200	9%
Allyn River	Halton	1940 to date	July 1964 to June 1965	6,000	8	3,000	6%
Williams River	Tilligra	1931 to date	July 1964 to June 1965	3,800	5	1,900	4%
Williams River	Glen Martin	1927 to date	July 1964 to June 1965	7,100	10	3,700	2%
Karuah River	Monkerai	1945 to date	Dec. 1964 to Nov. 1965	5,900	8	3,000	5%

The Paterson River at Mount Rivers has ceased flowing on a number of occasions since records commenced in 1955, the longest periods being 63 consecutive days from November 1964 to January 1965 and 40 consecutive days from November 1957 to January 1958. In all, there have been 149 days of records on which zero flow occurred.

The Allyn River at Halton has also been known to have ceased flowing several times. The longest periods of zero flow were 51 days from December 1941 to February 1942, 50 days from November 1957 to January 1958, and 47 days in December 1964 and January 1965. In all, there have been 322 days of zero flow since records commenced in 1940.

The longest periods during which the Williams River at Tilligra has ceased flowing were 49 days in December 1964 and January 1965, 45 days from December 1941 to February 1942, and 36 days from November 1957 to January 1958. Since records commenced in 1931, zero flow has been recorded on a total of 349 days.

The Williams River at Glen Martin has ceased flowing for continuous periods of 223 days from December 1964 to July 1965, 51 days from December 1941 to February 1942, and 45 days in December 1957 and January 1958. There have been 440 recorded days of zero flow since 1927.

The Karuah River at Monkerai has twice completely ceased flowing, for 7 days in February 1952 and 1 day in February 1946. The lowest 30 days sequence of flows recorded since 1945 was in 1957, when the average flow was 1.1 cusecs (410 gallons per minute) from 22nd November to 21st December.

12. THE 1964 TO 1966 DROUGHT.

Since July 1964 a period of extremely low rainfall has been experienced over the Lower Hunter and Karuah Valleys. The total rainfall of 14.43 inches at East Maitland for the twelve months ending 30th June 1965 was the lowest twelve monthly total ever recorded at that location, the next lowest having been 14.87 inches in the twelve months ending 30th April 1906.

The recorded monthly rainfalls at five selected locations in the valley from July 1964 to April 1966 are set out in Table 17.

TABLE 17

Month	Rainfall in Points				
	East Maitland	Paterson	Raymond Terrace	Clarencetown	Stroud
July 1964	58	25	48	51	61
August 1964	104	103	128	103	122
September 1964	201	134	170	116	78
October 1964	205	321	194	164	182
November 1964	68	104	98	105	111
December 1964	174	196	122	175	97
January 1965	67	119	122	62	195
February 1965	80	72	77	39	87
March 1965	0	7	5	12	17
April 1965	226	177	227	240	210
May 1965	53	59	37	48	95
June 1965	207	159	203	168	236
July 1965	563	520	537	407	476
August 1965	32	40	54	49	82
September 1965	247	223	204	208	234
October 1965	358	534	361	355	380
November 1965	94	60	75	65	71
December 1965	442	465	480	410	385
January 1966	128	105	109	130	244
February 1966	218	454	423	491	518
March 1966	302	285	302	323	1,019
April 1966	136	252	347	254	287
Totals July 1964 to April 1966	3,963	4,414	4,323	3,975	5,187
Totals January 1965 to December 1965	2,369	2,435	2,382	2,063	2,468
Minimum Twelve Monthly Total During Period	1,443	1,476	1,431	1,283	1,491

As a result of the very low rainfalls, streamflows in the valleys diminished rapidly during the latter half of 1964, and the flow at most gauging stations ceased in December 1964. The only stations where flow was maintained throughout December 1964 were the Hunter River at Belmore Bridge, which benefited from releases from Glenbawn Dam, Fishery Creek at Kurri Kurri, which included drainage from a reticulated town water supply, and the Karuah River at Monkerai. Low flows continued during the early part of 1965, and although minor rises were experienced in all streams in July of that year, these brought only temporary relief and low flows were again experienced later in 1965.

During 1966, flows have remained low in the southern part of the area, although there was some alleviation of conditions in the northern section in mid-February 1966.

In Wallis Creek at Richmond Vale there was no flow on 27th January 1966 and 3rd March 1966, while flows of 0.6 cusec (220 gallons per minute) and 1.3 cusecs (490 gallons per minute) were measured on 18th May and 1st June 1966 respectively. On the 16th and 17th February 1966 the flow in the Karuah River at Monkerai was 11 cusecs (4,100 gallons per minute) whilst discharges of the Williams River were 0.14 cusec (50 gallons per minute) at Dungog, 2.6 cusecs (970 gallons per minute) at Tilligra and flow had ceased at Glen Martin.

However, from the 18th to 21st February 1966 higher flows occurred in a number of streams, including 102 cusecs (38,000 gallons per minute) in the Paterson River at Mount Rivers, 667 cusecs (250,000 gallons per minute) in the Allyn River at Halton, and 255 cusecs (96,000 gallons per minute) in the Williams River at Salisbury.

Details of discharge measurements obtained at gauging stations in the valleys in June 1966, which are listed in Table 18, indicate that in that month there was a substantial flow in all streams except Wallis and Fishery Creeks in the southern part of the catchment.

TABLE 18

Stream	Station	Date of Measurement	Measured Flow	
			Cusecs	Gals./Min.
Hunter River	Belmore Bridge	23rd June, 1966	66	25,000
Fishery Creek	Kurri Kurri	23rd June, 1966	0.9	340
Wallis Creek	Richmond Vale	1st June, 1966	1.3	490
Paterson River	Carrabolla	20th June, 1966	33	12,000
Paterson River	Mount Rivers	20th June, 1966	39	15,000
Allyn River	Upper Allyn	21st June, 1966	15	5,600
Allyn River	Halton	20th June, 1966	24	9,000
Williams River	Salisbury	21st June, 1966	13	4,900
Williams River	Tilligra	22nd June, 1966	18	6,800
Williams River	Dungog	22nd June, 1966	29	11,000
Williams River	Glen Martin	22nd June, 1966	36	13,000
Karuah River	Monkerai	21st June, 1966	14	5,300

The only gauging stations in operation throughout the drought at which flow did not fail completely were the Karuah River at Monkerai, where the minimum flow recorded was 1 cusec (370 gallons per minute) in May 1965 and again in December 1965, and Fishery Creek at Kurri Kurri.

Zero flows were recorded on a total of 109 days at the Paterson River at Mount Rivers between November 1964 and December 1965; on 83 days at the Allyn River at Halton between December 1964 and November 1965; on 132 days at the Williams River at Tilligra between December 1964 and December 1965; and on 247 days at the Williams River at Glen Martin between December 1964 and December 1965.

A comparison of the minimum sixty day flows during the 1941/1942, 1957/1958 and 1964/1966 droughts for the gauging stations where records are available, is given in Table 19. This table shows that, on this basis of comparison, the 1964/1966 drought was generally more severe than the other two droughts.

TABLE 19

Stream	Station	Minimum Sixty Day Flow (Acre Feet)		
		1964-65	1957-58	1941-42
Paterson River	Mount Rivers	0	99	*
Allyn River	Halton	26	52	35
Williams River	Tilligra	36	75	54
Williams River	Glen Martin	0	49	35
Karuah River	Monkerai	498	441	*

* Stations established after 1942.

13. WATER REQUIREMENTS FOR CURRENT DEVELOPMENT.

In the lower portions of the Hunter River and its tributaries, corresponding approximately to the areas of tidal influence, the use of river water is administered under the Hunter River Flood Mitigation Act by the New South Wales Department of Public Works. In the reaches of the Hunter River and tributaries upstream of these areas, and also on the Karuah River, authorisation of the use of water for irrigation and other purposes is administered under the Water Act by the Water Conservation and Irrigation Commission. The use of water for town supplies by the Hunter District Water Board does not lie within the ambit of either of these two Acts, being provided for under the Hunter District Water Supply and Sewerage Act.

The area licensed for irrigation under the Water Act has increased from about 350 acres in 1944 to about 5,700 acres at the end of 1965, while the number of licenses in force has increased from 38 to 405 in the same period. The average area applicable to each license increased slowly from about 9 acres in 1944 to about 13 acres in 1949, and since then has remained fairly constant, varying between 12 and 14 acres. A graph showing the growth since 1944 in both licensed area and number of licenses is appended at Figure 29.

In addition to licenses for irrigation purposes a total of 44 licenses under the Water Act were current at the end of 1965 permitting a maximum diversion of up to 4,064 gallons per minute (10.8 cusecs) for town, commercial and industrial water supplies, excluding water drawn by the Hunter District Water Board.

Under the Hunter River Flood Mitigation Act, 77 permits to instal pumps had been issued at June 1966, and it is estimated that the total area irrigated by these pumps is approximately 1,100 acres.

Several significant water conservation or utilisation schemes for town and industrial supplies are operated by the Hunter District Water Board for the supply of water to Newcastle, Maitland, Cessnock, Kurri Kurri and other centres.

The first scheme constructed was the Walka pumping station which drew water from the Hunter River near Maitland into a small holding reservoir of 170 million gallons capacity (630 acre feet) adjacent to the river, from where it was delivered by pumping throughout the reticulation system. No storage other than the small reservoir at Walka was provided with this system which was largely dependent on run-of-the-river flows.

Early in the century it became apparent that the Walka supply was not sufficiently reliable for the needs of the growing City of Newcastle and surrounding districts, and after considerable investigation a storage reservoir known as Chichester Dam was built on the Chichester River, north of Dungog. Chichester Dam, which was completed in 1923, is a mass concrete gravity structure 135 feet high with a fixed crest spillway, and has a storage capacity of 5,000 million gallons (18,400 acre feet). The spillway crest level is 514 feet above sea level, and consequently there is sufficient head to gravitate the supply to consumer areas. The delivery main originally constructed was 36 inches in diameter and consisted of 45 miles of steel pipe and 9 miles of woodstave pipe. The woodstave pipe was later replaced with a steel main having a delivery capacity of 12 million gallons per day (22 cusecs).

The source of supply next exploited by the Hunter District Water Board was the underground water contained in the Tomago sand beds, previously referred to in Section 4. Although the total volume of underground water in storage in the 50 square miles of these beds has not been assessed, it has been estimated by the Hunter District Water Board that the maximum usable yield at Tomago is approximately 500,000 gallons per day per square mile. The maximum amount of water obtained from the Tomago sand beds in any calendar year to date was 5,980 million gallons in 1965, equivalent to a continuous drawoff of over 16 million gallons per day, or 30 cusecs. The water supplied from the sand beds is treated to remove dissolved gases and solids before delivery.

With the continuing growth of Newcastle and surrounding districts, the demand for water has continued to rise, and during the nineteen fifties consideration was given to means of further augmenting the supply. The scheme finally adopted and on which construction is now almost complete is the Grahamstown Water Supply Scheme.

This scheme consists of a storage reservoir of 33,000 million gallons capacity (121,000 acre feet) on a small catchment area of 30 square miles to the east of Raymond Terrace. The reservoir was formed by the construction of a clay and sand filled embankment with a maximum height of about 55 feet and as the top storage level is only 40 feet above sea level, water is pumped from the reservoir, and also from the adjacent Tomago sand beds, to the supply system. The maximum rate at which water can be taken from the Grahamstown Reservoir with existing equipment is 40 million gallons per day, equivalent to 74 cusecs, and it is proposed to ultimately instal additional pumps to bring the total maximum draw-off rate to 60 million gallons per day, equivalent to 110 cusecs.

The estimated maximum demands on surface water in both valleys under present development, for irrigation purposes, water supply, riparian usage and river losses are given in Table 20, and the total requirements for the major streams are shown at Table 21, together with the estimated areas under irrigation.

TABLE 20

Requirement	Cusecs	Gallons per Minute
Irrigation under license (6,800 acres at 2 feet per season).	28	10,400
Town, commercial and industrial water supply.	107	40,000
Riparian usage and losses *	15	5,600
Total present requirements	150	56,000

* On middle and lower reaches of main streams only.

TABLE 21

Stream	Irrigated Area (Acres)	Total Requirement	
		Cusecs	Gallons per Minute
Wallis Creek	400	11	4,100
Hunter River	400	3	1,100
Paterson River	2,000	12	4,500
Allyn River	1,200	8	3,000
Williams River	2,100	110	41,100
Karuah River	700	6	2,200
Totals	6,800	150	56,000

14. POSSIBLE IRRIGATION AND WATER SUPPLY DEVELOPMENT.

To meet the expected increase in demand for town water supplies in the foreseeable future, the Hunter District Water Board currently plans to obtain additional water from the Tomago sand beds, and also to draw additional water from the Grahamstown Reservoir.

These measures are expected to meet requirements for some considerable time and together with existing water supply schemes, will involve a total possible usage of surface water at a rate equivalent to a continuous flow of over 70 million gallons per day. This water would be drawn partly

from the natural runoff of the Grahamstown catchment and of an adjacent lagoon, but mainly from the Williams and Chichester Rivers. It represents about one third of the average flow of the Williams River at Glen Martin.

When the demand eventually exceeds the capacity of the present amplification proposals, additional supplies could be obtained in a number of ways. Measures at present being considered include raising the height of the existing Chichester Dam and constructing a new dam at Tilligra on the Williams River.

Irrigation development in the valleys will be influenced by a number of physical limitations, of which the main ones are the suitability of the surface water supply as governed by the extent of upstream penetration of tidal salt water, the topography of the country, and the occurrence of soil types which would give a satisfactory return on irrigation.

Tidal influence extends to the vicinity of Maitland in the Hunter River, upstream of Paterson in the Paterson River, upstream of Clarencetown in the Williams River, and upstream of Booral in the Karuah River. However, because of the constant replenishment of fresh water in the upstream sections of tidal influence, useful irrigation supplies can usually be obtained from the Hunter River as far downstream as Morpeth and from the Paterson River as far downstream as its junction with the Hunter. On completion of a proposed weir at Seaham, supplies of fresh water normally will be available from the Williams River at all points upstream from the weir.

Topographical considerations dictate that utilisation of river water for irrigation will be mainly restricted to river frontage land. The most extensive areas of this land having suitable soil characteristics are located on the Paterson and Williams Rivers, whilst there are smaller areas on the Allyn and Karuah Rivers.

A preliminary assessment has indicated that the total area in the valleys which could economically be irrigated from streamflow is of the order of 28,000 acres, and a dissection of this area is given in Table 22

TABLE 22

Location	Approximate Area Suitable for Irrigation from Streamflow (Acres)
Paterson River upstream from Hunter River junction	12,000
Williams River upstream from Seaham	9,000
Allyn River	3,000
Karuah River upstream from Booral	2,000
Other Streams in the valleys	2,000
Total Area	28,000

Watering of the full irrigable area of 12,000 acres on the Paterson River with two feet of water per annum would create an average water requirement excluding transmission losses of about 50 cusecs (19,000 gallons per minute) over an irrigation season of eight months. Allowance for river losses and increased demands for other purposes would raise the average irrigation season requirement to about 55 cusecs (21,000 gallons per minute). This total requirement is approximately one third of the average flow of the Paterson River at Mount Rivers.

Similarly, on the Williams River, the net irrigation requirement would be about 37 cusecs (14,000 gallons per minute) and allowance for transmission losses and other increased demands would bring the average irrigation season requirement to about 45 cusecs (17,000 gallons per minute). This requirement, which represents approximately one tenth of the average flow of the Williams River at Glen Martin, would be additional to the Hunter District Water Board's currently projected usage estimated at about one third of the average flow at Glen Martin.

On the Allyn River, the irrigation requirement would be about 12 cusecs (4,500 gallons per minute), and the total irrigation season requirement, allowing for river losses and other increased demands, would be about 16 cusecs (6,000 gallons per minute).

On the Karuah River, the irrigation requirement would be about 8 cusecs (3,000 gallons per minute), and the total requirement would be about 12 cusecs (4,500 gallons per minute).

On the Hunter River downstream from Maitland and on Wallis and Fishery Creeks it is unlikely that there will be any large scale increase in irrigation activities, although it is likely that increasing use will be made of the two latter streams for industrial purposes.

Preliminary analyses based on available streamflow records have been made, and they indicate that in order to meet the requirements of the preliminary estimates of maximum irrigable areas on the various streams during a repetition of the worst recorded sequences of low flows, storage dams with capacities of the order of those shown in Table 23 would be required. This table also shows the approximate percentages of time during which natural flows were less than estimated requirements.

TABLE 23.

Stream	Location of Proposed Storage	Storage Capacity Required (Acre Feet)	Percentage of Time Natural Flow Less Than Requirement
Paterson River	Near Carrabolla	40,000	84%
Williams River	Near Salisbury	74,000	85%
Allyn River	Near Upper Allyn	8,000	72%
Karuah River	Upstream of Monkerai	4,000	30%

Augmentation of water supplies for irrigation will, however, be planned having regard to possible future domestic and industrial requirements, to ensure that adequate supplies will ultimately be available for both purposes.

15. INVESTIGATION OF STORAGE PROPOSALS.

Investigations have been made into the feasibility of constructing regulating storages to provide assured water supplies in the valleys both for domestic and industrial use, and for irrigation in the four main areas of possible development. The locations of sites which have been considered for additional storages are shown at Figure 30.

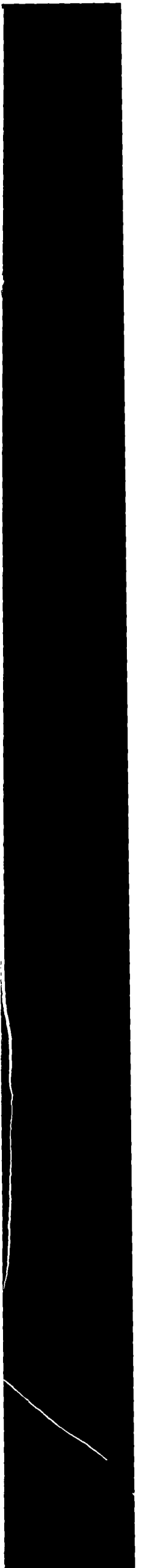


Sites near Lostock on the Paterson River, Halton on the Allyn River, Tilligra on the Williams River and Monkerai on the Karuah River have been considered for the construction of dams for water supply purposes. The Hunter District Water Board has also considered the possibility of raising the full supply level of the existing Chichester Dam.

Preliminary investigation has been undertaken of sites for dams near Carrabolla on the Paterson River, Upper Allyn on the Allyn River, Salisbury on the Williams River, Upper Karuah on the Karuah River and also on Mammy Johnson's Creek. Initially, irrigation requirements could be satisfied by relatively small storages compared with those which would be needed for domestic and industrial supply. All sites selected for irrigation storages are located near the headwaters of the rivers, upstream from those sites likely to be chosen for reservoirs for Newcastle's water supply. Storages situated in locations selected by the Commission would be capable of supplying irrigators both on the upper and lower reaches of each stream.

Investigations so far completed in connection with the proposed Carrabolla Dam include topographic and capacity surveys and foundation testing by core drilling. A safe draft-capacity relationship has been derived indicating the various storage capacities necessary to meet the different levels of demand. Comparative estimates of cost are being prepared to assist in the evaluation of the desirable size of storage which should be initially provided.

As part of the assessment of the Upper Allyn Dam proposal, four alternative sites have been surveyed and safe draft-capacity relationships determined. However, preliminary estimates indicate that the cost of constructing a storage dam on the Allyn River would be high. Consideration is therefore being given to an alternative proposal for providing a regulated flow through a tunnel either from the proposed Carrabolla storage on the Paterson River, or from one on the Barrington River.



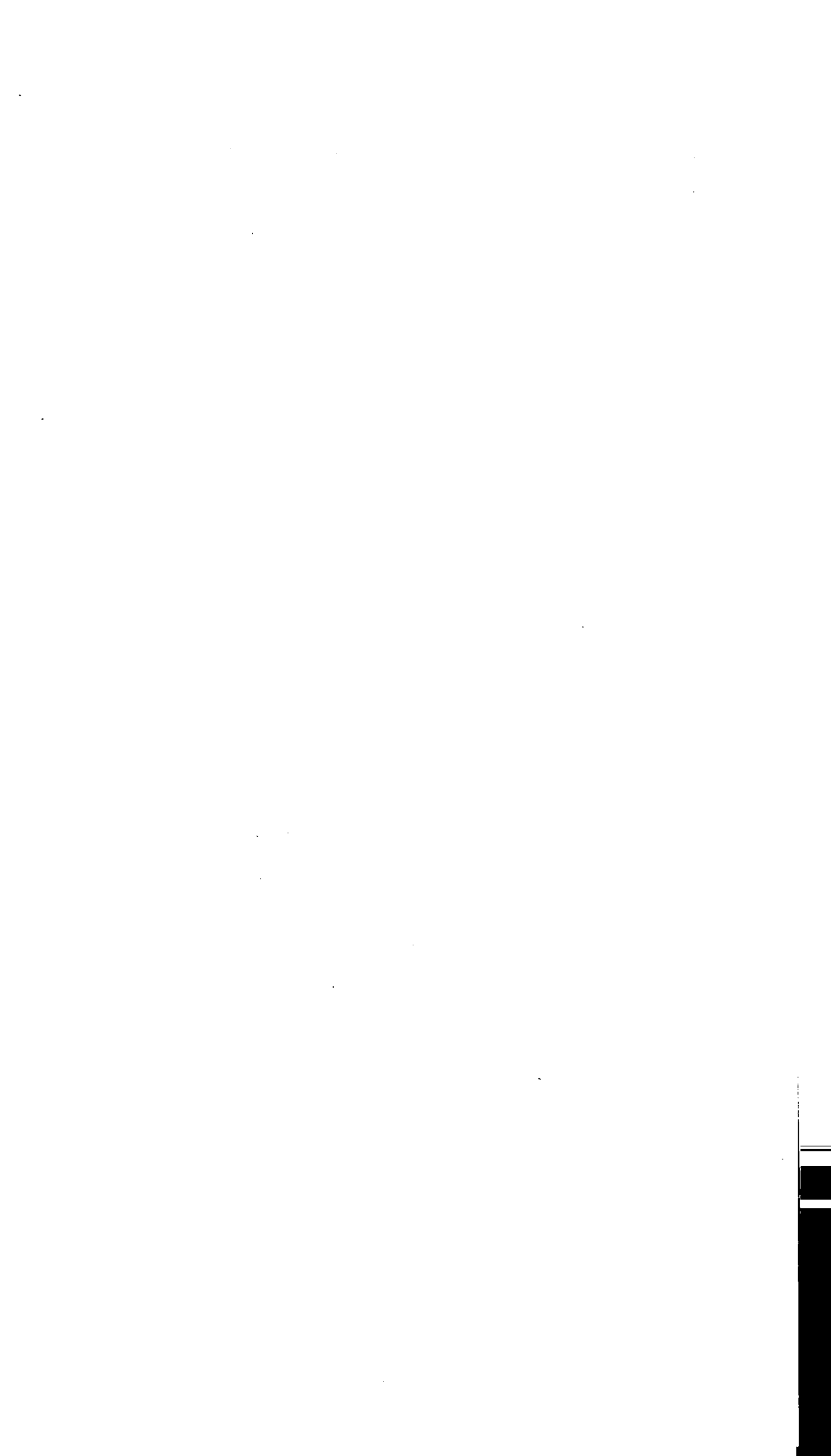
Investigations completed on the Salisbury Dam Site include topographical and capacity surveys and preliminary foundation assessment by boring through overburden at the site. In addition, the safe draft-capacity relationship has been derived.

Investigations undertaken to date into the feasibility of constructing a dam in either the Upper Karuah or Mammy Johnson's Creek, have shown that the Upper Karuah proposal could supply the greater area of irrigable land and be constructed at less cost.

Present indications are that from an economic viewpoint the proposed Carrabolla storage, which would command a substantial area of irrigable land, offers the greatest advantages for initial development. This appears to be the most suitable site for construction of a small dam as a first stage in the provision of assured water supplies for irrigation development in the Lower Hunter Valley.

16. ACKNOWLEDGMENTS.

The Water Conservation and Irrigation Commission wishes to acknowledge the assistance given in the preparation of this report by the Director, Commonwealth Bureau of Meteorology, in providing the section on Climatic Features, the Rainfall Statistical Data and the Median Rainfall Maps; by the Hunter District Water Board in providing particulars of its water supply schemes and records of flows in the Chichester River; and by the New South Wales Public Works Department in providing details of the numbers and locations of pumps authorised under the Hunter River Flood Mitigation Act.



Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1887	NO RECORDS			1144	633	419	177	734	355	143	494	722	
1888	130	877	173	361	112	393	202	203	575	437	91	394	3948
1889	422	477	321	172	760	104	872	581	404	337	480	21	4951
1890	838	979	1087	1086	992	294	787	287	96	119	522	50	7137
1891	681	520	605	224	229	1195	957	298	791	132	782	242	6656
1892	112	640	816	804	182	175	244	366	651	301	442	1126	5859
1893	452	642	1460	353	131	808	522	460	136	645	536	256	6401
1894	289	495	1206	188	348	114	188	86	767	367	25	604	4677
1895	1961	564	148	295	515	187	75	100	258	29	748	539	5419
1896	408	409	323	51	707	529	454	436	167	247	342	270	4343
1897	166	75	92	448	451	1323	180	665	142	95	3	852	4492
1898	732	405	205	55	1227	484	377	397	559	154	46	295	4936
1899	146	109	44	524	333	642	464	2188	278	522	328	205	5783
1900	117	71	236	276	582	947	731	103	424	104	322	267	4180
1901	418	78	312	488	402	118	489	225	53	470	76	87	3216
1902	223	47	227	800	162	80	689	628	78	728	170	243	4075
1903	46	76	1245	163	473	164	597	595	353	583	377	369	5041
1904	216	507	545	882	159	24	848	84	92	221	113	33	3724

CARRINGTON RAINFALL STATISTICS
(Points)

CARRINGTON RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1905	116	157	456	524	121	66	82	219	201	146	207	441	2736
1906	302	109	318	95	362	45	63	657	139	204	239	128	2661
1907	475	342	844	249	173	844	37	63	36	31	455	383	3932
1908	138	1888	443	618	441	460	882	675	400	129	158	135	6367
1909	68	561	30	251	80	448	90	255	1073	183	386	853	4278
1910	631	62	858	264	466	567	224	65	70	407	137	412	4163
1911	955	258	202	380	172	118	1082	493	392	150	199	301	4702
1912	240	421	1099	408	334	403	1853	119	76	85	154	529	5721
1913	324	264	346	995	1520	912	651	167	416	237	80	95	6007
1914	125	256	671	69	432	713	591	346	949	591	328	846	5917
1915	177	377	239	752	935	290	278	200	230	372	6	526	4382
1916	116	407	183	308	319	444	390	309	173	721	353	553	4276
1917	726	227	377	1101	401	266	52	201	655	436	791	340	5573
1918	424	544	188	426	40	119	526	305	493	136	144	87	3432
1919	237	374	779	457	2170	138	541	60	313	277	293	344	5983
1920	312	276	334	252	102	156	633	118	450	85	258	1742	4718
1921	646	97	486	633	764	483	539	230	84	572	393	703	5630
1922	726	474	53	354	380	229	1302	485	379	136	17	126	4661

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1923	352	13	55	1074	72	474	333	334	161	62	230	339	3499
1924	499	150	85	656	387	216	281	190	393	141	448	492	3938
1925	515	292	312	131	696	493	132	621	139	108	348	260	4047
1926	190	27	574	628	341	204	252	246	111	80	69	1227	3949
1927	599	137	1040	1963	1007	334	70	60	306	194	954	289	6953
1928	399	345	380	357	549	912	790	147	3	96	87	212	4277
1929	113	1238	343	514	392	564	512	251	420	1163	275	65	5850
1930	142	218	431	578	527	1215	196	109	25	294	55	1168	4958
1931	378	280	624	1733	606	433	604	109	293	111	255	617	6043
1932	33	602	319	316	753	355	730	207	712	128	203	174	4532
1933	327	148	216	861	254	208	698	71	434	414	326	292	4249
1934	356	797	125	613	408	282	581	530	475	159	220	489	5035
1935	376	172	395	146	160	225	146	52	377	280	71	497	2897
1936	419	395	486	179	313	322	161	134	264	55	164	474	3366
1937	530	179	658	408	82	1247	353	285	37	486	566	394	5225
1938	534	295	83	218	456	356	198	545	317	258	263	41	3564
1939	536	0	1490	632	327	55	419	300	447	393	118	68	4785
1940	45	27	162	579	597	201	587	578	298	400	422	558	4454

CARRINGTON RAINFALL STATISTICS
(Points)

CARRINGTON RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1941	549	315	183	522	258	602	370	200	37	345	181	135	3697
1942	31	144	789	102	96	286	766	222	45	829	326	196	3822
1943	472	129	172	194	1119	118	58	394	353	254	492	472	4827
1944	574	296	275	319	224	389	433	376	314	22	45	172	3239
1945	448	679	153	454	248	1031	581	131	26	167	294	237	4449
1946	136	187	1153	1580	108	483	0	52	392	109	129	162	4491
1947	327	863	164	362	348	256	85	86	134	227	392	602	3846
1948	883	289	964	231	375	659	122	161	487	126	86	337	4720
1949	607	713	1146	480	312	2202	433	324	763	195	295	384	7854
1950	346	723	89	568	732	2337	858	512	189	449	551	71	7425
1951	1763	139	699	462	183	1453	177	105	134	56	131	261	5563
1952	49	292	341	404	360	418	683	1344	100	327	158	130	4606
1953	343	621	358	244	1142	256	429	418	93	243	127	27	4301
1954	541	778	130	120	190	312	582	298	762	270	379	136	4498
1955	408	1283	710	839	446	473	545	44	179	162	599	461	6149
1956	524	1310	1104	26	739	616	310	347	72	260	37	225	5570
1957	73	489	234	241	83	64	506	850	218	7	78	107	2950
1958	483	532	231	233	169	725	99	272	334	291	63	405	3837

CARRINGTON RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1959	394	549	823	405	527	501	596	622	293	867	406	392	5375
1960	499	428	184	116	348	2204	160	185	174	613	359	562	5632
1961	282	374	276	473	345	366	162	747	188	205	356	414	4188
1962	619	880	653	818	785	82	181	286	474	255	87	811	5931
1963	681	164	1422	1387	929	915	421	927	300	395	473	228	6242
1964	322	288	169	398	121	895	16	178	158	220	54	151	2970

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1895				NO RECORDS					155	19	597	857	
1896	210	75	591	0	657	233	220	294	56	260	493	224	3798
1897	208	75	126	234	355	954	231	326	118	189	5	1245	4066
1898	689	534	203	48	719	492	384	292	448	185	56	313	4163
1899	198	124	30	802	217	438	517	1862	260	410	299	126	5283
1900	132	32	296	246	322	855	645	91	190	103	372	271	3555
1901	360	110	336	259	277	106	343	158	118	596	204	167	3034
1902	293	46	163	532	70	47	258	309	54	789	278	172	3011
1903	87	81	847	111	277	193	378	436	1021	487	571	543	5032
1904	174	570	506	644	65	20	995	162	83	239	99	67	3624
1905	103	42	626	378	111	89	48	155	173	127	137	395	2384
1906	107	113	301	107	326	69	18	807	146	277	236	123	2630
1907	386	221	700	178	286	596	16	61	13	24	512	445	3438
1908	77	2015	346	522	170	76	620	570	234	94	196	117	5037
1909	97	597	70	208	102	327	48	204	1018	185	363	727	3946
1910	870	67	675	312	368	559	307	29	130	355	63	698	4433
1911	873	443	273	349	151	57	833	539	252	105	218	137	4230
1912	281	654	990	220	180	228	1117	115	40	117	98	993	5033

CLARENCE TOWN RAINFALL STATISTICS
(Points)

CLARENCETOWN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1913	335	344	492	1056	1395	920	365	70	406	136	138	90	5747
1914	93	292	471	81	230	775	398	168	842	634	379	518	4881
1915	155	361	174	480	877	155	185	165	293	156	0	556	3557
1916	81	337	188	303	469	513	196	272	185	924	428	643	4539
1917	765	350	360	665	165	240	24	126	757	208	876	319	4855
1918	709	638	197	318	60	16	493	216	441	151	106	31	3376
1919	191	265	791	327	1345	80	245	36	246	453	145	370	4494
1920	388	261	152	118	69	222	610	117	191	56	232	1438	3854
1921	765	140	436	828	962	496	675	135	175	761	389	561	6323
1922	701	409	0	88	177	211	1209	636	437	69	45	200	4182
1923	231	39	108	859	65	553	307	347	243	72	157	550	3531
1924	891	166	135	869	431	292	321	218	373	108	568	857	5229
1925	699	329	472	165	796	459	80	501	161	127	259	615	4663
1926	108	59	1056	597	352	325	747	205	196	74	77	1185	4981
1927	712	143	905	2519	257	189	28	8	158	106	1000	803	6828
1928	716	516	417	542	246	1189	842	123	17	131	63	209	5011
1929	73	1097	305	251	91	174	479	242	772	825	185	171	4665
1930	127	473	640	306	399	1622	97	87	7	251	52	757	4818

CLARENCETOWN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1931	161	259	736	1387	327	160	419	48	111	142	352	453	4555
1932	34	328	561	210	285	222	361	149	1313	76	231	215	3985
1933	236	54	251	383	289	204	532	14	511	474	353	303	3604
1934	165	892	74	423	290	202	438	381	471	217	196	773	4522
1935	384	431	397	89	47	152	173	20	322	218	87	297	2617
1936	506	684	554	167	195	185	130	114	118	31	112	666	3462
1937	419	172	548	139	50	817	306	207	41	363	627	332	4021
1938	530	320	113	318	277	170	102	371	206	212	480	29	3128
1939	347	0	1628	375	190	38	196	140	520	292	195	20	3941
1940	121	31	150	549	185	64	68	471	279	291	157	522	2888
1941	689	428	219	219	183	236	161	120	56	325	124	160	2920
1942	44	350	1335	79	78	179	515	105	26	1107	523	186	4527
1943	344	66	187	188	1174	73	38	745	360	299	621	669	4764
1944	226	303	89	299	235	104	262	341	268	53	20	112	2312
1945	257	329	81	251	391	1185	310	123	39	58	173	248	3445
1946	111	289	1143	2023	90	409	5	17	166	56	134	136	4579
1947	183	925	251	360	316	202	59	58	135	182	292	872	3835
1948	693	234	505	149	284	404	52	125	521	69	158	324	3518

CLARENCETOWN RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1949	864	837	632	547	100	1029	527	258	464	186	255	366	6065
1950	335	797	103	335	386	2333	521	317	86	436	587	350	6586
1951	1650	575	531	121	204	1441	120	121	103	67	13	190	5136
1952	70	295	352	343	264	236	392	1505	50	363	135	210	4215
1953	457	665	463	165	705	37	238	236	91	216	155	135	3563
1954	532	958	119	103	139	288	432	244	506	374	430	183	4308
1955	390	1229	819	441	348	211	167	39	112	216	529	248	4749
1956	511	1044	1597	96	528	343	133	260	58	211	50	326	5157
1957	88	811	388	106	8	110	375	607	81	15	74	187	2850
1958	414	448	197	422	103	345	82	190	338	209	116	507	3371
1959	505	485	583	213	238	286	267	575	153	846	350	350	4851
1960	295	356	212	143	282	983	81	110	225	519	260	775	4241
1961	447	319	253	277	156	451	59	470	170	126	402	811	3941
1962	550	623	220	1002	1022	34	227	182	338	162	122	698	5180
1963	653	90	1386	949	626	785	178	545	361	179	295	370	6417
1964	344	226	310	303	298	763	51	103	116	164	105	175	2958

COCKLE CREEK RAINFALL STATISTICS
(Points)

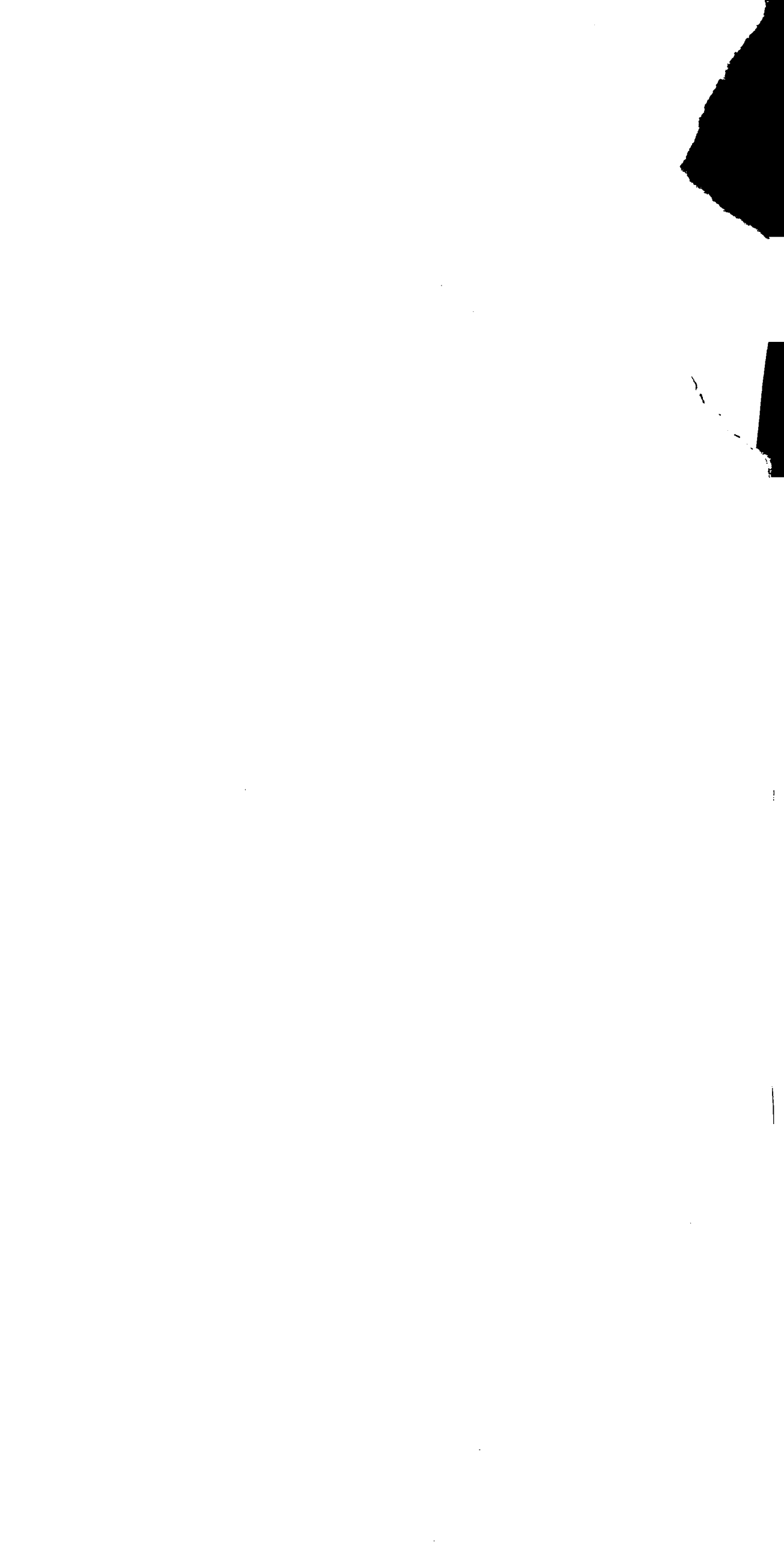
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1900	104	158	189	357	429	786	592	123	149	45	357	525	3814
1901	374	153	306	504	233	123	317	140	58	470	178	85	2941
1902	283	40	377	324	112	14	287	417	100	1096	233	142	3425
1903	156	234	895	206	282	145	674	670	1214	743	289	578	6086
1904	107	604	507	932	230	10	907	67	186	133	133	151	3967
1905	249	64	553	357	265	153	50	92	142	125	458	293	2801
1906	225	93	402	325	732	115	15	770	185	320	140	150	3472
1907	375	300	865	110	223	685	10	60	20	20	460	225	3353
1908	195	2080	510	425	150	45	825	400	158	75	135	60	5058
1909	90	570	128	190	225	352	45	140	880	280	365	580	3845
1910	820	100	545	292	385	410	350	20	135	430	75	620	4182
1911	935	500	238	475	140	10	1250	340	270	160	105	320	4743
1912	90	610	742	580	495	190	1440	200	60	80	305	420	5212
1913	150	210	940	855	1290	971	230	40	159	150	215	36	5246
1914	40	280	561	50	431	472	323	141	669	912	302	698	4879
1915	271	145	211	487	1096	88	152	141	100	94	15	352	3152
1916	76	352	70	384	110	209	101	251	175	538	249	505	3020
1917	644	264	175	855	39	318	25	168	609	225	581	482	4385

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1918	725	499	113	331	81	25	713	151	396	177	59	35	3305
1919	115	496	491	357	1166	47	107	15	201	235	207	279	3716
1920	447	261	95	110	79	266	476	82	149	21	173	1718	3877
1921	613	88	462	1369	884	414	405	89	209	519	402	571	6025
1922	560	480	101	183	152	212	906	209	423	87	39	259	3611
1923	191	19	84	955	29	450	477	325	211	0	212	204	3157
1924	924	121	146	735	267	193	107	167	327	55	561	667	4270
1925	387	69	314	341	992	571	25	213	NO RECORDS				
1926	NR	225	1099	719	NR	200	NO RECORDS		96	224	47	2122	
1927	430	294	586	1913	166	302	16	7	87	119	759	345	5024
1928	423	337	398	421	350	649	691	45	0	81	0	105	3500
1929	55	1635	110	422	253	358	518	198	346	1176	251	126	5448
1930	272	116	966	406	645	2067	592	33	16	340	73	667	6193
1931	240	443	520	2649	597	256	918	206	190	180	268	631	7098
1932	47	840	750	211	192	366	218	200	1057	150	166	153	4350
1933	243	29	317	604	232	112	559	45	509	476	259	502	3887
1934	234	866	109	660	570	249	702	433	664	229	288	470	5474
1935	405	151	305	39	120	188	156	75	419	259	116	299	2532

COCKLE CREEK RAINFALL STATISTICS
(Points)

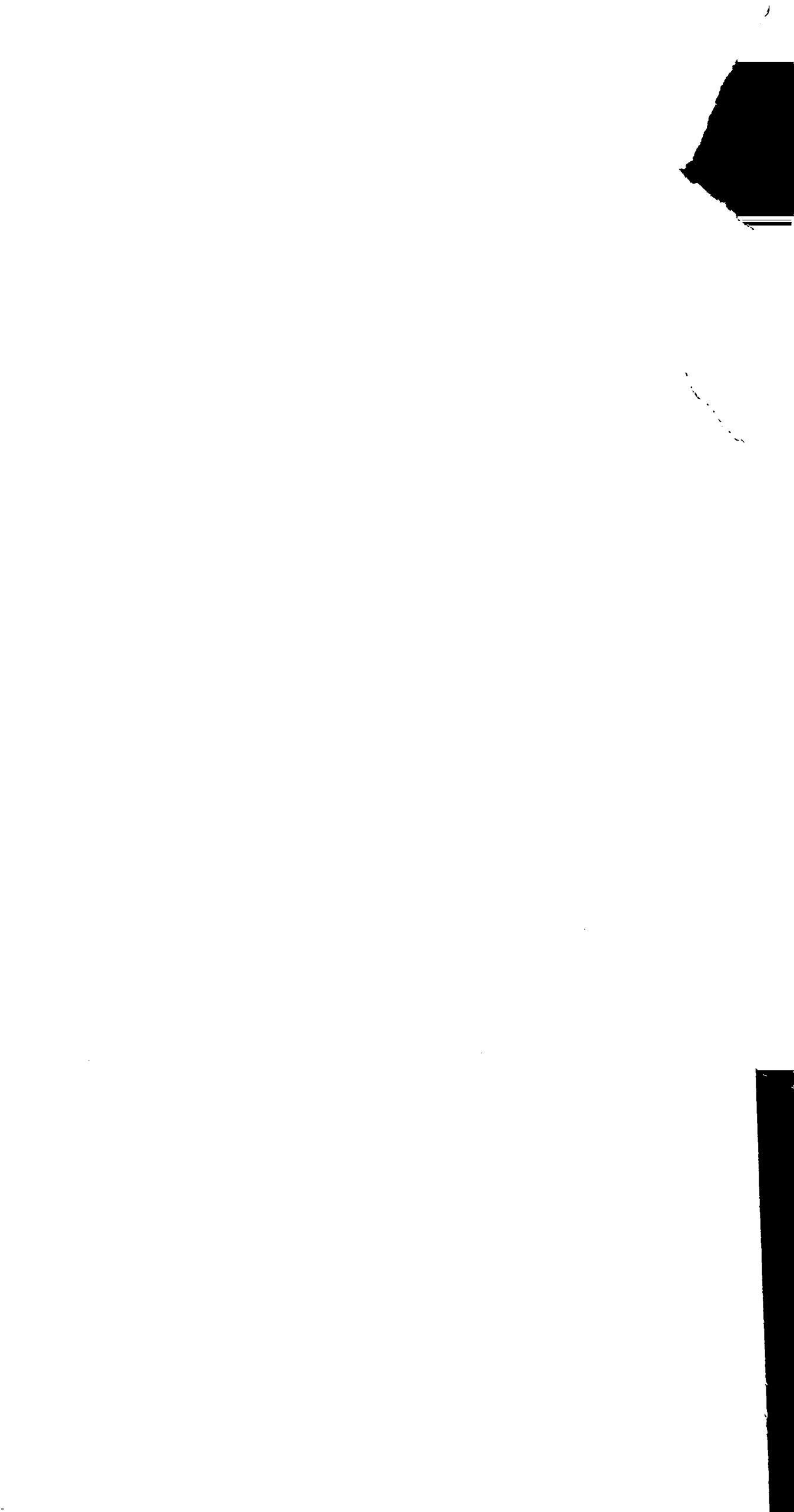
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1936	458	727	464	256	246	243	130	112	54	59	40	414	3203
1937	263	165	566	259	53	1027	216	183	34	311	423	222	3722
1938	525	439	270	308	573	91	40	560	202	367	192	123	3690
1939	451	0	872	507	276	55	236	188	724	547	258	11	4125
1940	63	21	96	497	167	98	193	669	256	322	280	452	3114
1941	313	587	160	306	200	236	155	160	37	266	218	142	2780
1942	79	132	967	153	181	169	411	97	66	855	317	146	3573
1943	266	80	312	72	1575	60	18	737	545	365	717	230	4977
1944	276	338	90	265	291	292	322	387	241	75	36	39	2652
1945	182	247	93	506	323	932	543	160	150	5	212	220	3573
1946	52	190	590	1888	0	525	0	3	108	85	262	237	3940
1947	158	832	141	396	322	216	10	100	65	107	367	954	3668
1948	883	369	400	600	600	651	48	68	592	16	22	0	4249
1949	370	519	860	300	143	1498	255	225	829				NO RECORDS
1950									371	467	259	534	175
1951	2063	330	834	68	180	1039	202	403	93	62	32	170	5476
1952	102	106	167	368	119	143	728	1820	190	287	50	210	4290
1953	620	814	350	97	1560	112	167	160	100	117	96	131	4324

COCKLE CREEK RAINFALL STATISTICS
(Points)



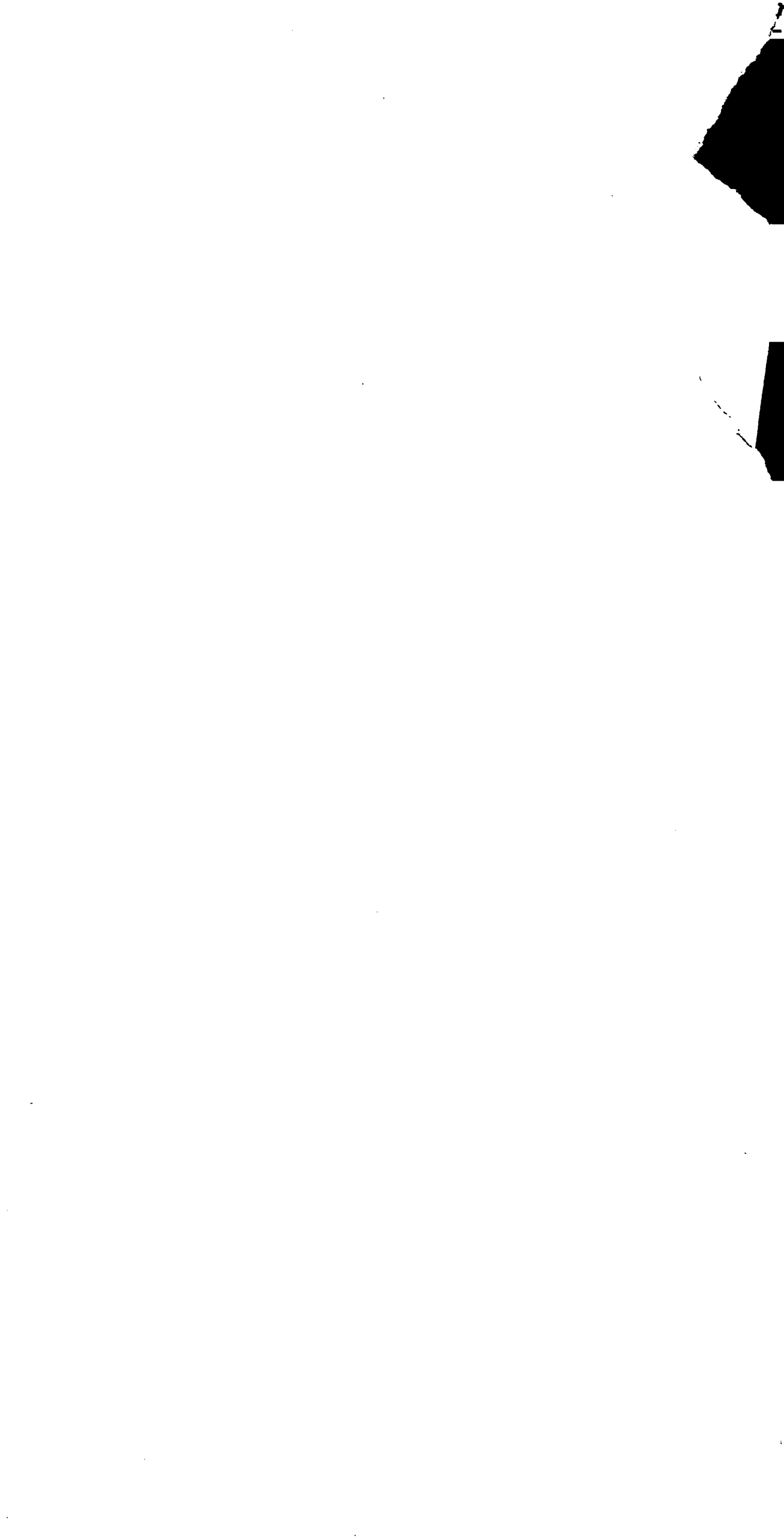
COCKLE CREEK RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1954	517	1138	284	242	162	80	469	186	267	499	389	218	4451
1955	223	1541	1042	567	552	332	165	18	207	101	648	203	5599
1956	314	998	1030	125	421	529	111	267	39	236	26	194	4290
1957	115	565	189	104	3	47	324	925	119	22	63	306	2782
1958	282	445	271	766	154	500	100	277	326	367	197	872	4557
1959	722	676	748	174	249	482	213	666	208	883	515	303	5839
1960	265	387	619	92	409	464	93	199	292	356	475	944	4595
1961	524	339	437	245	74	318	72	399	106	325	515	664	4018
1962	438	956	400	388	986	38	194	194	233	101	45	761	4734
1963	451	226	1446	1003	777	734	146	495	277	256	95	330	6236
1964	220	124	412	415	149	1282	61	92	102	210	89	179	3335



1898	505	408	215	68	575	550	336	221	441	235	80	330	3964
1899	151	207	40	637	308	363	468	1612	249	284	289	195	4803
1900	70	71	202	219	245	647	455	87	147	82	324	284	2833
1901	362	62	183	150	237	174	280	105	88	444	137	196	2418
1902	242	81	218	820	84	52	280	322	64	685	206	263	3317
1903	60	119	896	88	236	165	270	355	1010	570	577	461	4807
1904	139	537	453	809	71	12	1047	64	41	112	132	194	3611
1905	130	127	279	250	128	59	27	125	163	133	209	403	2033
1906	143	67	370	35	221	38	22	737	114	143	241	165	2296
1907	NO RECORDS												
1908	60	1827	347	320	107	37	393	465	186	90	210	125	4167
1909	70	590	10	170	80	312	58	159	768	120	418	752	3507
1910	635	50	516	145	270	405	101	29	40	287	45	442	2965
1911	1047	397	436	290	158	37	693	574	152	94	239	159	4276
1912	243	620	563	228	99	178	932	79	44	108	67	694	3855
1913	191	326	405	800	1141	834	357	36	300	118	83	110	4701
1914	133	192	547	105	222	577	252	201	838	743	657	800	5267
1915	197	148	174	329	1034	76	174	126	151	111	8	914	3442

DUNGOG RAINFALL STATISTICS
(Points)



1916	88	376	178	313	455	443	89	172	92	504	354	525	3589
1917	333	459	121	359	71	198	46	65	700	273	772	223	3620
1918	647	603	102	253	28	69	377	183	294	82	52	149	2839
1919	288	306	788	335	1049	57	191	26	154	186	328	357	4065
1920	NO RECORDS												
1921	601	254	577	578	634	627	627	74	159	493	201	360	5235
1922	413	532	66	43	127	151	890	522	519	79	43	349	3734
1923	197	14	309	600	27	406	189	351	208	83	161	484	3029
1924	717	218	136	518	223	119	264	137	296	139	509	914	4190
1925	624	286	290	80	498	327	66	279	155	148	348	449	3550
1926	135	7	863	367	350	194	601	125	108	100	53	875	3778
1927	403	179	619	1654	155	120	11	10	102	106	756	631	4746
1928	519	464	496	348	159	1018	547	38	1	77	97	164	3928
1929	62	1761	252	220	67	109	358	224	671	810	329	332	5195
1930	226	653	902	193	248	1139	103	37	21	309	66	495	4392
1931	215	266	436	1302	329	127	352	47	105	95	126	413	3813
1932	43	333	489	257	273	192	423	120	770	92	435	141	3568
1933	440	154	196	463	145	129	571	25	585	738	489	524	4459

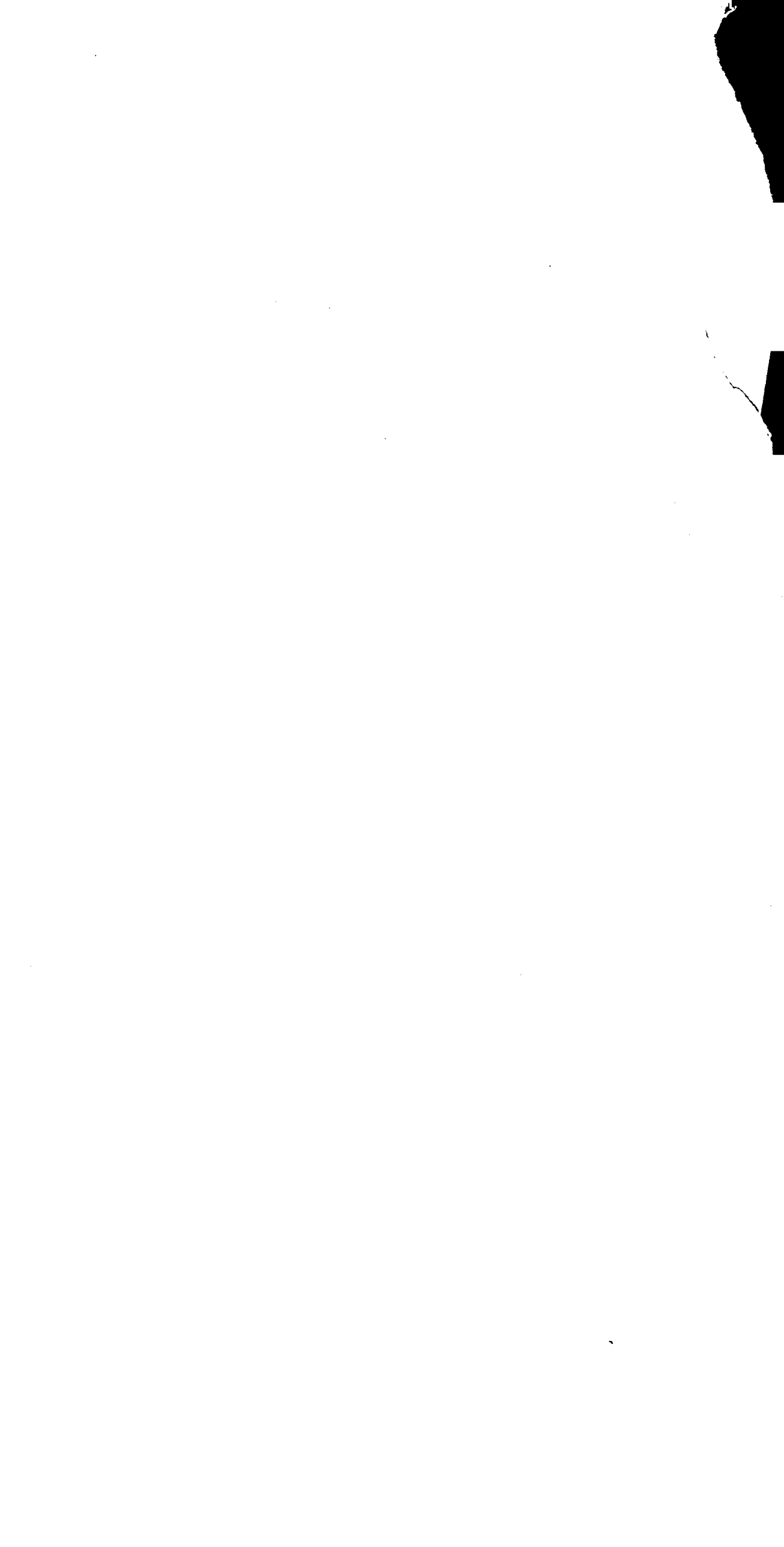
DUNGOG RAINFALL STATISTICS
(Points)





Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1952	42	658	152	282	250	404	243	1082	25	413	135	236	3922
1953	422	662	485	164	613	43	163	240	58	222	72	100	3244
1954	530	1003	199	122	164	252	142	107	426	405	374	221	3945
1955	508	1423	669	540	239	147	81	36	85	273	460	375	4836
1956	707	1092	995	187	520	271	90	204	121	175	26	187	4575
1957	141	691	289	94	4	116	282	702	20	7	65	264	2675
1958	464	273	213	342	101	328	52	148	312	209	90	534	3066
1959	505	484	811	282	181	294	235	477	196	797	487	412	5161
1960	404	294	198	195	218	681	144	71	218	289	349	795	3856
1961	402	323	250	223	185	552	47	400	188	299	381	762	4012
1962	642	552	197	845	905	45	209	137	344	196	167	890	5129
1963	723	160	1603	642	753	511	153	564	412	267	253	517	6558
1964	308	163	257	396	287	567	69	105	100	269	64	206	2791

DUNGOG RAINFALL STATISTICS
(Points)



Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	
1895	NO RECORDS										0	629	636	
1896	269	785	280	58	472	229	163	163	29	232	437	102	3219	
1897	84	114	64	287	226	532	308	237	73	209	33	846	3013	
1898	563	441	185	54	560	645	260	281	389	170	25	467	4040	
1899	145	292	33	633	188	336	390	1696	244	271	308	123	4659	
1900	127	46	162	221	264	904	342	104	176	57	348	385	3136	
1901	348	91	273	144	218	139	257	121	56	401	118	149	2315	
1902	253	56	423	320	43	23	307	149	78	583	198	209	2642	
1903	63	47	568	89	123	206	220	317	961	351	709	209	3863	
1904	164	595	502	614	34	15	1215	28	66	121	61	101	3516	
1905	46	39	257	256	109	64	54	95	133	98	135	252	1538	
1906	51	84	342	39	209	81	19	573	143	190	255	155	2141	
1907	348	210	640	127	173	554	13	41	17	29	310	427	2889	
1908	137	1659	325	296	73	68	298	287	224	57	272	140	3836	
1909	248	508	30	147	44	280	97	203	462	179	414	727	3339	
1910	793	95	500	121	262	345	214	26	75	264	76	462	3233	
1911	664	326	299	330	148	65	546	553	206	130	226	145	3638	
1912	298	597	634	205	228	166	813	96	72	138	88	424	3759	

GRESFORD RAINFALL STATISTICS
(Points)



Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1913	298	356	754	675	956	883	252	46	294	93	151	0	4758
1914	178	149	356	92	192	595	200	91	812	469	405	478	4017
1915	97	136	107	267	922	64	NO RECORDS					649	
1916	76	292	174	309	171	362	132	93	172	531	503	818	3633
1917	296	436	77	259	60	152	65	87	760	302	840	281	3615
1918	325	477	88	233	13	80	372	127	224	177	45	82	2243
1919	246	212	522	272	735	8	107	25	194	348	288	248	3205
1920	375	125	159	63	71	198	265	55	0	75	227	805	2418
1921	617	120	427	632	453	431	377	56	91	459	140	530	4333
1922	511	286	32	44	84	87	620	309	NO RECORDS				
1923	198	0	111	479	16	390	182	269	190	0	158	413	2406
1924	712	171	203	465	219	77	198	0	226	131	396	643	3441
1925	530	311	252	0	335	54	39	215	113	95	237	528	2709
1926	151	13	898	237	212	159	630	119	188	41	35	857	3540
1927	415	97	444	1332	64	62	26	13	114	75	806	590	4038
1928	660	424	482	411	94	802	490	42	28	135	136	149	3853
1929	96	1377	193	340	81	178	351	229	978	753	286	71	4933
1930	175	271	598	215	179	1259	202	45	25	275	55	446	3745

GRESFORD RAINFALL STATISTICS
(Points)



GRESFORD RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1931	243	395	750	1196	342	123	326	57	162	165	239	478	4476
1932	115	553	442	90	217	207	150	119	808	53	329	174	3257
1933	382	105	215	298	124	192	496	26	385	539	329	451	3542
1934	257	596	90	395	148	107	337	338	457	174	170	392	3461
1935	375	335	286	53	39	174	82	17	263	166	57	332	2179
1936	600	405	605	269	219	141	103	95	82	105	45	403	3072
1937	350	194	627	126	65	530	240	279	41	217	379	323	3371
1938	406	506	141	338	259	57	112	282	188	208	390	49	2936
1939	371	0	1184	219	164	25	87	122	419	268	187	51	3097
1940	145	14	114	406	148	37	29	258	232	237	214	599	2433
1941	596	255	265	126	82	126	106	106	61	283	126	121	2253
1942	91	218	1026	79	41	133	409	94	57	991	549	499	4187
1943	422	69	198	88	777	46	40	474	337	221	321	450	3443
1944	295	*165	46	106	184	60	238	292	144	31	38	79	1678
1945	185	320	152	282	246	1011	262	146	0	244	154	340	3342
1946	198	229	536	1106	90	422	6	11	128	69	103	197	3095
1947	197	848	136	403	206	162	65	59	122	326	184	817	3525
1948	396	141	406	130	328	368	23	94	466	26	153	395	2926

GRESFORD RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1949	374	691	512	347	57	732	438	180	556	189	341	244	4661
1950	286	720	216	550	308	1607	572	377	71	421	666	165	5959
1951	1437	276	503	59	32	976	174	90	76	109	27	185	3946
1952	45	473	337	444	173	251	310	945	36	428	57	311	3810
1953	492	686	412	211	631	18	154	248	66	210	123	56	3307
1954	550	1184	174	149	115	229	176	124	422	502	255	127	4007
1955	469	1739	461	401	262	89	44	55	125	188	432	342	4607
1956	486	887	991	290	414	254	108	174	73	236	21	274	4208
1957	153	659	223	122	0	67	195	434	22	7	60	166	2108
1958	683	358	261	468	111	239	36	116	240	174	172	405	3263
1959	456	322	624	187	76	246	227	425	140	642	468	215	4028
1960	528	210	210	179	133	363	95	77	174	242	150	634	2995
1961	393	329	151	123	44	443	30	247	75	252	325	746	3158
1962	498	366	248	936	759	21	165	144	227	201	162	612	4339
1963	811	248	1500	575	746	484	121	305	400	138	387	471	6186
1964	282	113	209	390	259	735	43	74	109	349	122	74	2759



Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1894	NO RECORDS			122	63	119	35	126	571	362	142	476	
1895	1614	297	102	128	93	85	34	69	157	39	341	470	3429
1896	239	780	252	75	617	231	279	232	49	213	264	143	3374
1897	162	78	155	372	243	914	234	488	76	221	20	546	3509
1898	731	369	267	46	813	288	315	251	499	202	22	203	4006
1899	107	153	78	608	246	335	550	1877	298	393	207	134	4986
1900	88	32	259	273	508	737	655	90	155	113	424	229	3563
1901	358	139	228	363	461	85	301	153	42	356	132	66	2684
1902	201	70	149	545	115	51	426	279	124	974	294	180	3408
1903	31	79	847	248	208	109	480	520	882	422	394	417	4637
1904	98	478	421	714	142	13	690	80	62	155	85	81	3019
1905	97	39	614	386	165	95	47	155	138	96	169	355	2356
1906	182	102	251	199	455	84	22	665	129	257	242	116	2704
1907	306	191	960	138	75	543	10	43	15	45	305	195	2826
1908	22	1632	434	459	123	69	673	389	186	82	197	70	4336
1909	142	393	80	129	115	350	56	141	820	190	231	789	3436
1910	735	166	567	409	390	405	243	47	128	426	138	436	4090
1911	927	313	295	410	134	79	826	406	303	152	132	251	4228

KINROSS RAINFALL STATISTICS
(Points)

KINROSS RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1912	311	455	743	493	370	229	1244	83	24	130	236	533	4851
1913	327	370	818	1046	1425	983	368	71	351	121	132	74	6086
1914	59	185	508	105	399	467	413	228	747	491	266	963	4831
1915	118	476	148	437	914	70	149	234	163	118	2	332	3161
1916	139	330	146	263	207	334	145	184	186	763	378	587	3662
1917	872	279	242	880	125	243	26	198	688	200	663	483	4899
1918	478	406	187	345	69	28	477	149	348	154	109	46	2796
1919	119	872	586	598	957	67	153	39	286	214	200	307	4398
1920	422	262	101	80	108	251	488	105	306	59	312	1540	4034
1921	446	112	483	1359	828	380	475	141	98	434	393	563	5712
1922	535	401	72	203	124	181	1008	306	544	152	27	179	3732
1923	218	32	85	854	48	426	332	210	180	35	118	405	2943
1924	523	140	217	536	281	243	238	191	309	84	439	574	3775
1925	491	256	299	116	888	464	65	379	120	117	241	177	3613
1926	83	78	1062	476	320	179	539	158	154	91	32	1333	4505
1927	578	192	871	2068	218	378	50	6	147	93	793	326	5720
1928	473	424	432	322	292	852	831	92	16	74	85	164	4057
1929	60	1440	307	326	233	256	492	277	532	1050	267	78	5318

KINROSS RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1930	142	142	662	632	440	1642	180	102	13	318	118	522	4913
1931	194	262	503	1880	469	268	531	87	146	169	159	586	5254
1932	76	671	396	137	221	289	236	156	962	166	196	187	3693
1933	258	71	262	506	243	208	758	62	718	498	333	400	4317
1934	316	776	139	500	493	251	492	259	538	171	290	460	4685
1935	464	302	262	116	77	167	143	39	407	298	91	305	2671
1936	542	434	566	178	302	269	138	98	112	120	56	375	3190
1937	443	184	563	228	51	819	290	226	73	322	503	512	4214
1938	589	423	237	264	487	148	83	510	174	282	207	36	3440
1939	270	0	1082	494	204	47	206	161	483	274	215	37	3473
1940	28	26	94	536	301	91	166	444	230	459	507	507	3389
1941	467	358	158	345	175	228	227	128	21	292	100	121	2620
1942	85	215	1172	37	129	181	462	186	51	737	393	205	3853
1943	443	49	182	165	1074	74	41	676	435	207	619	354	4319
1944	178	363	111	393	230	187	290	454	242	106	28	77	2659
1945	231	336	120	308	446	959	537	126	14	215	253	243	3788
1946	136	269	860	1648	87	456	0	7	192	96	173	223	4147
1947	120	602	166	420	273	299	45	57	119	138	417	611	3267

KINROSS RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1948	673	178	804	204	410	595	52	112	607	63	132	267	4097
1949	744	725	854	443	224	2164	393	318	644	198	247	417	7371
1950	213	775	231	365	404	2067	585	605	128	385	564	171	6493
1951	1505	225	540	42	187	1046	220	181	127	73	25	227	4398
1952	84	183	139	299	190	178	651	1368	21	379	68	181	3741
1953	446	600	321	112	717	48	188	304	82	200	76	155	3249
1954	414	1076	118	309	193	139	468	237	276	475	397	393	4495
1955	381	1145	620	689	423	260	232	35	251	177	685	302	5200
1956	482	1107	1508	144	466	334	102	275	44	336	36	408	5242
1957	107	450	238	103	4	104	362	706	93	23	76	179	2445
1958	424	375	266	562	200	420	67	308	296	306	124	462	3810
1959	525	419	723	213	296	525	231	608	232	786	462	545	5565
1960	456	451	448	260	303	739	110	184	344	420	266	744	4725
1961	478	348	198	112	112	184	53	493	152	203	466	567	3366
1962	479	807	624	486	1055	51	278	227	352	167	96	831	5453
1963	346	131	1558	975	726	610	169	549	367	221	182	373	6207
1964	241	184	356	247	174	1110	60	140	177	210	105	137	3141

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	
1902			NO RECORDS					0	249	120	727	326	140	
1904	48	61	542	310	168	124	364	434	810	400	258	418	3937	
1904	227	472	407	697	115	6	775	46	31	109	96	118	3099	
1905	122	20	656	314	90	58	73	169	119	91	130	252	2094	
1906	135	95	202	73	470	70	4	526	122	266	0	249	2212	
1907	277	141	564	102	176	445	10	12	20	10	361	228	2346	
1908	19	1757	488	0	94	47	419	230	215	33	110	103	3515	
1909	326	471	83	94	42	276	45	133	590	213	355	901	3529	
1910	572	5	440	220	228	278	270	30	101	374	34	541	3093	
1911	1034	295	348	250	104	32	677	395	195	130	154	188	3802	
1912	213	367	663	329	386	163	916	114	43	29	189	335	3747	
1913	201	130	538	949	1112	682	320	54	270	184	111	63	4614	
1914	86	158	431	76	346	506	170	117	652	615	377	675	4209	
1915	214	124	145	334	805	50	124	78	176	82	0	354	2486	
1916	72	329	89	330	110	167	69	205	140	654	419	693	3277	
1917	618	172	35	412	16	196	36	36	519	251	475	75	2841	
1918	489	353	51	184	99	78	402	101	290	105	0	0	2152	
1919	39	334	397	97	957	48	61	42	229	134	155	190	2683	

EAST MAITLAND RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1920	357	291	75	85	14	341	364	133	144	4	347	1181	3336
1921	391	105	481	1395	752	402	543	69	175	317	264	565	5459
1922	498	421	58	167	130	218	934	208	515	145	379	583	4256
1923	120	2	85	719	24	514	298	250	322	27	154	398	2913
1924	399	280	102	586	135	179	255	184	360	80	455	515	3530
1925	450	371	82	68	319	497	32	259	0	95	204	209	2586
1926	70	41	1020	452	273	171	412	119	168	31	28	1060	3845
1927	569	62	329	1639	107	158	0	1	63	22	795	290	4035
1928	328	303	326	315	152	478	541	66	8	102	84	109	2812
1929	100	1296	36	291	83	133	356	161	498	911	232	44	4141
1930	107	394	727	175	325	1749	110	10	2	211	99	245	4154
1931	151	129	276	1790	364	131	491	31	101	113	71	438	4086
1932	0	590	290	209	46	185	95	82	856	88	110	227	2778
1933	190	43	117	364	160	195	540	2	469	328	279	361	3048
1934	335	791	137	343	203	131	483	258	643	158	184	338	4004
1935	234	485	288	74	16	98	143	37	320	245	73	293	2306
1936	484	311	386	139	169	217	81	69	35	52	42	469	2454
1937	437	111	508	160	28	593	165	215	67	208	430	489	3411

EAST MAITLAND RAINFALL STATISTICS
(Points)

EAST MAITLAND RAINFALL STATISTICS

(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1938	369	374	334	336	296	61	24	341	97	213	211	7	2685
1939	229	0	835	299	112	28	69	186	434	421	104	8	2727
1940	45	22	114	525	103	62	63	380	249	313	381	675	2932
1941	400	339	201	202	54	177	148	118	14	303	116	107	2179
1942	100	236	997	69	62	149	314	83	70	706	425	404	3615
1943	508	40	226	71	1050	57	56	512	338	209	529	527	4123
1944	206	226	123	240	207	63	233	246	163	127	25	46	1905
1945	213	202	58	215	283	1077	462	120	18	243	213	300	3404
1946	116	164	661	1379	111	488	0	7	118	38	110	249	3441
1947	174	486	85	269	284	78	38	91	95	122	362	748	2832
1948	482	133	732	181	331	633	16	56	563	10	186	271	3614
1949	540	786	613	247	237	1991	541	292	469	137	224	413	6490
1950	307	721	128	217	425	2162	549	505	447	445	591	67	6584
1951	1693	270	359	60	235	862	160	167	107	71	30	157	4171
1952	130	134	278	378	152	318	494	1732	10	341	32	218	4217
1953	314	548	191	159	866	32	130	247	72	191	107	100	2957
1954	449	994	320	71	113	104	437	146	231	528	450	282	4125

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	
1955	498	NO RECORDS					114	123	45	194	144	656	199	
1956	343	927	1038	63	361	486	140	203	66	259	27	264	4177	
1957	93	523	110	96	3	53	238	663	61	21	92	346	2299	
1958	383	393	245	347	138	278	68	264	262	266	83	530	3257	
1959	428	417	642	136	64	380	211	434	235	827	538	733	5045	
1960	347	310	256	177	228	448	105	166	208	335	262	792	3634	
1961	641	363	189	194	97	262	54	393	92	217	591	504	3597	
1962	493	929	422	430	1293	33	258	206	190	174	106	584	5118	
1963	399	270	921	634	562	369	153	409	415	296	141	346	4915	
1964	243	132	243	371	127	749	58	104	201	205	68	174	2675	

EAST HATFIELD RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1862	496	446	370	199	103	380	6	167	31	345	184	408	3135
1863	894	933	410	886	40	681	146	462	201	728	67	229	5677
1864	NO RECORDS												
1865	NO RECORDS												
1866	NO RECORDS												
1867	284	902	157	1367	417	824	194	263	243	44	47	45	4787
1868	459	1057	84	145	937	648	577	335	216	69	249	381	5157
1869	363	271	267	566	632	40	99	6	129	475	684	120	3652
1870	303	312	2067	674	1118	23	181	271	177	282	771	1077	7256
1871	691	267	2143	1154	644	269	56	75	89	576	162	137	6263
1872	142	411	712	369	74	79	93	674	141	425	256	408	3784
1873	404	800	285	757	232	795	677	303	162	346	584	415	5760
1874	694	766	631	666	562	751	533	525	369	332	446	18	6293
1875	137	770	935	123	798	719	363	42	336	161	372	207	4963
1876	101	58	373	348	608	298	819	92	302	452	454	108	4013
1877	223	23	164	285	947	35	1051	236	260	482	100	579	4385
1878	303	859	207	145	157	591	174	292	373	85	313	448	3947
1879	228	431	190	340	1167	430	209	1335	1115	263	142	194	6044

NEWCASTLE RAINFALL STATISTICS
(Points)

NEWCASTLE RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1880	192	346	455	190	9	140	168	36	904	235	268	146	3089
1881	446	687	59	329	582	254	795	447	529	361	261	261	5011
1882	110	83	208	95	259	239	517	253	59	665	222	154	2864
1883	306	446	104	386	723	98	938	426	670	157	197	258	4709
1884	157	28	94	891	683	298	974	59	224	372	394	43	4217
1885	323	128	284	471	86	1066	780	82	158	204	35	449	4066
1886	123	58	618	504	324	266	486	180	322	262	419	267	3829
1887	945	409	365	934	903	264	203	798	182	61	564	633	6261
1888	79	322	323	145	62	224	187	172	493	329	45	443	2824
1889	218	352	246	248	1351	156	918	390	311	275	265	61	4791
1890	476	1119	1484	856	1204	267	629	294	141	168	351	561	7550
1891	403	512	637	190	411	1040	461	237	702	153	693	207	5646
1892	613	713	1141	597	235	119	466	517	829	421	255	1273	7179
1893	596	607	1646	432	209	1084	757	249	225	560	320	191	6876
1894	194	445	1341	146	114	168	219	198	732	301	134	594	4586
1895	1590	865	104	178	180	204	35	72	309	21	362	564	4484
1896	188	424	194	57	739	492	383	368	91	303	276	139	3654
1897	165	172	316	298	225	852	355	480	121	274	9	585	3852

NEWCASTLE RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1898	797	401	294	71	1346	298	374	227	674	175	28	175	4860
1899	213	98	132	524	273	481	530	2146	279	515	163	231	5585
1900	127	125	265	308	762	965	817	87	370	70	486	377	4759
1901	214	77	340	948	396	92	347	260	121	421	147	78	3441
1902	143	36	331	664	152	70	783	547	69	880	248	115	4038
1903	76	209	1325	163	419	137	734	726	1063	763	283	523	6421
1904	169	449	443	816	340	14	992	93	135	150	56	183	3840
1905	192	76	580	343	161	161	55	128	221	155	210	239	2521
1906	249	105	376	105	563	65	60	770	245	188	204	185	3115
1907	392	276	666	234	118	966	47	82	21	32	357	204	3395
1908	164	2127	500	511	544	66	1066	415	204	146	280	51	6074
1909	144	570	157	107	350	413	88	176	884	191	329	621	4030
1910	864	322	471	253	561	521	332	22	113	326	84	505	4374
1911	902	287	309	394	150	89	1070	543	313	231	132	313	4733
1912	259	318	450	514	516	242	1382	163	73	142	387	364	4810
1913	282	328	548	582	1423	950	602	184	305	75	79	68	5656
1914	98	173	747	66	681	524	529	374	468	581	273	693	5207
1915	162	238	177	605	757	119	355	226	139	143	15	326	3262

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1916	119	485	302	209	117	315	262	255	240	574	193	402	3473
1917	743	279	166	1029	218	332	29	227	443	294	578	297	4635
1918	549	218	126	436	75	87	643	147	489	155	82	21	3028
1919	124	638	308	383	1201	87	285	83	276	157	141	247	3930
1920	371	193	161	161	82	259	651	124	381	102	191	1221	3897
1921	387	98	298	766	952	386	433	182	116	403	357	444	4822
1922	352	572	38	230	192	228	833	388	413	120	27	158	3571
1923	175	2	38	924	35	440	409	257	182	43	217	322	3044
1924	427	84	118	713	264	291	301	294	301	95	461	325	3674
1925	360	188	238	154	1278	544	186	273	93	118	202	242	3876
1926	69	28	1112	366	305	178	540	183	191	76	24	1285	4357
1927	450	220	839	1552	265	485	49	16	205	70	671	208	5030
1928	445	286	568	230	436	622	760	200	13	63	38	72	3733
1929	51	1176	301	386	544	252	539	226	244	1092	296	64	5171
1930	178	101	532	778	440	1223	391	90	44	275	105	535	4692
1931	158	196	434	2151	670	333	318	232	226	133	165	451	5467
1932	40	691	281	172	344	257	196	154	697	93	167	158	3250
1933	221	80	211	578	203	186	647	66	977	437	217	246	4069

NEWCASTLE RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1934	276	783	117	715	743	429	575	404	553	195	273	266	5329
1935	386	151	605	57	256	426	154	34	490	351	113	174	3197
1936	428	420	448	159	389	240	193	103	190	41	76	487	3174
1937	530	181	494	275	94	1041	315	262	65	337	403	327	4124
1938	475	389	346 ⁶	351	529	237	122	641	156	386	189	72	3893
1939	235	3	1069	370	200	46	318	219	376	334	140	84	3414
1940	24	64	107	389	552	143	250	470	262	410	407	480	3558
1941	345	278	152	361	226	308	328	222	42	157	166	141	2726
1942	73	214	621	120	60	251	638	263	37	546	293	147	3263
1943	249	62	287	149	987	141	43	791	570	232	396	235	4142
1944	234	295	116	363	271	247	519	352	399	81	62	66	3005
1945	246	320	207	869	297	570	564	168	16	196	179	251	3883
1946	108	141	759	1799	147	666	3	18	360	206	187	245	4639
1947	189	578	178	492	470	245	58	113	114	205	436	643	3721
1948	687	205	654	521	235	516	93	135	582	79	175	305	4187
1949	612	627	836	372	735	1268	366	262	743	319	225	474	6839
1950	278	840	244	358	559	1912	738	426	450	336	594	135	6870
1951	1122	243	579	219	134	1497	281	327	187	162	35	194	4980

NEWCASTLE RAINFALL STATISTICS
(Points)

NEWCASTLE RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1952	126	141	194	681	244	97	992	1637	279	425	108	144	5068
1953	565	641	299	560	536	224	313	330	90	195	85	121	3959
1954	451	1178	66	208	148	134	308	263	302	436	348	148	3990
1955	235	1173	528	805	693	560	654	50	175	137	741	450	6201
1956	406	709	898	57	561	465	163	385	81	472	12	224	4433
1957	126	380	292	163	8	68	500	516	194	52	72	258	2629
1958	291	430	293	472	181	390	117	152	277	259	60	392	3314
1959	585	344	540	228	586	719	412	684	248	786	292	272	5696
1960	317	383	456	155	485	1086	125	193	220	431	395	879	5125
1961	482	403	381	530	198	212	92	596	129	142	480	646	4293
1962	368	826	515	455	737	86	350	296	507	270	48	761	5219
1963	545	261	1326	1271	696	1116	319	719	213	232	182	209	7089
1964	210	192	218	251	272	897	68	147	134	325	154	239	3107

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1902	299	33	86	604	43	35	244	214	132	866	278	241	3075
1903	32	38	840	89	139	30	305	423	929	562	234	525	4146
1904	171	735	540	902	65	20	1029	10	2	198	68	67	3807
1905	125	32	851	531	116	70	69	191	154	111	360	94	2704
1906	106	119	331	70	384	88	12	759	139	302	287	N.R.	
1907	449	306	786	271	182	600			NO RECORDS				
1908	224	1962	290	310	84	62	532	370	201	0	380	106	4521
1909	216	561	60	104	56	332	62	190	620	175	293	858	3527
1910	684	53	629	206	309	364	384	12	65	412	102	552	3772
1911	989	366	447	355	113	65	767	581	252	157	199	210	4501
1912	250	834	861	320	288	238	1158	81	82	105	90	493	4800
1913	148	205	667	966	1426	986	394	45	457	114	95	113	5616
1914	113	241	603	75	234	668	322	122	893	625	452	858	5206
1915	242	242	303	426	1105	62	207	162	189	84	4	565	3591
1916	61	379	162	348	143	374	121	154	163	875	303	489	3572
1917	641	294	122	350	107	190	40	115	782	201	548	398	3788
1918	564	417	249	289	31	36	465	121	361	172	90	11	2806
1919	150	495	595	304	1030	40	133	26	216	330	252	380	3951

PATERSON RAINFALL STATISTICS
 (Points)

PATERSON RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1920	280	274	90	40	46	244	479	104	137	52	267	1507	3520
1921	705	156	556	934	1124	646	650	50	125	484	427	656	6513
1922	568	414	100	64	86	149	914	399	441	118	21	339	3613
1923	233	16	72	660	0	544	232	261	291	62	129	553	3053
1924	768	225	120	728	214	223	264	120	368	98	556	700	4384
1925	666	280	445	100	609	493	76	298	140	135	280	393	3915
1926	171	14	1087	471	275	230	590	111	168	39	65	1145	4366
1927	485	129	714	1757	87	133	4	2	44	70	806	608	4839
1928	538	474	396	427	161	795	622	84	7	36	66	109	3715
1929	70	1366	157	249	52	167	407	229	802	811	222	216	4748
1930	157	441	905	252	232	1853	160	36	0	254	5	270	4565
1931	142	447	795	1424	347	193	475	48	175	151	120	417	4734
1932	379	361	578	90	100	246	130	109	936	51	227	236	3443
1933	326	46	392	285	220	199	508	17	493	687	316	383	3872
1934	289	1050	73	538	334	135	402	377	452	145	155	571	4481
1935	447	456	314	38	15	120	170	17	255	220	59	298	2409
1936	685	404	530	195	195	168	104	88	59	34	44	481	2987
1937	375	137	637	186	30	716	197	205	33	241	611	232	3600

PATERSON RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1938	515	323	113	299	204	21	38	270	104	203	252	31	2373
1939	310	0	1500	248	216	40	97	165	595	317	215	10	3713
1940	165	29	97	622	160	79	35	297	214	307	271	749	3025
1941	572	423	207	198	80	164	120	102	11	293	228	113	2511
1942	92	155	1423	78	60	155	457	130	53	897	551	253	4304
1943	438	60	350	141	1080	60	47	713	421	315	545	829	4999
1944	239	267	185	243	296	80	238	272	172	26	24	138	2180
1945	223	391	108	259	295	1105	331	144	21	275	267	346	3765
1946	143	507	630	1500	108	426	2	7	136	47	135	182	3823
1947	171	933	217	403	479	247	64	75	135	125	508	701	4058
1948	573	486	812	174	254	491	19	68	581	58	197	393	3806
1949	575	854	639	398	138	1213	519	329	507	146	278	439	6035
1950	411	908	144	287	406	2235	610	442	67	430	607	295	6842
1951	1969	226	471	82	139	1036	175	125	89	95	19	119	4545
1952	75	265	274	333	205	345	438	1458	36	420	104	228	4181
1953	508	782	303	385	708	32	167	260	59	226	156	65	3651
1954	487	1265	184	211	147	219	403	170	380	499	475	211	4651
1955	418	1247	805	492	290	146	127	59	159	223	574	463	5003

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1956	612	1161	1107	313	400	337	126	188	37	246	29	259	4815
1957	133	488	178	94	0	66	189	611	38	31	121	324	2273
1958	405	447	333	589	100	361	49	235	235	193	210	746	3903
1959	618	424	749	248	145	261	165	496	289	725	459	492	5071
1960	387	405	281	229	225	585	103	130	236	424	257	800	4062
1961	398	350	218	167	84	388	47	409	160	206	544	792	3763
1962	448	969	182	702	984	41	221	174	268	193	103	837	5122
1963	518	210	1405	814	607	533	145	390	422	217	304	297	5862
1964	339	167	170	284	220	1056	25	103	134	321	104	196	3119

PATERSON RAINFALL STATISTICS
(Points)

STROUD RAINFALL STATISTICS
(Points)

1890	617	1764	1380	778	718	357	684	137	194	84	550	215	7478
1891	502	852	557	265	261	853	457	258	635	214	549	367	5770
1892	562	775	1658	1017	162	107	155	437	416	392	472	662	6815
1893	662	781	1942	134	151	871	363	357	189	928	482	298	7158
1894	373	452	1690	323	245	106	117	87	327	468	36	622	4846
1895	2119	621	188	166	258	60	27	48	206	60	661	703	5117
1896	292	928	359	56	515	241	246	192	32	227	466	494	4048
1897	58	103	91	344	161	612	311	515	55	114	20	1081	3465
1898	551	244	305	276	518	626	417	379	387	116	103	436	4358
1899	167	136	44	714	260	434	838	1946	233	219	295	198	5484
1900	56	46	228	220	381	842	587	53	341	291	356	233	3634
1901	302	70	193	193	290	88	411	129	65	554	109	52	2456
1902	185	60	164	735	45	33	345	400	98	779	170	162	3176
1903	7	283	769	105	215	152	241	436	596	704	501	268	4277
1904	125	519	458	808	53	0	892	26	85	135	170	198	3469
1905	253	150	364	443	140	46	42	172	181	176	310	422	2699
1906	155	54	525	185	283	30	11	749	168	180	273	140	2753
1907	562	170	902	82	210	674	15	27	0	9	268	311	3230
1908	400	2015	505	535	160	20	698	748	227	39	178	119	5644

STROUD RAINFALL STATISTICS
(Points)

1909	141	535	59	194	116	356	93	235	949	199	439	820	4136
1910	772	159	889	349	512	581	167	24	98	444	149	515	4659
1911	937	362	297	330	232	72	985	842	273	138	310	168	4946
1912	308	956	726	390	214	274	1027	173	10	108	218	1095	5499
1913	199	624	328	1192	1260	877	273	27	325	199	82	91	5477
1914	216	298	585	73	81	560	300	163	737	909	262	883	5067
1915	183	202	63	256	1122	162	234	151	100	74	47	603	3197
1916	183	570	325	359	764	537	198	166	145	751	223	584	4805
1917	326	529	455	545	248	259	20	114	812	277	889	268	4742
1918	599	808	374	410	105	110	398	220	453	149	88	209	3923
1919	199	460	755	377	1363	194	385	42	168	453	397	328	5121
1920	746	285	212	150	157	240	494	120	211	71	281	1126	4093
1921	738	296	497	619	938	583	805	132	312	421	225	557	6123
1922	764	737	100	142	183	228	979	538	726	114	19	343	4873
1923	205	20	102	665	38	424	248	376	179	110	169	409	2945
1924	453	327	182	614	205	208	294	191	305	107	592	641	4119
1925	680	322	321	141	666	524	71	406	128	144	256	241	3900
1926	262	43	889	503	611	244	544	118	125	67	23	844	4273
1927	550	347	754	2117	483	163	23	7	167	127	680	632	6050

STROUD RAINFALL STATISTICS
(Points)

1928	398	965	657	411	221	1031	407	77	0	131	142	124	4504
1929	109	1743	249	283	130	139	488	251	559	1023	344	56	5374
1930	240	518	1037	511	307	1293	103	57	15	326	127	817	5351
1931	252	197	616	1695	362	157	333	68	176	106	253	658	4873
1932	74	310	404	266	507	211	661	223	965	117	341	235	4314
1933	297	85	242	424	239	224	829	41	509	525	413	420	4248
1934	264	729	148	493	473	141	437	477	452	198	364	424	4600
1935	358	334	400	109	78	100	183	49	330	216	71	402	2630
1936	543	420	604	439	242	226	111	128	145	35	47	570	3510
1937	427	197	484	296	56	900	329	221	56	410	651	363	4390
1938	700	456	176	396	345	210	165	368	325	200	456	100	3897
1939	474	0	1875	413	255	38	182	176	356	782	124	94	4769
1940	109	66	234	500	235	84	92	554	296	201	278	813	3462
1941	599	463	158	229	110	287	202	144	35	346	88	117	2778
1942	74	321	1537	98	100	248	620	110	26	1401	565	250	5350
1943	387	74	164	172	1187	88	53	627	291	244	595	467	4349
1944	426	334	178	230	223	113	359	546	219	62	18	93	2801
1945	232	566	132	334	335	1345	378	147	24	241	288	309	4331
1946	109	242	1781	2048	111	322	6	12	224	59	349	281	5544

STROUD RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1947	240	1011	312	354	487	234	61	65	124	296	369	782	4335
1948	480	284	659	160	476	418	68	131	579	103	107	311	3776
1949	699	853	997	512	170	1094	622	345	571	228	351	214	6656
1950	525	790	177	565	476	2051	509	454	174	522	673	228	7144
1951	2004	187	328	121	80	1101	116	133	109	88	23	167	4457
1952	104	751	285	454	217	317	364	1330	9	417	150	237	4635
1953	465	709	368	116	642	47	240	278	85	288	86	99	3623
1954	610	1371	232	101	216	398	243	218	603	479	448	344	5263
1955	546	1443	881	622	337	276	155	44	116	251	416	443	5530
1956	669	1376	1923	52	577	363	141	192	89	230	33	233	5878
1957	119	1096	646	129	5	102	436	609	109	17	57	136	3461
1958	524	586	148	324	88	528	100	164	312	249	79	690	3792
1959	698	515	935	409	313	332	370	569	215	1046	444	469	6315
1960	470	330	334	142	220	1105	109	46	169	281	332	603	4141
1961	467	337	277	432	211	591	58	415	120	423	400	876	4607
1962	695	622	455	798	1020	52	149	182	255	250	114	955	5547
1963	494	184	2075	888	771	476	256	542	479	257	384	401	7207
1964	249	325	308	306	345	538	61	122	78	182	111	97	2722

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1891			NO RECORDS			1261	205	206	506	123	532	244	
1892	477	458	1187	804	234	86	485	334	706	467	458	593	6289
1893	408	534	1642	238	170	1047	478	203	108	548	239	208	5823
1894	389	488	1545	364	38	113	37	77	283	280	53	378	4045
1895	1867	502	65	161	109	74	62	61	210	26	319	553	4009
1896	232	744	354	40	393	376	149	171	17	218	360	98	3152
1897	148	62	226	377	394	543	657	349	69	300	12	565	3702
1898	694	585	437	30	466	353	267	350	776	226	26	272	4482
1899	134	109	268	482	173	396	552	1580	215	313	254	137	4613
1900	163	200	168	233	473	939	597	79	171	53	343	353	3772
1901	288	110	239	261	208	116	205	193	45	366	182	86	2299
1902	227	83	140	177	72	26	179	215	85	880	257	238	2579
1903	88	114	398	210	187	141	345	405	722	370	346	740	4066
1904	77	523	390	647	128	32	1004	66	56	271	112	94	3400
1905	280	152	492	326	148	158	61	71	128	144	158	343	2461
1906	236	92	402	53	430	77	21	532	248	328	205	194	2818
1907	306	294	501	121	202	403	21	66	49	30	267	277	2537
1908	95	1929	512	169	61	63	323	373	162	48	133	158	4026

WOLLONG RAINFALL STATISTICS
(Points)

WOLLONG RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1909	372	336	67	110	132	345	45	128	379	267	311	814	3306
1910	655	43	478	161	220	375	378	19	224	299	80	522	3454
1911	877	526	277	168	174	19	761	482	196	145	213	369	4207
1912	179	664	486	447	382	181	1012	162	41	178	109	206	4047
1913	212	71	384	813	1784	635	256	39	173	145	87	88	4687
1914	151	246	293	75	221	561	163	80	547	760	358	808	4263
1915	153	152	163	238	1416	94	174	81	154	79	27	237	2968
1916	62	428	142	384	125	222	150	172	76	787	257	1032	3837
1917	600	247	150	396	67	217	37	116	522	142	782	303	3579
1918	646	382	70	250	36	38	517	153	204	119	35	46	2496
1919	142	250	397	186	698	20	50	49	191	110	162	323	2578
1920	551	282	63	79	46	333	394	185	146	24	147	1033	3283
1921	262	112	363	1012	961	303	729	78	98	303	316	764	5301
1922	454	327	93	83	110	91	995	222	542	106	23	193	3239
1923	172	25	71	613	22	390	333	237	273	40	211	203	2590
1924	717	166	87	697	201	168	207	89	345	68	631	307	3683
1925	329	211	238	349	489	324	39	112	87	93	286	391	2948
1926	100	23	868	500	341	96	304	112	179	49	41	1440	4053

WOLLONG RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1927	415	52	351	1863	68	92	7	9	54	34	559	205	3709
1928	409	501	315	356	108	578	416	32	16	109	56	132	3028
1929	107	1744	79	330	86	252	451	214	454	869	335	75	4996
1930	302	152	666	397	247	1831	187	88	28	249	59	325	4531
1931	151	405	391	2048	325	131	457	71	169	73	201	410	4832
1932	24	469	371	172	59	183	113	151	919	207	249	155	3072
1933	307	17	116	291	185	120	592	7	455	281	307	329	3007
1934	237	888	159	304	188	152	615	324	620	286	345	423	4541
1935	208	249	347	86	7	34	147	23	242	305	99	311	2058
1936	474	427	474	198	205	146	113	47	34	66	45	716	2945
1937	309	229	485	165	44	683	153	227	28	258	526	317	3424
1938	638	285	221	462	319	55	39	381	82	263	142	50	2937
1939	227	4	696	247	76	35	79	182	276	409	206	41	2478
1940	35	15	122	294	61	47	29	387	239	142	414	615	2400
1941	398	305	239	178	85	134	73	132	30	177	128	98	1977
1942	70	274	889	85	60	221	249	67	81	1102	385	272	3755
1943	324	85	180	67	1393	49	27	464	309	231	415	312	3856
1944	176	209	144	102	138	82	258	302	131	27	24	69	1662

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1945	215	409	93	255	315	1024	474	154	15	214	208	154	3530
1946	104	101	420	1352	88	445	4	3	146	67	266	320	3316
1947	59	643	162	235	205	92	29	80	69	140	333	1153	3200
1948	492	203	418	207	460	706	20	99	663	24	113	290	3695
1949	548	704	539	194	279	1894	360	320	384	248	318	482	6270
1950	412	857	532	310	180	2068	676	309	558	294	596	83	6875
1951	1901	301					NO RECORDS						

WOLLONG RAINFALL STATISTICS
(Points)

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Carrington	Minimum	31	0	30	26	40	24	0	44	3	7	3	21	2661
	10%	104	74	91	119	107	100	74	70	51	76	52	70	3341
	30%	229	182	209	251	237	227	197	171	140	138	130	200	4170
	50%	376	342	341	405	362	393	429	272	293	237	255	301	4606
	70%	499	515	641	574	522	566	585	410	397	358	358	468	5567
	90%	726	866	1112	1011	946	1199	850	667	666	595	539	818	6380
	Maximum	1961	1888	1490	1963	2170	2337	1853	2188	1073	1163	954	1742	8242
Clarencetown	Minimum	34	0	0	0	8	16	5	8	7	15	0	20	2312
	10%	86	52	100	95	68	55	46	38	41	58	52	116	2914
	30%	169	226	199	182	173	172	144	122	118	126	128	194	3579
	50%	335	334	352	303	264	235	267	190	190	208	196	326	4215
	70%	506	504	541	423	340	446	411	303	332	296	353	554	4758
	90%	765	899	922	861	812	992	689	581	568	659	569	820	5240
	Maximum	1650	2015	1628	2519	1395	2333	1209	1862	1313	1107	1000	1438	6828
Kinross	Minimum	22	0	72	37	4	13	0	6	13	23	2	36	2356
	10%	82	68	102	105	86	65	45	47	24	72	32	77	2702
	30%	142	184	195	204	183	161	148	122	123	127	122	181	3434
	50%	313	321	281	345	244	251	260	188	177	200	211	316	3929
	70%	469	427	564	488	414	387	470	286	307	310	307	464	4498
	90%	731	813	861	857	834	918	675	605	648	492	503	624	5464
	Maximum	1614	1632	1508	2068	1425	2164	1244	1877	962	1050	793	1540	7371

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
East Maitland	Minimum	0	0	35	0	14	6	0	1	0	4	0	0	1905
	10%	55	27	63	71	32	47	18	17	15	28	29	51	2240
	30%	134	130	127	160	107	96	73	69	97	95	107	190	2830
	50%	231	275	305	243	164	174	201	126	171	151	185	286	3407
	70%	399	371	444	334	285	347	413	216	324	252	348	420	3944
	90%	560	766	708	880	789	808	547	422	588	503	453	688	4244
	Maximum	1693	1757	1020	1790	1112	2182	934	1732	856	911	795	1181	6584
Newcastle	Minimum	24	2	38	57	8	14	3	16	13	21	9	18	2521
	10%	102	62	116	121	98	87	62	67	70	71	39	72	3093
	30%	177	185	215	224	222	209	238	166	179	154	141	180	3791
	50%	249	318	323	363	389	291	366	237	260	232	210	247	4187
	70%	396	445	530	522	571	502	568	370	374	335	316	418	4901
	90%	672	817	928	889	951	1041	901	675	701	540	460	631	6249
	Maximum	1590	2127	1646	2151	1423	1912	1382	2146	1115	1092	741	1285	7550
Paterson	Minimum	61	0	60	38	0	21	2	2	0	0	4	10	2180
	10%	125	50	99	80	40	41	39	22	35	38	27	108	2688
	30%	224	242	185	204	106	144	121	99	101	112	113	235	3643
	50%	387	391	333	289	204	230	197	144	175	193	227	393	3915
	70%	520	477	608	399	291	377	404	260	305	296	306	555	4549
	90%	684	1094	879	810	1002	1006	615	464	605	650	553	832	5156
	Maximum	1969	1962	1500	1757	1426	2235	1158	1458	936	897	806	1507	6842

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Stroud	Minimum	7	0	44	52	5	0	6	7	0	9	18	52	2456
	10%	109	68	138	107	80	49	46	41	28	64	40	107	3037
	30%	234	283	236	199	173	153	150	122	121	128	130	233	3948
	50%	398	420	374	349	242	248	273	176	194	219	273	344	4457
	70%	549	624	640	485	377	506	410	366	322	342	391	567	5120
	90%	723	1062	1474	790	746	979	762	593	600	768	581	834	6094
	Maximum	2119	2015	1942	2117	1363	2051	1027	1946	965	1401	889	1126	7478
Wollong	Minimum	24	4	63	30	7	19	4	3	15	24	12	41	1662
	10%	77	43	79	79	46	35	27	32	30	34	35	83	2461
	30%	163	152	163	172	108	92	79	79	85	109	128	194	3007
	50%	262	250	347	247	185	168	207	151	173	214	213	307	3530
	70%	408	428	420	364	279	375	416	222	276	286	318	391	4045
	90%	646	704	696	804	489	939	676	387	620	548	458	808	4996
	Maximum	1867	1929	1642	2048	1784	2068	1012	1580	919	1102	782	1440	6875

MINIMUM RAINFALL RECORDED
IN CONSECUTIVE MONTHS
(Points)

Station	Number of Months	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Carrington	1	31	0	30	26	40	24	0	44	3	7	3	21
	2	72	68	250	188	147	108	52	99	67	67	143	113
	3	234	495	361	388	269	362	136	130	186	192	231	140
	4	700	873	622	565	488	561	167	333	398	483	258	302
	5	990	929	883	729	689	649	603	543	511	640	420	881
	6	1184	992	1124	1106	835	921	777	658	732	699	999	1125
	7	1294	1296	1435	1359	1042	1327	913	816	1078	1318	1283	1409
	8	1672	1673	1607	1457	1435	1531	1205	1272	1631	1412	1446	1555
	9	1942	1953	1852	1932	1690	1688	1546	1773	1714	1706	1668	1774
	10	2088	2024	2250	2309	1847	2015	1950	1917	1778	1889	1887	1975
	11	2295	2359	2701	2418	2212	2186	2310	1983	1981	2108	2088	2121
	12	2661	2834	2874	2736	2307	2548	2435	2065	2200	2309	2234	2328
Clarencetown	1	34	0	0	0	8	16	5	8	7	15	0	20
	2	145	147	88	114	76	87	22	74	37	73	132	141
	3	302	435	265	224	248	225	90	98	170	185	269	172
	4	628	600	476	461	392	383	114	304	357	340	311	322
	5	954	822	755	481	576	489	378	494	443	550	517	832
	6	1023	934	878	803	703	690	514	564	633	692	1050	1056
	7	1041	1309	1194	940	840	923	684	795	1090	1103	1251	1120
	8	1552	1479	1418	1052	1013	1106	979	1211	1371	1481	1315	1188
	9	1725	1749	1505	1405	1196	1344	1331	1554	1697	1607	1383	1619
	10	1852	1886	1783	1628	1455	1645	1663	1818	1837	1675	1718	1792
	11	1989	2086	1847	1833	1756	1752	1938	1999	1873	1957	1891	1919
	12	2312	2275	2197	2134	1863	2078	2058	2028	2040	2130	2018	2056

MINIMUM RAINFALL RECORDED
IN CONSECUTIVE MONTHS
(Points)

Station	Number of Months	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Kinross	1	22	0	72	37	4	13	0	6	13	23	2	36
	2	54	117	181	107	97	106	7	58	60	98	105	65
	3	148	396	289	211	212	188	68	103	175	211	263	91
	4	652	551	408	340	281	345	113	267	339	383	302	185
	5	859	705	442	409	438	384	418	431	399	457	400	721
	6	1006	739	511	566	477	700	613	491	519	674	936	929
	7	1242	808	668	605	818	1053	635	599	858	1030	1126	1113
	8	1406	965	707	946	1220	1178	1120	1039	1157	1208	1325	1279
	9	1736	1004	1048	1369	1253	1302	1259	1338	1347	1398	1494	1476
	10	1832	1345	1518	1391	1444	1555	1558	1528	1525	1614	1673	1817
	11	2001	1815	1757	1890	1755	1789	1748	1706	1800	1755	1902	1913
	12	2356	2054	2095	2141	1954	2153	1926	1906	1941	2057	1998	2082
East Maitland	1	0	0	35	0	14	6	0	1	0	4	0	0
	2	67	87	150	90	114	74	1	12	30	59	0	39
	3	181	337	174	141	209	151	42	42	129	105	39	75
	4	505	465	412	331	266	222	52	198	303	144	179	189
	5	809	765	540	368	329	244	273	369	403	465	293	714
	6	871	867	656	688	351	496	522	469	496	671	759	817
	7	934	903	914	762	665	859	660	542	834	886	921	879
	8	1314	1253	1062	804	982	936	910	1074	1049	1169	983	942
	9	1511	1451	1190	1239	1114	1122	1233	1266	1332	1404	1046	1322
	10	1712	1501	1310	1298	1212	1324	1339	1572	1614	1467	1426	1571
	11	1842	1663	1349	1526	1414	1397	1633	1660	1641	1716	1675	1830
	12	1905	1702	1683	1728	1487	1681	1879	1733	1856	1944	1926	1960

MINIMUM RAINFALL RECORDED
IN CONSECUTIVE MONTHS
(Points)

Station	Number of Months	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Newcastle	1	24	2	38	57	8	14	3	16	13	21	9	18
	2	88	40	251	171	76	125	21	103	53	100	103	108
	3	195	386	404	239	317	311	150	135	114	173	161	172
	4	496	597	531	507	353	530	182	314	186	224	312	279
	5	755	856	701	543	726	641	539	386	237	482	400	668
	6	994	1263	773	978	821	843	743	437	752	520	808	1016
	7	1342	1344	1082	999	1091	1169	907	885	933	1142	1205	1255
	8	1514	1713	1103	1361	1330	1418	1211	1321	1518	1479	1273	1613
	9	1823	1880	1465	1673	1579	1523	1647	1737	1594	1745	1753	1730
	10	2072	2090	2029	1922	1684	1712	1843	1816	1826	1957	1872	2084
	11	2282	2329	2176	2027	1912	2004	2144	2067	2092	2085	2156	2255
	12	2521	2454	2390	2282	2165	2244	2374	2185	2220	2306	2311	2465
Paterson	1	61	0	60	38	0	21	2	2	0	0	4	10
	2	185	88	130	53	6	59	6	36	43	50	101	161
	3	291	404	176	160	224	139	50	116	109	188	213	204
	4	684	450	338	343	226	183	120	193	218	281	419	301
	5	730	694	527	360	270	253	327	302	288	573	516	923
	6	959	998	674	615	340	497	509	372	662	799	1085	1083
	7	1148	1130	882	835	692	919	680	787	936	1169	1181	1162
	8	1484	1305	1149	887	1043	1106	962	1061	1269	1385	1247	1197
	9	1694	1466	1208	1192	1203	1229	1236	1394	1464	1493	1412	1494
	10	1746	1664	1506	1401	1358	1672	1569	1599	1530	1682	1709	1708
	11	1949	1858	1608	1556	1946	1931	1774	1718	1719	2026	1923	2015
	12	2180	2031	1763	2194	2227	2107	1844	1907	2268	2240	2116	2208

MINIMUM RAINFALL RECORDED
IN CONSECUTIVE MONTHS
(Points)

Station	Number of Months	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Stroud	1	7	0	44	52	5	0	6	7	0	9	18	52
	2	102	122	242	134	53	41	18	27	9	74	111	169
	3	252	410	369	236	228	135	42	36	183	173	279	269
	4	550	699	653	470	393	341	51	304	319	382	393	461
	5	757	834	699	519	581	401	319	474	491	701	570	748
	6	136	1088	747	765	659	692	630	583	981	803	1043	1129
	7	1243	1253	953	825	934	1123	740	1017	1189	1262	1342	1274
	8	1610	1439	1013	1136	1329	1293	1327	1318	1492	1381	1383	1414
	9	1741	1634	1536	1538	1403	1558	1729	1824	1608	1737	1538	1808
	10	1967	1870	1716	1632	1698	1817	2169	1964	1964	1830	1978	1974
	11	2228	2154	1790	1953	2107	2268	2250	2010	2026	2065	2159	2165
	12	2456	2253	2111	2300	2408	2551	2535	2052	2198	2294	2335	2475
Wollong	1	24	4	63	30	7	19	4	3	15	24	12	41
	2	50	96	142	93	41	70	7	48	79	51	81	76
	3	172	332	188	127	137	108	70	97	145	120	223	91
	4	466	470	377	274	176	162	104	192	251	335	297	213
	5	527	498	471	297	230	196	305	345	420	519	419	507
	6	574	568	532	539	264	451	638	452	768	590	713	568
	7	603	892	742	703	656	772	708	909	968	1085	774	615
	8	990	977	768	854	857	842	982	1210	1223	1183	821	644
	9	1204	1270	1087	1035	927	1116	1365	1297	1378	1230	850	1031
	10	1371	1417	1274	1105	1201	1400	1553	1518	1404	1259	1237	1270
	11	1593	1486	1344	1379	1476	1694	1720	1597	1535	1646	1472	1412
	12	1662	1649	1618	1723	1770	1755	1767	1717	1798	1838	1618	1826

ALLYN RIVER AT HALTON

LOCATION: Latitude 32°19' Longitude 151°30'

PERIOD OF ESTABLISHMENT: December 1940 to date.

COMPLETE YEARS OF COMPUTED RECORDS: 25 years.

ZERO OF GAUGE: 83.70 Assumed Datum.

CATCHMENT AREA: 79 square miles.

CONTROL: Rock.

EQUIPMENT: Automatic Recorder (pressure type)
installed October 1963.
Staff gauge, range 0 to 30 feet.

CURRENT METER OBSERVATIONS:

- (a) Number obtained : 159
- (b) Maximum observation
in cusecs : 5,750
- (c) Minimum observation
in cusecs : 0.07

MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS: 14,000 cusecs.

MEAN DAILY DISCHARGE FOR 25 YEARS: 132 cusecs.

MEAN ANNUAL DISCHARGE FOR 25 YEARS: 96,300 acre feet.

ALLYN RIVER AT HALTON

Year 1940

Year 1941

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	Jan.	555	7	83	5,148
Feb.	Feb.	3670	10	259	14,514
Mar.	Mar.	24	10	16	978
Apr.	Apr.	51	6	14	844
May	May	20	3.5	8.3	515
June	June	51	8	16	986
July	July	58	6	13	810
Aug.	Aug.	16	4	8	494
Sept.	Sept.	8	3	4.8	294
Oct.	Oct.	37	3.5	10	622
Nov.	Nov.	20	3.5	7	426
Dec.	No Records			4,700 *	Dec.	8	0	1.8	113
Total				4,700	Total	..	..	..	25,744

Year 1942

Year 1943

Jan.	0	0	0	0	Jan.	520	10	173	10,750
Feb.	37	0	12	678	Feb.	12	47	7	392
Mar.	1485	3	324	20,096	Mar.	124	2.6	11	706
Apr.	400	6	51	3,032	Apr.	96	6	21	1,308
May	9	1	4	263	May	1100	3.5	209	12,968
June	37	1	8	455	June	96	9	27	1,642
July	1350	10	121	7,472	July	10	6	9	562
Aug.	78	9	27	1,672	Aug.	470	9	191	11,846
Sept.	12	3	6.9	412	Sept.	200	33	106	6,390
Oct.	8240	1.8	785	48,666	Oct.	152	16	54	3,330
Nov.	6020	23	385	23,110	Nov.	1910	16	234	14,038
Dec.	260	14	42	2,610	Dec.	1620	37	260	16,126
Total	..	..	..	108,466	Total	..	..	..	80,058

* Estimated.

ALLYN RIVER AT HALTON

Year 1944

Year 1945

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	395	10	91	5,768	Jan.	10	0	4	259
Feb.	170	16	61	3,528	Feb.	85	0	21	1,198
Mar.	96	9	23	1,456	Mar.	24	0	7	449
Apr.	27	6	13	774	Apr.	89	8	14	858
May	37	6	13	838	May	130	9	20	1,266
June	51	7	15	912	June	9180	16	744	44,664
July	460	15	78	4,836	July	3270	37	211	13,102
Aug.	1350	6	297	18,388	Aug.	78	10	34	2,084
Sept.	205	18	41	2,514	Sept.	10	6	7	432
Oct.	20	8	11	676	Oct.	44	1.8	14	842
Nov.	5	1.4	3	185	Nov.	78	7	26	1,536
Dec.	13	1.8	4	257	Dec.	69	4.7	22	1,393
Total	..	..	..	40,132	Total	..	..	..	68,007

Year 1946

Year 1947

Jan.	18	0	5.7	351	Jan.	3	0	0.5	31
Feb.	520	0	46	2,575	Feb.	3670	0.1	241	13,192
Mar.	160	2.7	20	1,266	Mar.	3390	19	214	12,294
Apr.	10760	37	1164	72,162	Apr.	870	15	91	5,486
May	48	29	38	2,350	May	870	8	146	9,083
June	1350	8	110	6,080	June	870	1.8	142	8,511
July	55	5	27	1,726	July	37	1	12	765
Aug.	5	0.1	2.4	149	Aug.	14	2.6	6	370
Sept.	3	0	0.6	34	Sept.	33	3.5	11	670
Oct.	0.5	0	0.1	7	Oct.	69	8	30	1,856
Nov.	200	0	9	536	Nov.	44	8	19	1,142
Dec.	4	0	0.6	35	Dec.	No Records			23,000*
Total	..	..	..	87,579	Total	..	..	..	76,400*

* Estimated.

ALLYN RIVER AT HALTON

Year 1948

Year 1949

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	1895	29	234	14,512	Jan.	106	1	22	1,366
Feb.	152	14	35	2,002	Feb.	1402	0.5	181	10,174
Mar.	3270	23	218	13,528	Mar.	1350	78	529	32,804
Apr.	1850	0	174	10,408	Apr.	280	60	140	8,420
May	1260	0	145	8,989	May	106	7	46	2,870
June	1260	0.5	448	26,856	June	3570	6	448	26,876
July	44	1.8	16	1,016	July	3570	0.25	280	17,346
Aug.	56	6	17	1,030	Aug.	1500	19	173	10,726
Sept.	870	8	211	12,664	Sept.	940	37	138	8,272
Oct.	160	6	32	2,020	Oct.	130	3	33	2,058
Nov.	7	0	1.9	111	Nov.	37	2	8	480
Dec.	10	0	0.8	47	Dec.	44	5	17	1,056
Total	..	..	..	93,183	Total	..	..	..	122,448

Year 1950

Year 1951

Jan.	113	2	17	1,024	Jan.	11500	89	1078	66,838
Feb.	2255	0.5	224	12,546	Feb.	686	44	111	6,198
Mar.	130	5	45	2,788	Mar.	1260	31	274	16,984
Apr.	870	5	129	7,710	Apr.	186	34	56	3,392
May	870	58	159	9,864	May	37	20	25	1,538
June	6750	73	1242	74,530	June	4120	20	588	35,304
July	905	66	346	21,476	July	501	59	147	9,122
Aug.	1080	24	258	15,970	Aug.	118	25	44	2,640
Sept.	255	44	77	4,618	Sept.	25	16	18	1,100
Oct.	490	44	185	11,460	Oct.	31	12	18	1,086
Nov.	1885	37	314	18,866	Nov.	25	3	7	393
Dec.	155	24	65	4,042	Dec.	9	2	3.8	238
Total	..	..	..	184,894	Total	..	..	..	144,833

ALLYN RIVER AT HALTON

Year 1952

Year 1953

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	20	0.5	2.9	203	Jan.	1595	18	323	20,014
Feb.	413	0	51	2,947	Feb.	1550	16	622	34,848
Mar.	852	9	100	6,200	Mar.	2360	31	217	13,500
Apr.	852	6	62	3,748	Apr.	118	12	32	1,904
May	471	12	63	3,888	May	1550	28	195	12,060
June	67	12	30	1,804	June	25	12	16	964
July	501	6.5	54	3,364	July	75	12	35	2,154
Aug.	4652	37	825	51,136	Aug.	231	9	30	1,850
Sept.	37	9	25	1,498	Sept.	75	3	15	879
Oct.	67	6	27	1,674	Oct.	31	6.5	12	727
Nov.	31	4	15	888	Nov.	31	2	7	399
Dec.	166	1	11	691	Dec.	4.5	0	1.3	81
Total	..	..	..	78,041	Total	..	..	..	89,380

Year 1954

Year 1955

Jan.	186	2	50	3,079	Jan.	142	28	72	4,454
Feb.	No	Records		70,700*	Feb.	No	Records		75,400*
Mar.	318	25	84	5,238	Mar.	No	Records		33,000*
Apr.	385	9	50	3,030	Apr.	1058	63	265	15,902
May	75	9	30	1,878	May	592	39	102	6,326
June	25	12	16	964	June	330	46	144	8,622
July	255	7	53	3,344	July	46	28	38	2,338
Aug.	255	9	49	3,056	Aug.	36	19	24	1,526
Sept.	1325	9	304	18,240	Sept.	59	11	25	1,527
Oct.	954	24	354	21,970	Oct.	73	6	22	1,393
Nov.	1595	20	352	21,124	Nov.	59	6	25	1,491
Dec.	186	24	59	3,662	Dec.	399	6	93	5,786
Total	..	..	..	156,285*	Total	..	..	..	157,765*

* Estimated.

ALLYN RIVER AT HALTON

Year 1956

Year 1957

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	2521	4	272	16,874	Jan.	13	2.7	14	850
Feb.	12025	157	1154	66,954	Feb.	8290	8.5	496	27,762
Mar.	10000	18	626	38,790	Mar.	752	19	105	6,500
Apr.	2090	31	184	11,048	Apr.	39	8.5	18	1,095
May	561	26	81	5,042	May	11.5	1.5	5.6	346
June	149	26	65	3,908	June	19	1.5	4.7	283
July	79	15	39	2,428	July	33	2.7	14	842
Aug.	670	22	121	7,486	Aug.	719	4.2	104	6,418
Sept.	No	Records		2,000*	Sept.	142	7.2	28	1,700
Oct.	No	Records		1,600*	Oct.	10	2.5	5.5	340
Nov.	23	4	94	5,618	Nov.	10	0	3	168
Dec.	54	2.7	15	934	Dec.	0	0	0	0
Total	..	..	..	162,682*	Total	..	..	..	46,304

Year 1958

Year 1959

Jan.	1128	0	65	4,056	Jan.	1460	10	232	14,382
Feb.	357	10	62	3,482	Feb.	6400	22	259	14,482
Mar.	33	2.5	15	917	Mar.	752	17	171	10,590
Apr.	172	2.5	41	2,452	Apr.	654	10	136	8,169
May	94	7.2	24	1,507	May	83	28	39	2,400
June	208	7.2	54	3,262	June	886	10	68	4,090
July	190	10	42	2,630	July	785	17	121	7,526
Aug.	14	4.7	9	559	Aug.	988	22	224	13,886
Sept.	54	4.7	15	897	Sept.	172	27	69	4,116
Oct.	54	10	28	1,764	Oct.	752	17	208	12,888
Nov.	10	2.5	5.4	322	Nov.	2360	54	297	17,824
Dec.	305	22	73	4,494	Dec.	No	Records		2,000*
Total	..	..	..	26,342	Total	..	..	..	112,353*

* Estimated.

ALLYN RIVER AT HALTON

Year 1960

Year 1961

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	116	7.2	26	1,604	Jan.	1880	22	207	12,846
Feb.	654	10.1	105	6,062	Feb.	471	26	109	6,728
Mar.	531	31	183	11,316	Mar.	149	9.5	37	2,284
Apr.	149	12	56	3,344	Apr.	65	7.2	16	974
May	31	2.7	10	626	May	84	0.5	18	1,092
June	357	12	76	4,548	June	2090	30	241	14,465
July	330	31	89	5,534	July	36	4	22	1,348
Aug.	47	18	27	1,670	Aug	1600	11	110	6,805
Sept.	84	15	31	1,870	Sept.	113	4	56	3,333
Oct.	149	9.5	28	1,710	Oct.	158	4	31	1,896
Nov.	26	4	10	598	Nov.	357	4	66	3,986
Dec.	1460	5.5	163	10,084	Dec.	1780	32	444	27,544
Total	..	..	..	48,966	Total	..	..	..	83,301

Year 1962

Year 1963

Jan.	3930	84	551	34,176	Jan.	1210	30	123	7,636
Feb.	450	22	178	9,964	Feb.	450	43	158	8,860
Mar.	1020	46	127	7,858	Mar.	14000	34	1123	69,638
Apr.	6820	43	611	36,678	Apr.	2810	64	480	28,808
May	5755	30	339	21,044	May	4615	46	533	33,040
June	60	14	30	1,774	June	2030	18	222	13,304
July	113	11	41	2,534	July	276	27	80	4,936
Aug.	No Records			1,800*	Aug.	3010	143	168	10,438
Sept.	845	18	107	6,456	Sept.	3655	27	292	17,538
Oct.	113	8.4	34	2,096	Oct.	950	39	116	7,204
Nov.	146	11	54	3,236	Nov.	830	39	95	5,692
Dec.	7000	4	270	16,772	Dec.	3320	33	210	13,004
Total	..	..	..	144,388*	Total	..	..	..	220,098

* Estimated.

ALLYN RIVER AT HALTON

Year 1964

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	129	22	35	2,164	Jan.	14.5	0	2.1	128
Feb.	129	14.3	25	1,430	Feb.	760	0.7	11.6	650
Mar.	2110	14.3	131	8,136	Mar.	5.5	0	0.9	56
Apr.	2495	11	99	5,932	Apr.	14.5	0	2.8	170
May	1370	20	72	4,442	May	9	0	3.1	194
June	2540	16	193	11,566	June	76	0.3	6.5	392
July	50	14	25	1,528	July	1920	1	76	4,732
Aug.	94	8.4	15	953	Aug.	18	9	12	744
Sept.	14	8.4	12.1	726	Sept.	18	2.5	11	658
Oct.	37	6	11.6	722	Oct.	870	1	22	1,350
Nov.	32	1	7.4	446	Nov.	6.5	0	2.2	138
Dec.	1	0	0.2	14	Dec.	143	1	32	1,968
Total	..	..	..	38,059	Total	..	..	..	11,180

HUNTER RIVER AT BELMORE BRIDGE (MAITLAND)

LOCATION: Latitude 32°44' Longitude 151°33'

PERIOD OF ESTABLISHMENT: January 1958 to date.

COMPLETE YEARS OF COMPUTED RECORDS: 8

ZERO OF GAUGE: R.L. 2.86 L.W.S.T. Newcastle.

CATCHMENT AREA: 6,750 square miles.

CONTROL: Gravel. Subject to continuous alteration.

EQUIPMENT: Staff gauge, range 0 to 45 feet.

CURRENT METER OBSERVATIONS:

(a) Number obtained	:	287
(b) Maximum observation in cusecs	:	197,120
(c) Minimum observation in cusecs	:	0.6

MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS: 100,000 cusecs.

MEAN DAILY DISCHARGE FOR 3 YEARS: 1,160 cusecs.

MEAN ANNUAL DISCHARGE FOR 3 YEARS: 850,000 acre feet.

REMARKS: Gauge heights available for periods March 1893 to December 1897 and from January 1906 to January 1958.

HUNTER RIVER AT BELMORE BRIDGE (MAITLAND)

Year 1958

Year 1959

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	598	20	28	1,736	Jan.	712	60	283	17,564
Feb.	13900	305	1646	98,750	Feb.	4380	135	991	55,480
Mar.	1060	91	307	19,078	Mar.	2190	356	864	53,576
Apr.	150	65	96	5,976	Apr.	1155	284	576	34,588
May	248	3	9	7,380	May	286	184	207	12,830
June	199	77	140	8,694	June	325	171	193	11,568
July	662	120	268	16,600	July	1325	267	660	40,922
Aug.	232	91	137	8,482	Aug.	2735	252	679	42,094
Sept.	3040	120	355	21,276	Sept.	440	237	308	18,494
Oct.	3430	199	850	52,692	Oct.	4520	222	985	61,040
Nov.	199	0.6	55	3,280	Nov.	12200	1020	2802	168,118
Dec.	680	80	226	14,006	Dec.	2050	374	905	56,094
Total	..	..	..	257,950	Total	..	..	..	572,368

Year 1960

Year 1961

Jan.	834	232	379	23,476	Jan.	1190	232	618	38,316
Feb.	400	135	224	13,000	Feb.	507	166	310	17,340
Mar.	400	105	200	12,420	Mar.	1142	200	325	20,180
Apr.	135	65	100	6,024	Apr.	831	130	206	12,386
May	232	65	113	7,008	May	232	182	198	12,260
June	248	120	179	10,762	June	900	199	417	25,014
July	1940	232	765	47,432	July	285	166	208	12,908
Aug.	792	305	525	32,534	Aug.	3520	199	835	51,752
Sept.	598	182	267	16,036	Sept.	1925	266	609	36,554
Oct.	507	91	253	15,716	Oct.	348	182	236	14,618
Nov.	507	77	208	12,458	Nov.	5530	77	1088	65,276
Dec.	4620	150	1161	71,992	Dec.	7560	509	2773	171,938
Total	..	..	..	268,858	Total	..	..	..	478,542

HUNTER RIVER AT BELMORE BRIDGE (MAITLAND)

Year 1964

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	14800	712	4046	250,868	Jan.	28000	587	4175	258,848
Feb.	22260	1180	5705	319,480	Feb.	5410	449	1579	88,418
Mar.	1700	405	716	44,400	Mar.	25800	335	4104	254,448
Apr.	12333	330	2405	149,112	Apr.	35440	335	3151	189,068
May	100000	425	7873	488,110	May	37916	2120	11253	697,670
June	1400	500	921	55,250	June	11450	1080	3693	221,556
July	4750	530	1602	99,300	July	2500	1120	1531	94,900
Aug.	3485	582	1285	79,696	Aug.	13000	1480	2572	159,442
Sept.	1445	413	730	43,808	Sept.	15775	880	4030	241,786
Oct.	1690	293	469	29,108	Oct.	4520	712	1643	101,886
Nov.	1750	233	510	30,602	Nov.	1245	478	710	42,570
Dec.	12734	253	1092	67,690	Dec.	3915	422	1089	67,538
Total	..	..	..	1,657,424	Total	..	..	..	2,418,130

Year 1964

Year 1965

Jan.	478	216	310	19,218	Jan.	185	52	102	6,352
Feb.	261	163	197	11,440	Feb.	168	60	110	6,146
Mar.	390	150	223	13,802	Mar.	68	35	50	3,126
Apr.	14800	202	1945	116,724	Apr.	137	31	60	3,598
May	4250	662	1181	73,222	May	68	27	42	2,574
June	94750	695	10532	631,936	June	46	14	25	1,492
July	1835	700	1179	73,082	July	2550	14	270	16,710
Aug.	848	418	592	36,732	Aug.	357	22	112	6,968
Sept.	696	440	513	30,774	Sept.	118	6	39	2,344
Oct.	1155	293	561	34,780	Oct.	1190	3	170	10,514
Nov.	310	80	204	12,264	Nov.	380	0	65	3,896
Dec.	185	70	95	5,890	Dec.	1550	68	383	23,756
Total	..	..	..	1,059,864	Total	..	..	..	87,476

KARUAH RIVER AT MONKERAI

LOCATION: Latitude 32°14' Longitude 151°51'

PERIOD OF ESTABLISHMENT: June 1945 to date.

COMPLETE YEARS OF COMPUTED RECORDS: 20 years.

ZERO OF GAUGE: R.L. 92.00 Assumed Datum.

CATCHMENT AREA: 78 Square Miles.

CONTROL: Rock and gravel. Subject to alteration.

EQUIPMENT: Staff gauge. Range 0 to 15 feet.

CURRENT METER OBSERVATIONS:

- (a) Number obtained : 104
- (b) Maximum observation in cusecs : 986
- (c) Minimum observation in cusecs : 0.75

MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS: 38,250 cusecs.

MEAN DAILY DISCHARGE FOR 20 YEARS: 175 cusecs.

MEAN ANNUAL DISCHARGE FOR 20 YEARS: 128,000 acre feet.

KARUAH RIVER AT MONKERAI

Year 1945

Year 1946

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.					Jan.	12	1	3.3	208
Feb.					Feb.	173	0	14	786
Mar.					Mar.	5625	2	124	7,690
Apr.					Apr.	11650	31	753	45,168
May					May	96	21	42	2,582
June					June	965	17	130	7,806
July	965	13	83	5,138	July	50	14	23	1,412
Aug.	32	10	15	908	Aug.	14	7	10	602
Sept.	10	3	6	338	Sept.	57	5	12	690
Oct.	32	2	7.4	460	Oct.	9	2	5	298
Nov.	148	1	9.3	556	Nov.	875	2	21	1,232
Dec.	199	1.5	14	898	Dec.	9	1.5	3.3	202
Total	..	..	..	8,298	Total	..	..	..	68,676

Year 1947

Year 1948

Jan.	42	2	5	308	Jan.	1110	25	108	6,670
Feb.	2580	2	177	9,886	Feb.	28	18	22	1,292
Mar.	965	32	148	9,184	Mar.	1380	25	167	10,382
Apr.	2375	12	155	9,292	Apr.	53	18	27	1,660
May	660	25	81	5,014	May	2110	18	131	8,112
June	745	25	123	7,350	June	920	18	175	10,488
July	25	12	19	1,182	July	42	15	25	1,542
Aug.	15	7	11	652	Aug.	3500	12	72	4,490
Sept.	18	6	8	492	Sept.	965	12	153	9,152
Oct.	18	4	9	572	Oct.	47	12	22	1,382
Nov.	25	2	9	532	Nov.	12	7	10	608
Dec.	6850	7	353	21,886	Dec.	25	3	8	488
Total	..	..	..	66,350	Total	..	..	..	56,266

KARUAH RIVER AT MONKERAI

Year 1949

Year 1950

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	440	12	60	3,750	Jan.	2720	12	193	11,954
Feb.	2375	12	198	11,110	Feb.	5265	18	496	27,760
Mar.	3070	122	571	35,430	Mar.	173	18	59	3,656
Apr.	4010	25	324	19,456	Apr.	1160	18	157	9,390
May	53	15	28	1,730	May	540	21	99	6,120
June	4340	15	314	18,818	June	10500	12	2166	129,908
July	8680	18	529	32,772	July	4580	66	718	44,492
Aug.	1160	25	186	11,554	Aug.	505	73	220	13,644
Sept.	920	53	286	17,164	Sept.	505	44	143	8,558
Oct.	620	25	70	4,316	Oct.	505	39	139	8,642
Nov.	28	12	18	1,106	Nov.	2860	24	395	23,684
Dec.	37	12	20	1,218	Dec.	234	24	51	3,186
Total	..	..	..	158,424	Total	..	..	..	290,994

Year 1951

Year 1952

Jan.	8925	49	1159	71,830	Jan.	24	2	4	256
Feb.	1210	29	199	11,168	Feb.	440	0	56	3,274
Mar.	790	39	183	11,358	Mar.	412	6	56	3,472
Apr.	73	24	40	2,422	Apr.	875	8	84	5,054
May	24	12	19	1,134	May	540	8	57	3,550
June	6700	8	1010	60,580	June	2375	8	78	4,650
July	412	31	95	5,874	July	258	6	27	1,692
Aug.	55	18	25	1,558	Aug.	10900	60	1427	88,478
Sept.	24	10	14	860	Sept.	55	21	31	1,836
Oct.	49	8	13	794	Oct.	87	15	29	1,808
Nov.	8	3	4	274	Nov.	24	10	14	848
Dec.	4	2	3	170	Dec.	104	4	19	1,202
Total	..	..	..	168,022	Total	..	..	..	116,120

KARUAH RIVER AT MONKERAI

Year 1953

Year 1954

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	505	12	94	5,800	Jan.	600	2	81	5,038
Feb.	2620	24	330	18,468	Feb.	27066	2	921	51,584
Mar.	2175	24	210	13,044	Mar.	300	31	62	3,842
Apr.	358	21	54	3,254	Apr.	16	8	13	774
May	1380	21	157	9,746	May	22	10	12	764
June	24	12	17	1,038	June	790	5	32	1,938
July	123	8	21	1,318	July	188	5	29	1,788
Aug.	31	8	10	602	Aug.	173	9	34	2,078
Sept.	12	4	7	448	Sept.	3140	9	201	12,048
Oct.	8	3	5	306	Oct.	3817	25	341	21,166
Nov.	8	1	4	214	Nov.	3817	31	254	15,234
Dec.	4	0.5	1.5	92	Dec.	750	20	78	4,866
Total	..	..	..	54,330	Total	..	..	..	121,120

Year 1955

Year 1956

Jan.	5052	17	238	14,784	Jan.	1910	3	109	6,790
Feb.	22933	34	1501	84,050	Feb.	16000	46	1459	84,634
Mar.	15000	66	972	60,286	Mar.	34800	165	1075	66,622
Apr.	6150	55	619	37,128	Apr.	930	44	167	10,042
May	1850	46	177	11,002	May	10260	44	312	19,346
June	94	31	48	2,878	June	3817	35	222	13,322
July	34	14	22	1,384	July	66	30	40	2,470
Aug.	15	12	12	764	Aug.	590	18	52	3,250
Sept.	23	8	12	750	Sept.	44	18	20	1,190
Oct.	66	3	10	590	Oct.	35	14	21	1,276
Nov.	79	3	16	952	Nov.	14	3	7	426
Dec.	79	3	23	1,410	Dec.	44	3	8	470
Total	..	..	..	215,978	Total	..	..	..	209,838

KARUAH RIVER AT MONKERAI

Year 1957

Year 1958

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	476	3	37	2,272	Jan.	930	4	53	3,272
Feb.	31800	5	995	55,708	Feb.	121	8	31	1,740
Mar.	10046	8	397	24,638	Mar.	202	8	21	1,300
Apr.	38	20	28	1,702	Apr.	96	8	23	1,388
May	20	8	12	760	May	38	8	13	794
June	28	4	8	462	June	407	8	91	5,460
July	62	4	15	938	July	980	8	95	5,900
Aug.	836	8	92	5,674	Aug.	8	4	6	368
Sept.	77	8	25	1,494	Sept.	77	4	16	954
Oct.	8	4	7	428	Oct.	8	2	4	258
Nov.	1280	1	18	1,064	Nov.	3	1.5	2	122
Dec.	14	1	2.8	177	Dec.	630	2	48	3,000
Total	..	..	..	95,317	Total	..	..	..	24,556

Year 1959

Year 1960

Jan.	2550	20	504	31,226	Jan.	161	26	43	2,688
Feb.	9620	20	407	22,800	Feb.	465	26	74	4,298
Mar.	3997	59	406	25,168	Mar.	430	34	115	7,112
Apr.	465	24	204	12,268	Apr.	138	26	48	2,910
May	105	35	47	2,888	May	66	23	28	1,720
June	500	24	51	3,064	June	760	26	98	5,860
July	395	39	97	6,008	July	335	26	80	4,974
Aug.	4818	24	222	13,784	Aug.	48	17	29	1,782
Sept.	129	31	52	3,112	Sept.	23	10	16	956
Oct.	2550	31	443	7,482	Oct.	34	10	13.4	828
Nov.	4935	80	548	32,870	Nov.	26	10	11	664
Dec.	275	30	73	4,520	Dec.	3600	10	290	17,986
Total	..	..	..	165,190	Total	..	..	..	51,778

KARUAH RIVER AT MONKERAI

Year 1961

Year 1962

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	1610	32	169	10,472	Jan.	5523	84	669	40,976
Feb.	822	32	123	6,912	Feb.	2692	43	262	14,718
Mar.	2912	32	63	3,890	Mar.	1202	43	253	15,688
Apr.	110	11	34	2,034	Apr.	4702	43	568	34,092
May	53	14	28	1,743	May	6286	54	368	22,808
June	3463	14	304	18,270	June	54	26	32	1,948
July	42	14	24	1,522	July	34	17	25	1,538
Aug.	238	14	30	1,848	Aug.	32	13	18	1,094
Sept.	32	14	22	1,324	Sept.	258	10	33	2,002
Oct.	93	14	24	1,468	Oct.	95	10	18	1,132
Nov.	405	14	55	3,272	Nov.	25	10	12	714
Dec.	5896	53	506	31,380	Dec.	15000	10	678	42,022
Total	..	..	..	84,135	Total	..	..	..	178,732

Year 1963

Year 1964

Jan.	980	53	185	11,472	Jan.	148	29	44	2,708
Feb.	405	59	120	6,736	Feb.	60	16	29	1,664
Mar.	38250	59	2943	182,438	Mar.	432	16	57	3,518
Apr.	6286	35	719	43,138	Apr.	2156	19	212	12,696
May	11400	120	1152	71,416	May	160	21	39	2,422
June	787	53	134	8,014	June	4372	16	201	12,044
July	283	5	81	5,042	July	33	16	21	1,280
Aug.	2692	20	155	9,640	Aug.	40	10	15	944
Sept.	3637	26	338	20,284	Sept.	12	9	10.6	638
Oct.	265	37	82	5,108	Oct.	16	6.4	9	556
Nov.	120	31	45	2,726	Nov.	23	5.1	11.7	700
Dec.	6980	27	341	21,126	Dec.	6.4	2.5	4	246
Total	..	..	..	387,140	Total	..	..	..	39,416

KARUAH RIVER AT MONKERAI

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	18	2.5	6	372
Feb.	16	4.5	6.3	354
Mar.	5.1	2.3	3.6	221
Apr.	12	1.8	4.4	267
May	8	1	3.5	219
June	12	2.5	4.3	258
July	640	2.5	31	1,899
Aug.	7	4.5	6.1	381
Sept.	23	3.5	9.2	555
Oct.	154	4.5	14.2	882
Nov.	10	2.2	4.3	260
Dec.	1910	1	147	9,138
Total	..	..	..	14,806

PATERSON RIVER AT MOUNT RIVERS.

LOCATION: Latitude 32°22' Longitude 151°29'

PERIOD OF ESTABLISHMENT: December, 1955 to date.

COMPLETE YEARS OF COMPUTED RECORDS: 10 years.

ZERO OF GAUGE: R.L. 92.16 Assumed Datum.

CATCHMENT AREA: 132 square miles.

CONTROL: Concrete causeway.

EQUIPMENT: Staff gauge, 0 to 25 feet.

CURRENT METER OBSERVATIONS:

(a) Number obtained	:	82
(b) Maximum observation in cusecs	:	18,300
(c) Minimum observation in cusecs	:	0.44

MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS: 35,700 cusecs.

MEAN DAILY DISCHARGE FOR 10 YEARS: 171 cusecs.

MEAN ANNUAL DISCHARGE FOR 10 YEARS: 125,000 acre feet.

PATERSON RIVER AT MOUNT RIVERS

Year 1956					Year 1957				
Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	2940	12	182	11,282	Jan.	34	1	8	496
Feb.	No Records			92,800*	Feb.	16967	7.5	738	41,320
Mar.	No Records			63,400*	Mar.	955	34	143	8,840
Apr.	No Records			18,500*	Apr.	46	12	22	1,328
May	1780	59	147	9,098	May	17	7.5	10	638
June	270	46	103	6,184	June	24	7.5	9	558
July	137	34	60	3,712	July	34	12	18	1,102
Aug.	765	34	158	9,806	Aug.	1280	12	141	8,748
Sept.	34	20	28	1,682	Sept.	160	12	37	2,218
Oct.	94	17	31	1,950	Oct.	7.5	1.0	5	324
Nov.	46	3	14	810	Nov.	12	0	2.4	142
Dec.	46	1	15	922	Dec.	0	0	0	0
Total	..	..	..	220,146*	Total	..	..	..	65,714

Year 1958					Year 1959				
Jan.	720	0	28	1,744	Jan.	1780	21	228	14,106
Feb.	510	6	61	3,406	Feb.	6600	14	347	19,452
Mar.	25	1	8.3	514	Mar.	No Records			10,600*
Apr.	169	1	39	2,320	Apr.	195	40	117	7,002
May	98	11	27	1,702	May	112	30	56	3,480
June	285	8	62	3,708	June	1180	21	79	4,714
July	390	14	59	3,652	July	3700	54	301	18,680
Aug.	68	14	24	1,490	Aug.	2660	40	273	16,904
Sept.	144	14	31	1,842	Sept.	124	40	75	4,490
Oct.	169	21	56	3,498	Oct.	2800	40	338	20,968
Nov.	14	1	5.8	350	Nov.	4380	68	457	27,410
Dec.	83	3	26	1,608	Dec.	83	21	41	2,520
Total	..	..	..	25,834	Total	..	..	..	150,326*

PATERSON RIVER AT MOUNT RIVERS

Year 1960					Year 1961				
Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	102	11	32	1,986	Jan.	2340	36	221	13,804
Feb.	710	16	101	5,838	Feb.	3155	36	157	8,828
Mar.	570	51	149	9,250	Mar.	99	15	34	2,140
Apr.	117	11.8	39	2,334	Apr.	99	3.8	16.8	1,010
May	67	8.5	18.3	1,133	May	36	8.5	15	930
June	430	22	118	7,092	June	3010	22	254	15,242
July	354	36	117	7,284	July	36	15	19	1,188
Aug.	231	15	58	3,626	Aug.	720	8.5	103	6,393
Sept.	117	15	43	2,592	Sept.	430	36	114	6,840
Oct.	136	8.5	28	1,734	Oct.	136	15	41	2,520
Nov.	51	1	8.8	530	Nov.	430	8.5	53	3,196
Dec.	2940	1	242	14,990	Dec.	3780	59	502	31,096
Total	..	..	..	58,389	Total	..	..	..	93,195

Year 1962					Year 1963				
Jan.	4115	74	601	37,282	Jan.	1330	22	191	11,872
Feb.	350	59	115	6,466	Feb.	720	45	205	11,466
Mar.	1045	45	130	8,042	Mar.	35700	45	2191	135,820
Apr.	18250	45	123	72,966	Apr.	5190	98	363	21,778
May	12350	74	734	45,480	May	8770	132	976	60,528
June	87	33	50	3,026	June	2730	109	316	18,950
July	505	22	81	5,034	July	435	91	162	10,062
Aug.	99	33	48	2,968	Aug.	3540	71	225	13,934
Sept.	435	15	73	4,406	Sept.	8050	55	495	29,714
Oct.	435	15	54	3,328	Oct.	333	82	172	10,702
Nov.	99	8.5	35	2,114	Nov.	333	72	104	6,270
Dec.	9770	8.5	403	25,006	Dec.	1580	82	253	15,712
Total	..	..	..	216,118	Total	..	..	..	346,808

PATERSON RIVER AT MOUNT RIVERS

Year 1964

Year 1965

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	121	40	58	3,606	Jan.	14	0	0.5	28
Feb.	157	25	48	2,964	Feb.	32	0.4	5.8	325
Mar.	1970	30	209	12,954	Mar.	1.8	0	0.4	23
Apr.	828	24	117	7,000	Apr.	8	0	1.8	109
May	1180	37	116	7,172	May	5.4	0.4	2.8	174
June	2470	37	296	17,748	June	100	0.4	8.0	479
July	165	37	58	3,604	July	2090	8	127	7,870
Aug.	230	240	38	2,336	Aug.	28	8	14.3	886
Sept.	24	14	18	1,080	Sept.	18	0	13.4	804
Oct.	24	6.5	18	1,092	Oct.	1005	1	38	2,382
Nov.	53	0	14	824	Nov.	23	0	8.6	516
Dec.	0	0	0	0	Dec.	130	0	34	2,100
Total	..	..	..	60,380	Total	..	..	..	15,696

WILLIAMS RIVER AT GLEN MARTIN

LOCATION: Latitude 32°33' Longitude 151°48'

PERIOD OF ESTABLISHMENT: December 1927 to date.

COMPLETE YEARS OF COMPUTED RECORDS: 38 years.

ZERO OF GAUGE: R.L. 0.38 Assumed Datum.

CATCHMENT AREA: 374 square miles.

CONTROL: Rock.

EQUIPMENT: Automatic Recorder (pressure type)
installed September, 1964.
Staff gauge, range 0 to 35 feet.

CURRENT METER OBSERVATIONS:

(a) Number obtained	:	146
(b) Maximum observation in cusecs	:	77,662
(c) Minimum observation in cusecs	:	0

MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS: 81,000 cusecs.

MEAN DAILY DISCHARGE FOR 38 YEARS: 412 cusecs.

MEAN ANNUAL DISCHARGE FOR 38 YEARS: 301,000 acre feet.

WILLIAMS RIVER AT GLEN MARTIN

Year 1927

Year 1928

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	Jan.	4400	125	626	38,780
Feb.	Feb.	3110	125	879	49,228
Mar.	Mar.	770	132	336	20,868
Apr.	Apr.	5450	138	705	42,328
May	May	132	103	111	7,152
June	June	31300	99	4100	246,012
July	July	35400	150	2912	180,526
Aug.	Aug.	1550	78	351	21,772
Sept.	Sept.	78	55	71	4,284
Oct.	Oct.	46	42	44	2,758
Nov.	Nov.	42	30	34	2,056
Dec.	11700	125	1686	104,514	Dec.	30	27	28	1,762
Total	104,514	Total	..	..	..	617,526

Year 1929

Year 1930

Jan.	27	23	25	1,556	Jan.	14	3	6	392
Feb.	61750	23	4838	270,912	Feb.	6350	4	224	12,552
Mar.	1550	55	237	14,690	Mar.	7700	6	915	56,724
Apr.	770	55	191	11,482	Apr.	1340	26	265	15,924
May	82	41	51	3,182	May	2120	6	315	19,552
June	195	41	65	3,928	June	29950	34	3123	187,382
July	1520	37	177	10,972	July	1120	106	333	20,646
Aug.	1780	57	320	19,800	Aug.	753	34	83	5,176
Sept.	25300	61	1488	89,292	Sept.	43	19	30	1,798
Oct.	11300	56	1342	83,212	Oct.	324	19	41	2,530
Nov.	1750	11	126	7,588	Nov.	96	19	25	1,456
Dec.	753	3	32	1,988	Dec.	709	14	61	3,774
Total	..	..	..	518,602	Total	..	..	..	327,906

WILLIAMS RIVER AT GLEN MARTIN

Year 1931

Year 1932

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	265	19	49	3,042	Jan.	26	8	16	1,010
Feb.	49	19	31	1,734	Feb.	56	6	16	902
Mar.	4250	34	335	20,786	Mar.	1370	6	94	5,804
Apr.	29400	63	3026	181,536	Apr.	687	14	48	2,914
May	7860	34	466	28,908	May	346	22	118	7,326
June	643	43	114	6,852	June	643	20	74	4,460
July	11100	26	529	32,774	July	6800	39	635	39,394
Aug.	70	19	30	1,866	Aug.	555	19	78	4,866
Sept.	63	19	28	1,668	Sept.	8700	26	1506	90,374
Oct.	26	11	16	998	Oct.	578	36	179	11,078
Nov.	43	14	16	944	Nov.	1100	30	155	9,300
Dec.	863	11	114	7,068	Dec.	34	11	21	1,288
Total	..	..	..	288,176	Total	..	..	..	178,716

Year 1933

Year 1934

Jan.	63	11	22	1,348	Jan.	1190	34	201	12,496
Feb.	28	6	12	652	Feb.	3460	86	1011	56,600
Mar.	34	5	10	604	Mar.	819	43	232	14,354
Apr.	1390	19	259	15,544	Apr.	1260	49	349	20,940
May	731	16	115	7,116	May	1090	43	253	15,658
June	1080	26	253	15,188	June	731	56	245	14,728
July	8450	34	859	53,256	July	7250	43	603	37,366
Aug.	467	34	111	6,858	Aug.	10500	70	934	57,926
Sept.	13600	28	485	29,114	Sept.	11600	78	1645	98,708
Oct.	7660	39	1106	68,556	Oct.	335	43	96	5,962
Nov.	3070	128	901	54,040	Nov.	117	34	50	3,002
Dec.	2380	106	587	36,398	Dec.	13400	30	1203	74,614
Total	..	..	..	288,674	Total	..	..	..	412,354

WILLIAMS RIVER AT GLEN MARTIN

Year 1935

Year 1936

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	6870	86	784	48,638	Jan.	5900	8	391	24,238
Feb.	1260	43	282	15,786	Feb.	775	26	139	8,052
Mar.	1150	34	222	13,790	Mar.	11300	106	1072	66,458
Apr.	214	26	37	2,224	Apr.	5970	63	625	37,482
May	26	20	24	1,462	May	500	63	134	8,286
June	30	19	24	1,438	June	775	34	96	5,780
July	43	20	29	1,774	July	56	34	40	2,478
Aug.	21	11	16	978	Aug.	43	19	29	1,788
Sept.	214	12	33	1,998	Sept.	30	14	21	1,246
Oct.	86	14	27	1,704	Oct.	14	5	10	608
Nov.	34	5	13	768	Nov.	5	2	4	216
Dec.	198	5	38	2,360	Dec.	643	0	40	2,468
Total	..	..	..	92,920	Total	..	..	..	159,100

Year 1937

Year 1938

Jan.	881	19	171	10,576	Jan.	1600	8	241	14,936
Feb.	335	8	81	4,538	Feb.	2070	34	392	21,924
Mar.	6570	43	675	41,838	Mar.	210	17	71	4,432
Apr.	863	43	110	6,638	Apr.	14100	15	805	48,294
May	86	34	46	2,832	May	1840	34	225	13,958
June	6420	26	667	40,040	June	775	34	189	11,320
July	3520	80	600	37,212	July	53	19	27	1,670
Aug.	1260	28	126	7,810	Aug.	1580	15	188	11,658
Sept.	158	9	40	2,410	Sept.	600	15	99	5,920
Oct.	775	9	124	7,706	Oct.	99	13	27	1,672
Nov.	6800	23	863	51,800	Nov.	250	10	47	2,806
Dec.	5390	11	339	20,998	Dec.	46	4	8	496
Total	..	..	..	234,398	Total	..	..	..	139,086

WILLIAMS RIVER AT GLEN MARTIN

Year 1939

Year 1940

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	1010	2	106	6,594	Jan.	105	5	16	1,018
Feb.	240	6	32	1,794	Feb.	6	2	4	236
Mar.	14900	5	3070	190,384	Mar.	3	0	1	44
Apr.	2300	335	857	51,442	Apr.	37	1	5	320
May	935	93	269	16,708	May	46	8	15	928
June	80	23	46	2,738	June	8	5	6	346
July	53	19	31	1,884	July	6	4	5	326
Aug.	175	15	35	2,158	Aug.	555	5	70	4,336
Sept.	6800	8	199	11,968	Sept.	290	5	28	1,704
Oct.	3175	37	438	27,172	Oct.	1370	4	124	7,660
Nov.	335	15	65	3,880	Nov.	5.5	0.25	2.6	158
Dec.	34	5	10	626	Dec.	4630	6	328	20,340
Total	..	..	..	317,348	Total	..	..	..	37,416

Year 1941

Year 1942

Jan.	1670	11	437	27,074	Jan.	0	0	0	0
Feb.	10100	34	793	44,420	Feb.	No Records			1,200*
Mar.	270	8	37	2,296	Mar.	12400	0	1204	74,618
Apr.	157	6	18	1,110	Apr.	1150	34	183	10,984
May	23	6	10	608	May	31	10	13	836
June	23	10	14	832	June	46	9	19	1,174
July	250	9	45	2,814	July	2940	15	306	18,954
Aug.	11	6	8	494	Aug.	731	15	175	10,874
Sept.	8	22	5	300	Sept.	23	5	9	568
Oct.	15	2	7	452	Oct.	28400	4	2327	144,300
Nov.	6	1.8	4	252	Nov.	9510	7	1201	72,034
Dec.	3.2	0	0.7	43	Dec.	600	34	138	8,532
Total	..	..	..	80,695	Total	..	..	..	344,074*

* Estimated.

WILLIAMS RIVER AT GLEN MARTIN

Year 1943

Year 1944

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	1600	34	341	21,122	Jan.	1300	37	247	15,318
Feb.	32	9	17	926	Feb.	378	27	107	6,186
Mar.	8	5	6	367	Mar.	159	20	39	2,426
Apr.	335	8	46	2,740	Apr.	37	15	27	1,600
May	7100	8	1049	65,040	May	88	10	19	1,196
June	403	39	114	6,824	June	32	15	18	1,106
July	37	15	26	1,634	July	556	27	137	8,518
Aug.	3120	15	511	31,708	Aug.	5530	32	525	32,520
Sept.	640	15	215	12,904	Sept.	378	48	135	8,138
Oct.	504	48	132	8,186	Oct.	63	11	28	1,732
Nov.	2810	27	473	28,394	Nov.	11	5	8	484
Dec.	2097	178	532	33,008	Dec.	6	0	1.3	82
Total	..	..	..	212,853	Total	..	..	..	79,306

Year 1945

Year 1946

Jan.	37	0	3	171	Jan.	48	3	11	688
Feb.	1550	0	105	5,888	Feb.	479	0.8	57	3,184
Mar.	73	0.5	9	550	Mar.	11400	9	399	24,712
Apr.	88	0.5	25	1,488	Apr.	45600	73	4181	250,860
May	198	5	33	2,028	May	241	54	106	6,544
June	23300	20	2242	134,524	June	9420	43	545	32,670
July	8970	88	649	40,254	July	159	37	65	4,048
Aug.	198	37	70	4,364	Aug.	32	15	21	1,292
Sept.	37	20	24	1,464	Sept.	32	15	19	1,158
Oct.	48	4	17	1,050	Oct.	15	4	7.5	462
Nov.	73	3	17	1,002	Nov.	379	3	56	3,458
Dec.	263	4	43	2,692	Dec.	60	5	15	910
Total	..	..	..	195,475	Total	..	..	..	329,986

WILLIAMS RIVER AT GLEN MARTIN

Year 1947

Year 1948

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	353	3.5	20	1,246	Jan.	767	27	157	9,746
Feb.	900	9	78	4,348	Feb.	208	43	75	4,378
Mar.	7950	178	508	31,484	Mar.	1150	48	410	25,430
Apr.	3150	159	420	25,192	Apr.	122	54	77	4,626
May	3150	105	431	26,708	May	4250	48	276	17,082
June	2890	80	577	34,602	June	3150	27	558	33,486
July	73	27	43	2,640	July	252	54	120	7,466
Aug.	27	15	20	1,262	Aug.	88	18	32	1,994
Sept.	37	9	21	1,250	Sept.	3630	27	455	27,272
Oct.	88	15	19	1,154	Oct.	329	20	73	4,548
Nov.	140	5	24	1,434	Nov.	23	12	18	1,060
Dec.	11200	32	903	56,004	Dec.	43	2	16	1,208
Total	..	..	..	187,324	Total	..	..	..	138,096

Year 1949

Year 1950

Jan.	379	2	76	4,742	Jan.	70	16	27	1,658
Feb.	4935	23	563	31,512	Feb.	7250	22	802	44,892
Mar.	11100	274	2062	127,846	Mar.	195	51	80	4,946
Apr.	10950	241	887	53,228	Apr.	4250	51	570	34,200
May	543	88	197	12,202	May	3200	172	458	28,388
June	34600	96	2341	140,442	June	23900	161	6907	416,786
July	25000	46	1314	81,474	July	9800	208	1779	106,790
Aug.	2570	77	457	28,232	Aug.	6570	161	1326	82,214
Sept.	3520	150	579	34,716	Sept.	812	85	242	14,520
Oct.	1280	70	255	15,818	Oct.	695	70	346	21,454
Nov.	85	18	37	2,214	Nov.	7700	101	898	53,870
Dec.	63	16	31	1,896	Dec.	812	93	283	17,538
Total	..	..	..	534,322	Total	..	..	..	827,256

WILLIAMS RIVER AT GLEN MARTIN

Year 1951

Year 1952

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	38400	110	4383	271,758	Jan.	7	2	5	294
Feb.	4430	77	651	36,444	Feb.	640	0	87	5,068
Mar.	8700	119	1389	86,110	Mar.	430	35	161	9,992
Apr.	250	101	147	8,834	Apr.	850	20	198	11,898
May	150	42	80	4,966	May	850	35	204	12,652
June	18400	35	2931	175,886	June	5390	33	360	21,584
July	1690	208	469	29,072	July	2890	22	263	16,286
Aug.	172	57	79	4,896	Aug.	26700	172	4088	253,484
Sept.	57	32	40	2,420	Sept.	161	35	71	4,236
Oct.	33	20	26	1,608	Oct.	370	25	76	4,698
Nov.	27	12	19	1,156	Nov.	110	15	48	2,896
Dec.	25	7	11	692	Dec.	63	6	12	790
Total	..	..	..	623,842	Total	..	..	..	343,878

Year 1953

Year 1954

Jan.	1690	77	349	21,654	Jan.	1320	6	111	6,842
Feb.	4630	35	762	42,680	Feb.	42200	4	2456	137,562
Mar.	5460	85	533	33,058	Mar.	370	25	122	7,586
Apr.	850	57	181	10,870	Apr.	29	7	17	1,012
May	12400	85	1152	71,410	May	119	18	27	1,702
June	85	35	57	3,432	June	1410	18	162	9,718
July	465	33	87	5,400	July	430	15	130	8,086
Aug.	250	20	36	2,250	Aug.	430	33	116	7,168
Sept.	208	25	45	2,696	Sept.	3200	29	468	28,070
Oct.	18	8	12	732	Oct.	3200	33	356	22,062
Nov.	11	2.5	6.8	406	Nov.	1320	93	410	24,610
Dec.	2.5	0	0.6	34	Dec.	640	93	189	11,734
Total	..	..	..	194,622	Total	..	..	..	266,152

WILLIAMS RIVER AT GLEN MARTIN

Year 1955

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	2270	77	372	23,064	Jan.	9240	11	607	37,612
Feb.	63600	172	4701	263,260	Feb.	21500	208	2147	124,522
Mar.	12700	172	1475	91,436	Mar.	45600	250	2153	133,484
Apr.	430	150	232	13,918	Apr.	850	85	204	12,282
May	2270	110	402	24,902	May	5900	128	898	55,648
June	714	150	347	20,820	June	5900	51	466	27,930
July	139	57	89	5,536	July	250	42	109	6,738
Aug.	51	25	37	2,276	Aug.	3870	46	308	19,120
Sept.	110	18	36	2,148	Sept.	57	22	31	1,874
Oct.	63	11	22	1,362	Oct.	63	16	24	1,474
Nov.	208	10	46	2,766	Nov.	18	5	11	674
Dec.	250	21	136	8,436	Dec.	51	5	13	794
Total	..	..	..	459,924	Total	..	..	..	422,152

Year 1957

Year 1958

Jan.	63	4	19	1,216	Jan.	63	0	7.5	462
Feb.	41100	7	2279	127,638	Feb.	1457	38	298	16,678
Mar.	535	77	253	15,702	Mar.	250	27	91	5,628
Apr.	70	29	45	2,696	Apr.	340	29	72	4,334
May	29	11	19	1,156	May	150	27	58	3,594
June	16	11	13	778	June	1025	24	168	10,088
July	430	8	94	5,856	July	850	18	141	8,740
Aug.	4250	7	499	30,962	Aug.	77	12	22	1,364
Sept.	1000	25	190	11,376	Sept.	250	10	36	2,136
Oct.	25	7	13.7	848	Oct.	51	11	27	1,676
Nov.	6	0.7	3.2	194	Nov.	18	2	7	424
Dec.	0.4	0	0.03	2	Dec.	1410	3	223	13,802
Total	..	..	..	198,424	Total	..	..	..	68,926

WILLIAMS RIVER AT GLEN MARTIN

Year 1959

Year 1960

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	3200	58	695	43,064	Jan.	290	8	61	3,772
Feb.	8700	40	754	42,232	Feb.	1535	14	87	5,042
Mar.	3380	118	729	45,206	Mar.	940	89	305	18,914
Apr.	1535	128	407	24,444	Apr.	530	29	162	9,720
May	261	52	150	9,322	May	25	7	14	884
June	905	22	104	6,266	June	800	12	261	15,634
July	3750	161	595	36,910	July	470	80	177	11,002
Aug.	8700	40	520	32,248	Aug.	98	17	47	2,908
Sept.	221	68	150	8,982	Sept.	144	3.7	39	2,322
Oct.	11300	46	1369	84,898	Oct.	440	11	81	5,050
Nov.	5040	198	775	46,500	Nov.	835	6	180	10,808
Dec.	161	22	59	3,638	Dec.	1175	170	461	28,568
Total	..	..	..	383,710	Total	..	..	..	114,624

Year 1961

Year 1962

Jan.	5040	34	532	33,000	Jan.	11600	178	2531	156,902
Feb.	1175	34	417	23,340	Feb.	2570	156	483	27,054
Mar.	89	25	54	3,320	Mar.	1680	114	351	21,780
Apr.	21	8	13	760	Apr.	16300	94	1967	118,016
May	188	3.7	38	2,370	May	36300	135	1900	117,828
June	8700	3.7	668	40,060	June	178	43	91	5,476
July	89	12	32	1,972	July	167	31	85	5,268
Aug.	2675	9	229	14,178	Aug.	74	10	35	2,172
Sept.	440	45	139	8,322	Sept.	393	8	109	6,514
Oct.	124	34	60	3,702	Oct.	200	14	72	4,458
Nov.	1095	8	104	6,222	Nov.	135	10	28	1,688
Dec.	9800	106	956	59,290	Dec.	21000	8	1288	79,884
Total	..	..	..	196,536	Total	..	..	..	547,040

WILLIAMS RIVER AT GLEN MARTIN

Year 1963

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	6350	114	642	39,774	Jan.	173	17	56	3,476
Feb.	1820	135	693	38,782	Feb.	122	6	17	972
Mar.	81000	160	4997	309,828	Mar.	4000	17	418	25,902
Apr.	19500	238	1701	102,072	Apr.	3460	13	334	20,028
May	18500	264	2384	147,814	May	885	63	182	11,302
June	13800	173	1207	72,406	June	8700	50	689	41,342
July	1300	122	465	28,802	July	200	17	67	4,166
Aug.	12400	79	1026	63,582	Aug.	74	6	20	1,232
Sept.	10300	39	1126	67,568	Sept.	21	7.5	11.6	696
Oct.	4310	173	633	39,264	Oct.	31	4	9.3	576
Nov.	450	122	224	13,416	Nov.	21	0.35	7.8	468
Dec.	3410	79	488	30,280	Dec.	0.4	0	0.06	4
Total	..	..	..	953,588	Total	..	..	..	110,164

Year 1965

Jan.	0	0	0	0
Feb.	0	0	0	0
Mar.	0	0	0	0
Apr.	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	2460	0	183	11,336
Aug.	32.4	6	12.7	786
Sept.	14.0	3.4	8.4	504
Oct.	390	0	28	1,716
Nov.	20	0	3.2	192
Dec.	420	0	54	3,332
Total	..	..	..	17,866

WILLIAMS RIVER AT TILLIGRA

LOCATION: Latitude 32°19' Longitude 151°40'

PERIOD OF ESTABLISHMENT: February 1931 to date.

COMPLETE YEARS OF COMPUTED RECORDS: 34 years.

ZERO OF GAUGE: 280.49 Standard Datum.

CATCHMENT AREA: 75 square miles.

CONTROL: Gravel. Subject to alteration.

EQUIPMENT: Automatic Recorder (pressure type)
installed August 1960
Staff gauge, range 0 to 30 feet.

CURRENT METER OBSERVATIONS:

- (a) Number obtained : 194
- (b) Maximum observation
in cusecs : 4,603
- (c) Minimum observation
in cusecs : 0.10

MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS: 26,600 cusecs.

MEAN DAILY DISCHARGE FOR 34 YEARS: 117 cusecs.

MEAN ANNUAL DISCHARGE FOR 34 YEARS: 85,400 acre feet.

WILLIAMS RIVER AT TILLIGRA

Year 1931

Year 1932

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.					Jan.	15	2	4	228
Feb.		No Records			Feb.	68	2	5	300
Mar.	356	3	47	2,890	Mar.	212	2	17	1,070
Apr.	9500	10	673	40,390	Apr.	356	2	20	1,228
May	824	8	78	4,832	May	122	4	36	2,232
June	176	10	35	2,126	June	104	3	11	684
July	6600	4	206	12,750	July	1500	6	156	9,696
Aug.	12	4	6	396	Aug.	57	3	9	564
Sept.	13	3	5	324	Sept.	3020	4	443	26,604
Oct.	6	2	3	174	Oct.	106	12	34	2,102
Nov.	10	2	3	194	Nov.	65	7	15	878
Dec.	248	2	41	2,556	Dec.	12	5	7	440
Total	..	..	..	66,632	Total	..	..	..	46,026

Year 1933

Year 1934

Jan.	106	5	14	902	Jan.	347	9	50	3,110
Feb.	12	4	7	414	Feb.	3280	22	446	25,014
Mar.	43	4	7	468	Mar.	186	11	46	2,880
Apr.	701	12	98	5,862	Apr.	389	14	91	5,474
May	106	9	23	1,412	May	525	14	76	4,694
June	658	16	111	6,684	June	570	14	70	4,210
July	2860	18	313	19,446	July	3190	9	247	15,350
Aug.	106	16	31	1,952	Aug.	910	33	283	17,578
Sept.	2200	16	128	7,704	Sept.	5568	14	377	22,652
Oct.	3820	9	287	17,788	Oct.	35	10	14	880
Nov.	1850	14	331	19,860	Nov.	64	8	15	906
Dec.	3280	22	280	17,342	Dec.	5200	8	337	20,898
Total	..	..	..	99,834	Total	..	..	..	123,646

WILLIAMS RIVER AT TILLIGRA

Year 1935

Year 1936

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	1127	8	193	11,996	Jan.	1720	4	121	7,514
Feb.	260	8	38	2,122	Feb.	122	8	25	1,450
Mar.	355	8	41	2,530	Mar.	5568	20	361	22,406
Apr.	8	6	7	394	Apr.	1320	10	148	8,916
May	6	5	5	346	May	197	8	24	1,494
June	8	4	5	308	June	256	6	19	1,178
July	18	6	8	514	July	8	6	7	430
Aug.	7	4	5	328	Aug.	8	5	6	410
Sept.	118	4	23	1,384	Sept.	7	4	5	309
Oct.	35	5	9	572	Oct.	4	2.5	3	195
Nov.	80	2	6	366	Nov.	2.5	0.5	2	108
Dec.	64	2	10	650	Dec.	321	0	33	2,050
Total	..	..	..	21,510	Total	..	..	..	57,843

Year 1937

Year 1938

Jan.	423	5.5	67	4,188	Jan.	596	3	80	4,942
Feb.	122	4	36	2,037	Feb.	1720	17	168	9,414
Mar.	950	9	175	10,864	Mar.	82	10	19	1,160
Apr.	355	7	31	1,856	Apr.	4190	8	214	12,822
May	10	6	7	468	May	423	17	103	6,418
June	787	6	144	8,646	June	45	12	21	1,254
July	596	12	106	6,382	July	14	8	11	664
Aug.	423	8	43	2,694	Aug.	208	8	33	2,022
Sept.	53	6	17	1,020	Sept.	208	8	25	1,494
Oct.	80	6	22	1,396	Oct.	20	4	10	648
Nov.	1910	10	205	12,286	Nov.	82	4	12	724
Dec.	1108	6	97	6,006	Dec.	8	1	3	156
Total	..	..	..	46,460	Total	..	..	..	41,718

WILLIAMS RIVER AT TILLIGRA

Year 1939

Year 1940

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	456	0	41	2,536	Jan.	51	2	9	598
Feb.	39	3	11	602	Feb.	3	0.5	2	100
Mar.	6310	2	650	40,278	Mar.	5	0	1	46
Apr.	745	29	181	10,872	Apr.	30	0.5	7	398
May	355	15	53	3,272	May	30	7	16	956
June	15	6	9	566	June	9	2	7	438
July	22	6	10	610	July	7	5	6	374
Aug.	19	6	8	488	Aug.	184	6	26	1,640
Sept.	4190	3	180	10,806	Sept.	24	6	13	782
Oct.	596	15	82	5,070	Oct.	233	4	35	2,164
Nov.	40	7	12	738	Nov.	51	2	6	374
Dec.	15	3	6	370	Dec.	1360	4	74	4,590
Total	..	..	f.	76,208	Total	..	..	..	12,460

Year 1941

Year 1942

Jan.	236	7	60	3,730	Jan.	0	0	0	0
Feb.	6700	19	337	18,860	Feb.	32	0	9	524
Mar.	18	7	13	806	Mar.	3020	2.5	385	23,852
Apr.	27	7	15	902	Apr.	51	10	22	1,290
May	39	7	13	818	May	16	4.5	9	538
June	39	12	16	964	June	39	6.5	13	790
July	58	7	19	1,194	July	314	1	45	2,778
Aug.	27	4.5	10	650	Aug.	58	12	25	1,562
Sept.	70	4.5	5.4	324	Sept.	12	5	8	480
Oct.	39	4.5	10	618	Oct.	16000	3	963	59,732
Nov.	14	4.5	6.5	394	Nov.	3580	12	278	17,226
Dec.	10	0	2	129	Dec.	24	9	14	898
Total	..	..	..	29,391	Total	..	..	..	109,670

WILLIAMS RIVER AT TILLIGRA

Year 1943

Year 1944

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	480	9	73	4,552	Jan.	294	27	74	4,600
Feb.	7.7	4.5	6	360	Feb.	73	16	37	2,102
Mar.	39	1	5.6	349	Mar.	34	16	23	1,408
Apr.	29	4.5	13	792	Apr.	34	10	15	892
May	1946	4.5	250	15,518	May	85	10	19	1,146
June	90	9	26	1,566	June	38	10	16	966
July	11	4.5	9	560	July	404	19	90	5,532
Aug.	404	4.5	155	9,600	Aug.	2023	16	194	12,062
Sept.	252	27	86	5,146	Sept.	90	20	34	2,068
Oct.	85	16	32	1,976	Oct.	18	6	12	772
Nov.	1546	13	119	7,158	Nov.	6	1	3	160
Dec.	1120	23	152	9,446	Dec.	10	0	2	141
Total	..	..	..	57,023	Total	..	..	..	31,849

Year 1945

Year 1946

Jan.	14	0	1	69	Jan.	22	2.5	7	408
Feb.	2464	0	49	2,763	Feb.	420	0.5	39	2,174
Mar.	12	0	3	183	Mar.	428	14	47	2,916
Apr.	44	7	14	822	Apr.	26600	23	1411	84,674
May	134	4.5	20	1,234	May	64	18	32	1,996
June	19470	10	968	58,102	June	6870	12	180	10,784
July	7530	27	244	15,114	July	48	6	16	976
Aug.	44	14	23	1,444	Aug.	25	2	7	458
Sept.	16	4.5	10	600	Sept.	7	1.5	4	249
Oct.	10	7	8	482	Oct.	12	1	2.7	169
Nov.	172	2.5	25	1,473	Nov.	1120	0	29	1,722
Dec.	134	2.5	20	1,210	Dec.	12	0	1.6	101
Total	..	..	..	83,491	Total	..	..	..	106,627

WILLIAMS RIVER AT TILLIGRA

Year 1947					Year 1948				
Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	9.5	0	1.7	107	Jan.	262	14	79	4,864
Feb.	4296	0	266	14,890	Feb.	35	14	22	1,292
Mar.	6210	22	263	16,314	Mar.	262	31	80	4,964
Apr.	1180	25	100	5,986	Apr.	134	19	42	2,512
May	1120	19	98	6,102	May	1120	14	65	4,036
June	698	16	110	6,590	June	950	14	142	8,624
July	17	9	14	856	July	44	25	31	1,936
Aug.	9	7	9	534	Aug.	22	14	18	1,116
Sept.	14	5	9	566	Sept.	2080	19	204	12,238
Oct.	47	5	16	998	Oct.	34	8	17	1,064
Nov.	262	5	22	1,320	Nov.	14	4	7	414
Dec.	8850	25	351	21,754	Dec.	172	4	11	704
Total	..	..	..	76,017	Total	..	..	..	43,764

Year 1949					Year 1950				
Jan.	150	10	40	2,454	Jan.	650	6.5	39	2,418
Feb.	2023	6	180	10,098	Feb.	4190	12	166	9,316
Mar.	9510	38	515	31,920	Mar.	134	30	41	2,540
Apr.	650	6	72	4,320	Apr.	950	24	159	9,550
May	172	12	35	2,180	May	2300	39	109	6,754
June	16770	12	546	32,784	June	9510	29	1481	89,224
July	9510	10	302	18,710	July	No Records			24,600 *
Aug.	1120	20	126	7,794	Aug.	No Records			10,300 *
Sept.	1946	51	167	10,038	Sept.	No Records			6,300 *
Oct.	134	16	38	2,352	Oct.	No Records			8,000 *
Nov.	24	12	14	860	Nov.	No Records			15,366 *
Dec.	16	6.5	9	544	Dec.	No Records			2,832 *
Total	..	..	..	124,054	Total	..	..	..	187,200 *

* Estimated.

WILLIAMS RIVER AT TILLIGRA

Year 1951

Year 1952

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	13775	45	1119	69,368	Jan.	21	0.5	2	141
Feb.	1000	16	38	2,112	Feb.	485	0	33	1,916
Mar.	4100	16	188	11,654	Mar.	485	11	54	3,366
Apr.	31	1	14	858	Apr.	5300	11	121	7,280
May	11	0	2	108	May	215	11	36	2,236
June	6500	0	545	32,714	June	158	11	29	1,776
July	215	21	66	4,086	July	380	11	36	2,248
Aug.	21	11	16	1,024	Aug.	10500	42	805	49,918
Sept.	11	6	9	526	Sept.	36	13	25	1,480
Oct.	16	5	9	534	Oct.	145	13	33	2,106
Nov.	11	3	4	254	Nov.	26	8	14	858
Dec.	6	1	3	164	Dec.	221	0.9	16	980
Total	..	..	..	123,402	Total	..	..	..	74,305

Year 1953

Year 1954

Jan.	1000	36	159	9,848	Jan.	444	0	53	3,294
Feb.	2100	13	234	13,080	Feb.	23120	2	707	39,610
Mar.	2225	19	193	11,948	Mar.	495	10	75	4,652
Apr.	538	19	86	5,180	Apr.	203	6	19	1,122
May	3050	19	190	11,778	May	61	6	17	1,050
June	19	9	14	842	June	900	10	53	3,190
July	31	8	19	1,184	July	203	10	41	2,518
Aug.	61	8	15	904	Aug.	203	19	50	3,124
Sept.	26	13	14	858	Sept.	2400	10	187	11,196
Oct.	16	1.9	7	418	Oct.	596	19	128	7,920
Nov.	8	1.9	3	191	Nov.	1650	14	216	12,950
Dec.	1.9	0	0.4	26	Dec.	123	10	45	2,816
Total	..	..	..	56,257	Total	..	..	..	93,442

WILLIAMS RIVER AT TILLIGRA

Year 1955

Year 1956

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	396	10	71	4,404	Jan.	7635	8	315	19,516
Feb.	18080	31	1005	56,260	Feb.	15570	84	1317	76,404
Mar.	3265	230	702	43,498	Mar.	10845	103	879	54,482
Apr.	2425	103	688	41,280	Apr.	3705	21	140	8,414
May	875	56	137	8,468	May	4605	21	84	5,186
June	275	38	86	5,176	June	1854	21	146	8,792
July	32	22	28	1,724	July	46	21	26	1,636
Aug.	22	11	18	1,114	Aug.	765	17	93	5,796
Sept.	22	11	15	896	Sept.	28	11	16	988
Oct.	84	8	20	1,226	Oct.	41	8	21	1,300
Nov.	84	8	19	1,136	Nov.	14	2	6	355
Dec.	125	8	36	2,246	Dec.	21	0	9	536
Total	..	..	..	167,428	Total	..	..	..	183,405

Year 1957

Year 1958

Jan.	70	2	16	1,019	Jan.	1780	0	37	2,284
Feb.	23150	11	716	40,106	Feb.	970	11.5	145	8,126
Mar.	355	17	83	5,138	Mar.	68	11.5	27	1,690
Apr.	14	9	11	670	Apr.	110	9	40	2,408
May	11.5	5.5	6.5	404	May	66	7.5	26	1,600
June	9	4.9	5.6	336	June	160	5.5	44	2,636
July	48	5.5	11.8	732	July	490	7.5	62	3,858
Aug.	770	11.5	80	4,960	Aug.	7.5	5.5	5.6	348
Sept.	140	9	27	1,646	Sept.	210	5.5	35	2,122
Oct.	9	3	4.7	290	Oct.	72	20	41	2,516
Nov.	5.5	0	1.6	98	Nov.	225	1.7	11	640
Dec.	0	0	0	0	Dec.	No Records			3,100 *
Total	..	..	..	55,399	Total	..	..	..	31,328 *

* Estimated.

WILLIAMS RIVER AT TILLIGRA

Year 1959

Year 1960

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	No Records			9,600 *	Jan.	115	5.5	17	1,076
Feb.	8800	22	559	31,288	Feb.	4820	5.5	211	12,258
Mar.	1070	38	329	20,380	Mar.	490	37	112	6,956
Apr.	2200	86	253	15,170	Apr.	68	14	29	1,716
May	135	9.5	46	2,840	May	43	9	18	1,088
June	1070	9.5	61	3,634	June	490	14	134	8,026
July	970	29	253	15,710	July	370	20	118	7,320
Aug.	2820	5.5	373	23,130	Aug.	29	7.5	15.7	974
Sept.	770	20	92	5,536	Sept.	49	2.3	16.4	982
Oct.	8400	9.5	543	33,660	Oct.	410	3	21	1,312
Nov.	3420	13	365	21,872	Nov.	100	1.3	5.9	352
Dec.	34	9.5	18	1,140	Dec.	3170	3	226	13,996
Total	..	..	..	183,960 *	Total	..	..	..	56,056

Year 1961

Year 1962

Jan.	2545	5.5	206	12,778	Jan.	10000	58	567	35,290
Feb.	5360	22	128	7,174	Feb.	1350	39	119	6,650
Mar.	42	11.7	20	1,224	Mar.	975	22	80	4,972
Apr.	27	6.4	11.7	700	Apr.	7650	22	578	34,656
May	124	9.1	14.4	892	May	11200	32	377	23,364
June	2290	18	193	11,610	June	55	14	33	1,980
July	22	9	12.4	755	July	286	14	40	2,450
Aug.	1215	7.3	59	3,682	Aug.	68	12	20	1,236
Sept.	236	20	59	3,534	Sept.	1230	7	74	4,420
Oct.	165	7.3	25	1,542	Oct.	275	9.1	28	1,766
Nov.	1044	4	45	2,730	Nov.	160	8.6	30	1,878
Dec.	4530	41	396	24,564	Dec.	10250	5.3	373	23,138
Total	..	..	..	71,185	Total	..	..	..	141,800

* Estimated.

WILLIAMS RIVER AT TILLIGRA

Year 1963

Year 1964

Month	Discharge in Cusecs			Discharge for Month Acre Feet	Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean			Max.	Min.	Mean	
Jan.	8315	3	177	11,006	Jan.	87	17	29	1,808
Feb.	522	8.6	110	6,134	Feb.	87	17	26	1,482
Mar.	25550	11.8	1331	82,554	Mar.	1800	17	115	7,150
Apr.	7530	54	413	24,762	Apr.	1450	17	101	6,036
May	9400	85	756	46,894	May	1500	23	82	5,058
June	5210	43	262	15,712	June	8220	30	254	15,218
July	532	49	99	6,110	July	40	12.5	20	1,250
Aug.	4050	49	191	11,822	Aug.	30	6	10	636
Sept.	3700	30	250	14,984	Sept.	10	4.7	6.3	380
Oct.	825	39	96	5,940	Oct.	22	4.7	6.3	390
Nov.	438	30	60	3,592	Nov.	22	2.3	5.4	324
Dec.	4440	39	208	12,916	Dec.	2	0	0.5	31
Total	..	..	..	242,426	Total	..	..	..	39,763

Year 1965

Jan.	6	0	0.3	19
Feb.	292	0.5	7.3	408
Mar.	2	0	0.4	23
Apr.	52	0	2.2	134
May	3.1	0	1.2	78
June	40	0	2.6	156
July	1500	4	63	3,910
Aug.	21	4	9	558
Sept.	13	1	6	384
Oct.	351	0	14.4	894
Nov.	5.5	0	1.8	110
Dec.	262	0	44	2,756
Total	..	..	..	9,430

CHICHESTER RIVER AT CHICHESTER DAM.

LOCATION: Latitude 32°14' Longitude 151°42'

PERIOD OF ESTABLISHMENT: January 1913 to date.

COMPLETE YEARS OF COMPUTED RECORDS: 53 years.

CREST LEVEL OF SPILLWAY: R.L. 514 Low Water Newcastle Datum.

CATCHMENT AREA: 76 Square Miles.

MEAN DAILY DISCHARGE FOR 53 YEARS: 154 cusecs.

MEAN ANNUAL DISCHARGE FOR 53 YEARS: 112,000 acre feet.

REMARKS: The Chichester Dam was completed in 1923 and is operated by the Hunter District Water Board for city water supply purposes.

River flow records were initially obtained from a gauging station near the site of the Dam; but after completion of the Dam, natural inflows have been deduced from observed changes in storage level, with appropriate allowance for diversions, spillway overflows and evaporation losses.

CHICHESTER RIVER AT CHICHESTER DAM

Monthly Inflows in Acre Feet

Month	Year					
	1913	1914	1915	1916	1917	1918
Jan.	1,482	237	15,312	1,033	1,322	13,164
Feb.	8,101	237	1,208	6,297	12,304	31,310
Mar.	3,562	2,871	652	2,459	3,893	6,130
Apr.	32,784	500	3,022	7,193	3,093	5,323
May	61,349	722	33,469	24,387	1,922	2,826
June	29,036	22,246	1,963	9,119	1,282	1,848
July	11,745	2,293	3,182	2,204	937	2,274
Aug.	1,237	922	1,600	1,756	652	2,493
Sept.	1,067	27,291	893	1,041	15,594	3,600
Oct.	685	3,200	504	1,252	2,445	3,078
Nov.	330	5,530	159	870	30,458	1,056
Dec.	304	21,283	6,345	4,649	9,697	778
Totals	151,683	87,332	68,309	62,260	83,599	73,880

Month	Year					
	1919	1920	1921	1922	1923	1924
Jan.	752	13,457	42,585	28,806	533	6,904
Feb.	826	4,793	4,178	5,849	119	9,100
Mar.	22,731	2,389	18,668	3,045	411	5,496
Apr.	9,290	1,270	12,975	341	6,519	21,622
May	44,192	1,163	16,031	670	2,845	4,333
June	9,416	948	20,387	741	3,452	4,330
July	3,574	3,308	43,474	6,215	5,270	19,900
Aug.	2,345	1,178	2,537	25,428	16,613	1,570
Sept.	1,478	1,004	1,063	12,671	3,574	2,463
Oct.	1,815	456	5,612	2,019	5,375	6,611
Nov.	2,085	1,185	1,300	859	85	19,111
Dec.	1,808	30,235	7,878	911	111	32,363
Totals	100,312	61,386	176,688	87,555	44,907	133,803

CHICHESTER RIVER AT CHICHESTER DAM

Monthly Inflows in Acre Feet

Month	Year					
	1925	1926	1927	1928	1929	1930
Jan.	17,285	2,781	20,567	20,233	626	196
Feb.	11,600	1,674	7,319	36,141	61,911	741
Mar.	4,922	13,985	27,363	17,670	3,893	3,063
Apr.	3,781	16,278	56,726	9,507	3,504	16,944
May	26,830	28,685	4,833	1,752	1,956	7,759
June	12,670	21,022	1,107	45,822	3,100	79,630
July	9,222	36,178	907	47,056	4,996	10,304
Aug.	604	3,156	133	4,930	5,967	1,785
Sept.	141	1,900	196	1,270	24,937	930
Oct.	844	744	285	1,096	63,070	619
Nov.	500	730	3,048	604	2,070	356
Dec.	578	682	20,374	637	285	263
Totals	88,977	127,815	142,858	186,718	176,315	122,590

Month	Year					
	1931	1932	1933	1934	1935	1936
Jan.	322	1,226	1,785	4,463	24,437	12,230
Feb.	696	878	826	26,074	4,070	4,963
Mar.	748	2,581	2,752	7,356	5,152	31,015
Apr.	52,489	1,207	9,400	7,504	1,637	22,170
May	4,748	3,852	2,941	7,167	1,019	4,859
June	1,489	2,022	7,141	5,670	822	2,456
July	5,677	12,778	15,756	14,415	1,133	1,530
Aug.	1,859	2,122	3,907	18,407	567	926
Sept.	1,481	32,400	6,778	32,178	2,474	871
Oct.	793	6,196	17,689	2,730	1,674	470
Nov.	1,019	1,978	25,485	2,452	537	122
Dec.	4,515	922	17,633	41,393	2,052	3,026
Totals	75,836	68,162	112,093	169,809	45,574	84,638

CHICHESTER RIVER AT CHICHESTER DAM

Monthly Inflows in Acre Feet

Month	Year					
	1937	1938	1939	1940	1941	1942
Jan.	4,848	8,222	4,878	863	8,367	333
Feb.	2,696	11,026	1,274	248	6,330	1,044
Mar.	17,293	3,200	45,826	248	2,063	37,056
Apr.	5,026	26,156	15,359	922	1,637	6,633
May	1,959	6,282	4,578	1,363	1,407	1,363
June	13,818	3,033	1,678	552	1,363	1,393
July	10,726	1,896	1,485	474	1,733	4,822
Aug.	2,719	2,478	1,174	1,652	767	2,756
Sept.	1,519	2,700	4,675	778	526	960
Oct.	3,496	1,941	7,037	2,270	922	64,781
Nov.	14,152	1,937	1,967	607	633	7,967
Dec.	4,026	641	756	4,204	400	3,700
Totals	82,308	69,512	90,687	14,181	26,148	132,748

Month	Year					
	1943	1944	1945	1946	1947	1948
Jan.	4,970	7,374	637	826	411	13,985
Feb.	1,556	3,381	641	2,367	11,248	2,630
Mar.	1,322	2,259	515	3,485	12,122	9,448
Apr.	1,652	1,770	1,804	64,656	15,211	3,152
May	20,389	1,530	1,848	3,567	7,244	5,622
June	3,952	1,419	45,067	4,759	12,200	13,322
July	1,519	5,930	13,719	2,007	1,722	1,944
Aug.	10,815	17,126	2,744	974	981	1,415
Sept.	6,978	4,885	956	785	763	12,048
Oct.	3,015	1,904	1,093	474	1,370	2,437
Nov.	18,185	674	1,519	733	1,433	978
Dec.	15,237	641	2,789	507	17,419	541
Totals	89,590	48,893	73,332	85,140	82,124	67,522

CHICHESTER RIVER AT CHICHESTER DAM
Monthly Inflows in Acre Feet

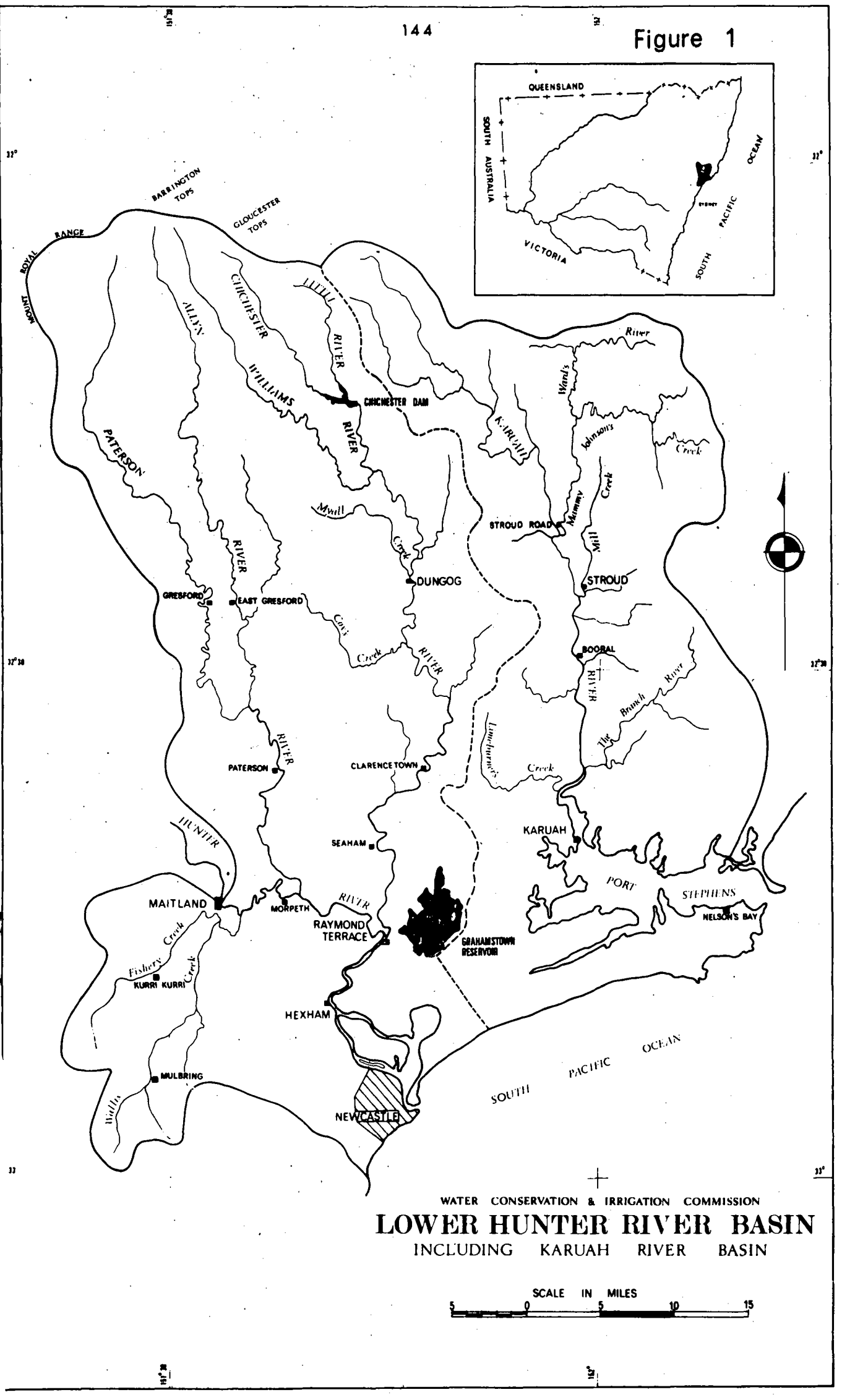
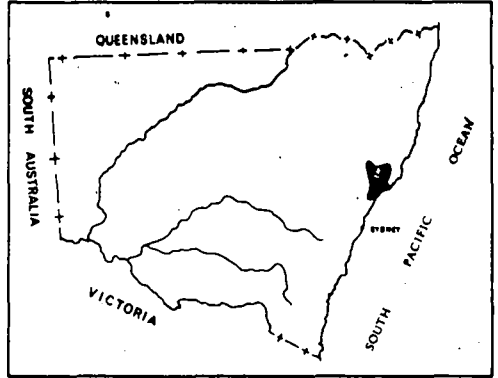
Month	Year					
	1949	1950	1951	1952	1953	1954
Jan.	3,311	3,567	95,364	648	18,884	7,000
Feb.	8,200	22,159	11,347	3,736	23,081	50,674
Mar.	26,959	6,485	25,191	7,814	14,145	7,820
Apr.	12,641	16,133	5,253	9,206	2,436	3,075
May	3,963	15,144	2,170	6,550	18,244	2,261
June	17,137	118,207	68,629	4,093	1,719	83,582
July	19,463	39,456	5,532	5,076	4,076	6,127
Aug.	12,830	11,826	2,251	87,517	1,745	4,828
Sept.	14,367	6,241	1,308	2,942	1,344	18,469
Oct.	4,548	10,578	1,219	5,657	1,076	11,671
Nov.	1,393	19,252	486	1,919	691	10,451
Dec.	1,237	10,289	641	2,860	333	10,000
Totals	126,049	279,337	222,391	138,018	87,774	215,958

Month	Year					
	1955	1956	1957	1958	1959	1960
Jan.	13,834	16,289	1,643	2,132	21,447	4,682
Feb.	75,458	46,297	82,467	8,232	18,819	10,690
Mar.	55,514	63,882	23,363	2,302	16,852	16,041
Apr.	20,703	6,618	4,936	4,912	19,246	7,307
May	12,108	5,274	827	4,481	10,303	2,635
June	6,921	5,678	994	7,022	7,739	11,062
July	3,457	3,252	1,391	7,738	12,732	6,910
Aug.	1,214	3,981	10,941	1,904	20,091	2,433
Sept.	1,636	1,570	3,898	1,632	8,936	1,916
Oct.	1,437	1,824	784	1,844	27,356	1,733
Nov.	1,553	692	314	707	27,058	1,130
Dec.	4,405	1,183	184	8,401	8,400	21,028
Totals	198,240	166,540	131,742	51,307	198,979	87,617

CHICHESTER RIVER AT CHICHESTER DAM
Monthly Inflows in Acre Feet

Month	Year					
	1961	1962	1963	1964	1965	1966
Jan.	17,356	39,104	15,050	3,812	853	1,909
Feb.	8,430	12,698	17,042	3,096	1,030	7,075
Mar.	4,416	11,433	84,779	14,658	449	3,545
Apr.	2,417	56,967	27,385	10,880	656	3,369
May	2,331	29,807	47,808	6,977	575	
June	23,539	3,370	12,870	13,812	626	
July	2,687	3,603	8,066	2,883	4,929	
Aug.	4,228	2,304	7,186	1,794	1,158	
Sept.	4,969	5,479	22,206	1,103	943	
Oct.	3,406	3,157	11,203	1,200	896	
Nov.	4,761	2,391	6,757	1,061	644	
Dec.	34,167	22,932	16,763	501	6,094	
Totals	112,709	193,245	277,115	61,777	18,853	

Figure 1



WATER CONSERVATION & IRRIGATION COMMISSION
LOWER HUNTER RIVER BASIN
 INCLUDING KARUAH RIVER BASIN

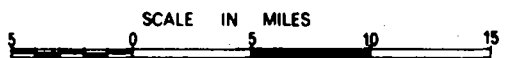




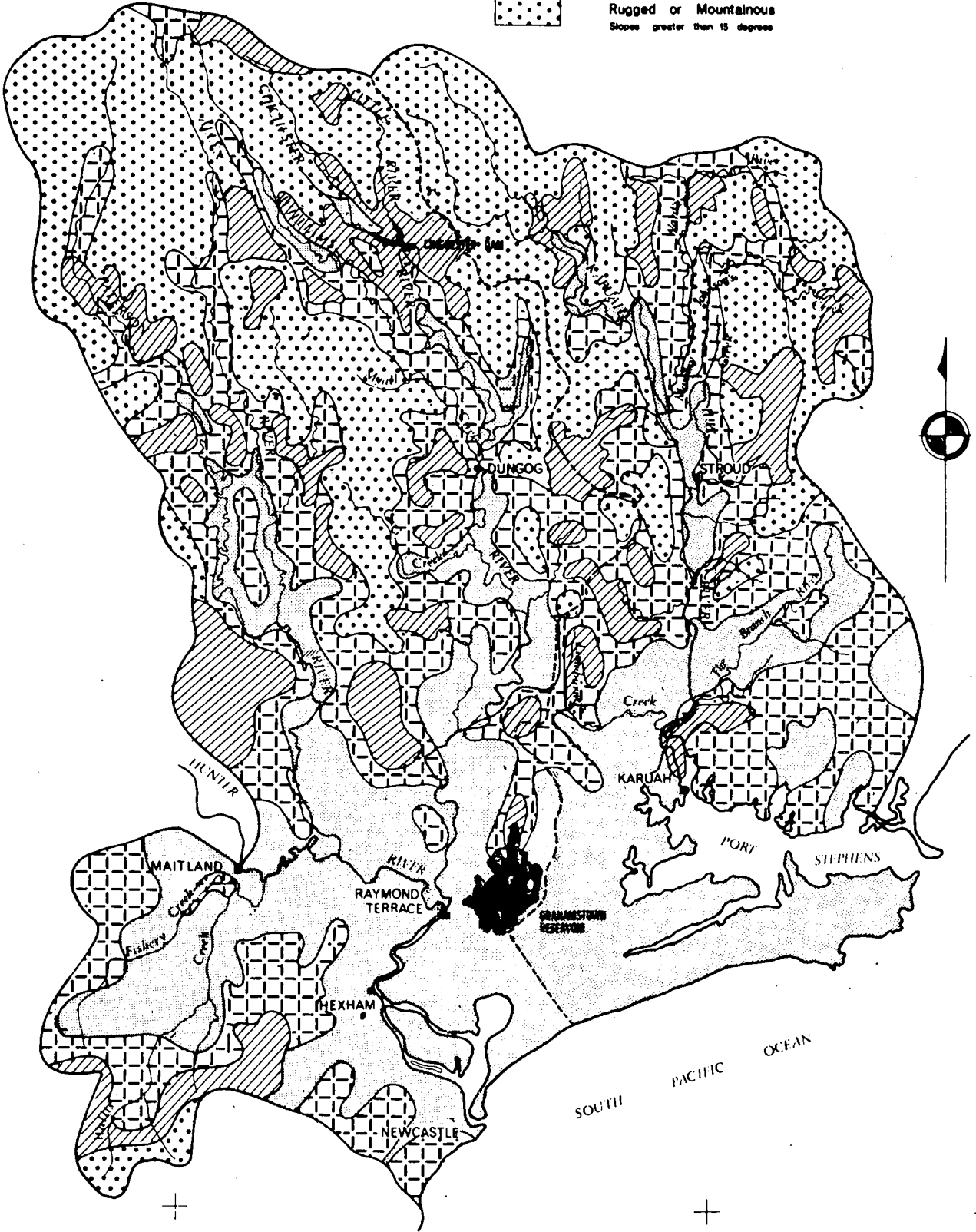


Figure 2

LEGEND

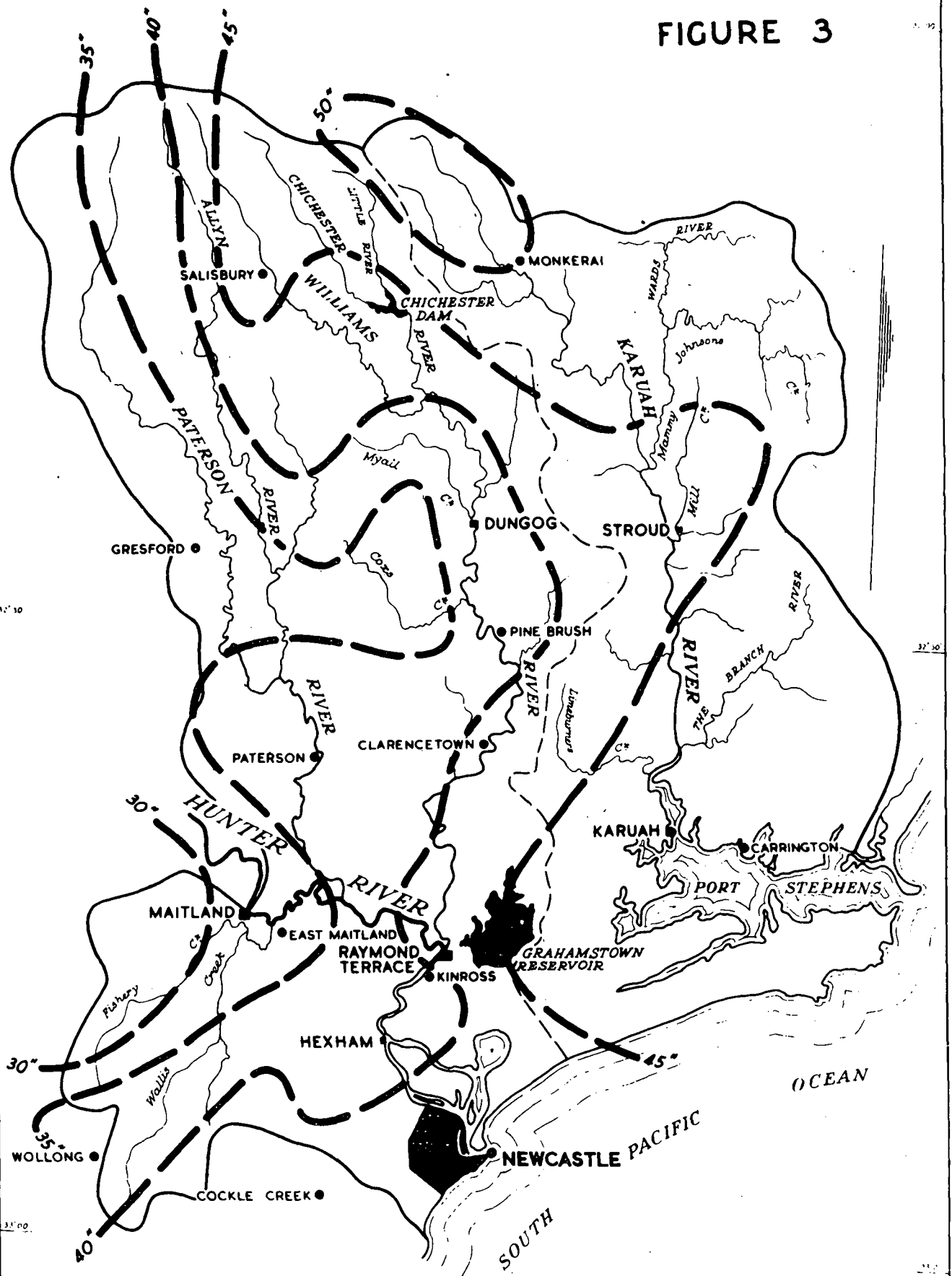
-  Mostly Flat
Slopes less than 3 degrees
-  Undulating to Hilly
Slopes greater than 3 degrees but less than 8 degrees
-  Hilly to Steep
Slopes greater than 8 degrees but less than 15 degrees
-  Rugged or Mountainous
Slopes greater than 15 degrees



WATER CONSERVATION & IRRIGATION COMMISSION
LOWER HUNTER RIVER BASIN
 INCLUDING KARUAH RIVER BASIN
LAND SLOPES

SCALE IN MILES
 0 5 10 15

FIGURE 3



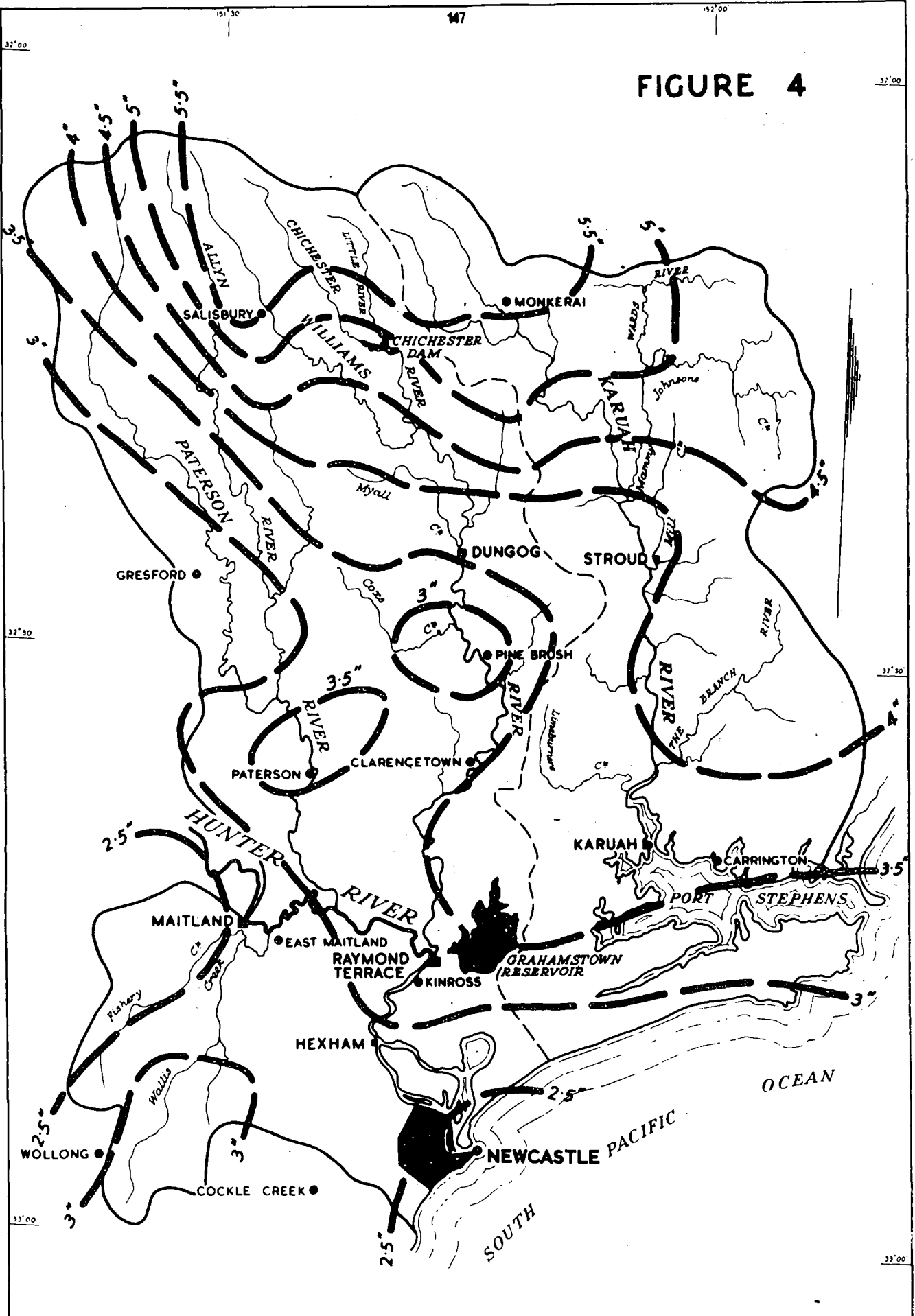
WATER CONSERVATION & IRRIGATION COMMISSION

LOWER HUNTER RIVER BASIN
INCLUDING KARUAH RIVER BASIN
ANNUAL MEDIAN RAINFALL

MILES 5 4 3 2 0 3 10 15 MILES

SCALE

FIGURE 4



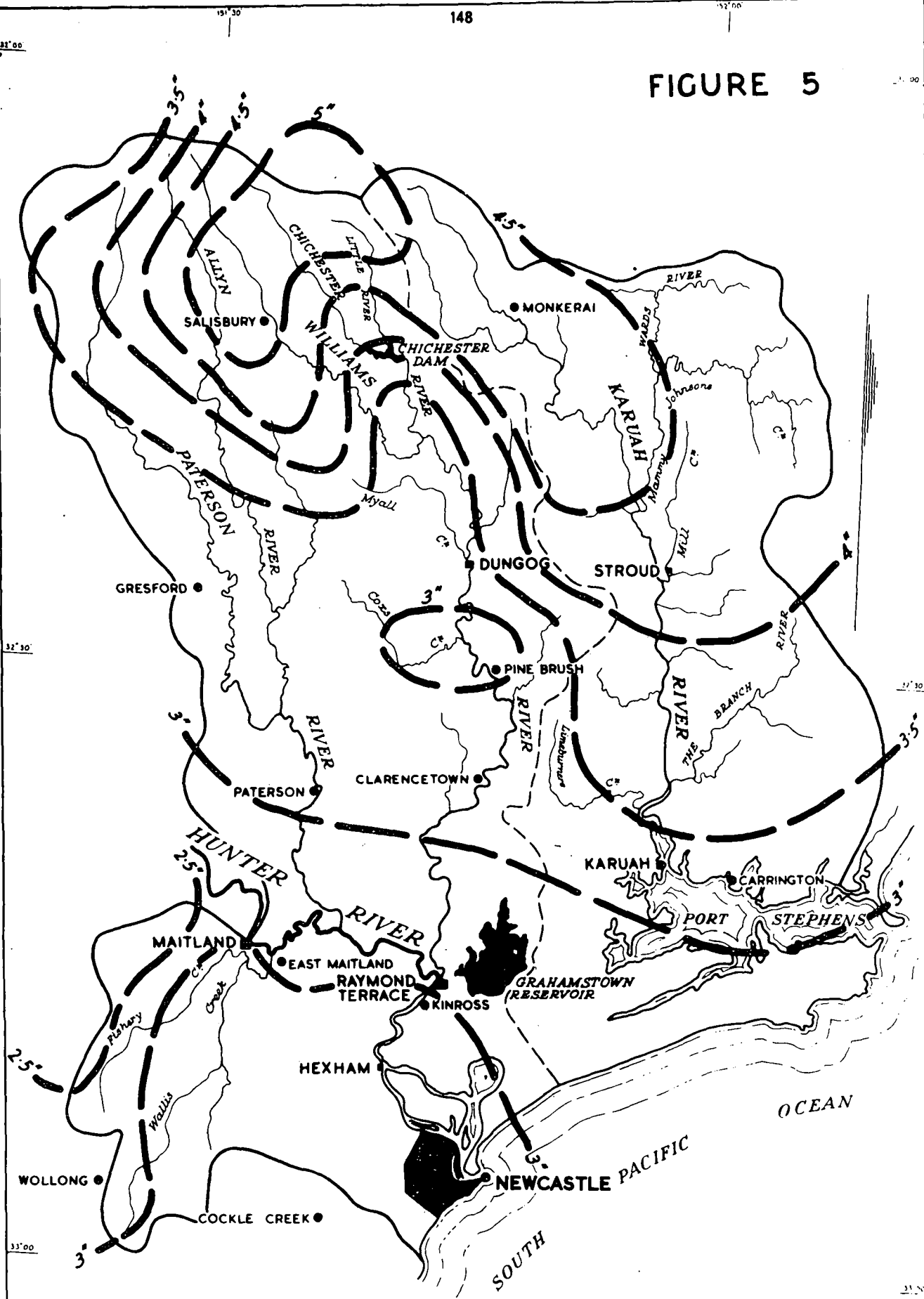
WATER CONSERVATION & IRRIGATION COMMISSION

**LOWER HUNTER RIVER BASIN
INCLUDING KARUAH RIVER BASIN
JANUARY MEDIAN RAINFALL**

MILES 5 4 3 2 0 5 10 15 MILES

SCALE

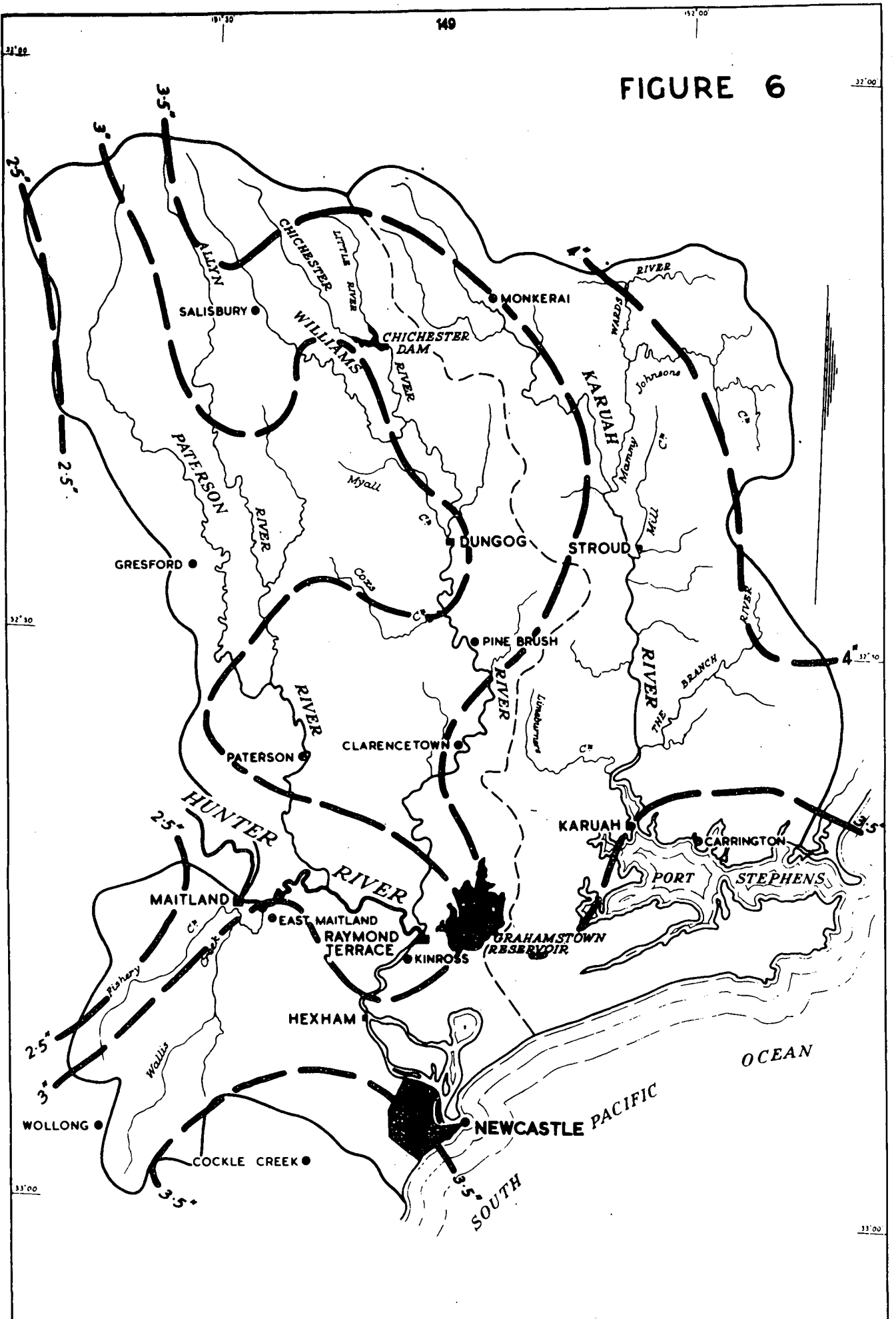
FIGURE 5



WATER CONSERVATION & IRRIGATION COMMISSION
LOWER HUNTER RIVER BASIN
 INCLUDING KARUAH RIVER BASIN
FEBRUARY MEDIAN RAINFALL

MILES 5 4 3 2 0 5 10 15 MILES
 SCALE

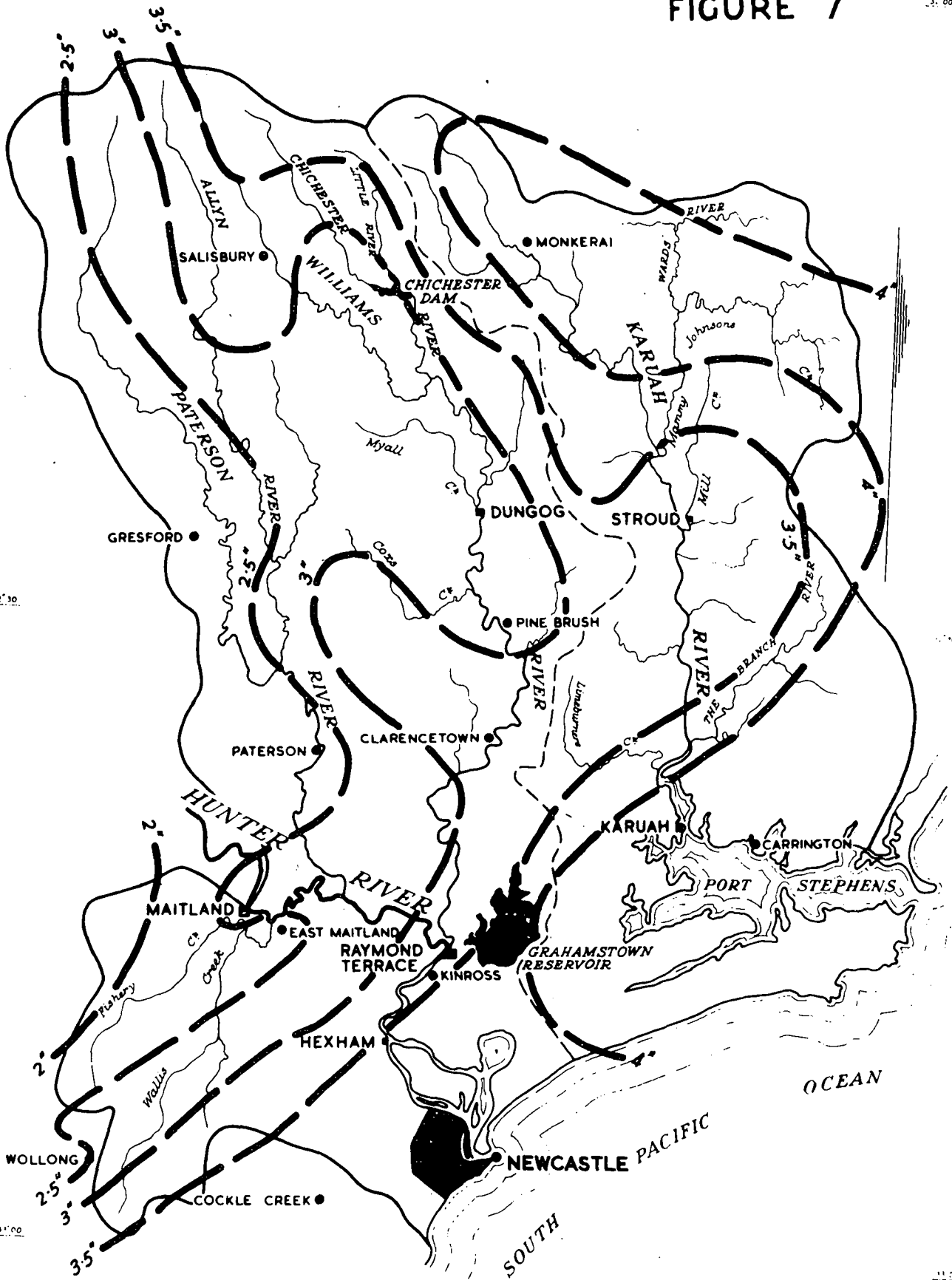
FIGURE 6



WATER CONSERVATION & IRRIGATION COMMISSION
LOWER HUNTER RIVER BASIN
 INCLUDING KARUAH RIVER BASIN
MARCH MEDIAN RAINFALL



FIGURE 7



WATER CONSERVATION & IRRIGATION COMMISSION

**LOWER HUNTER RIVER BASIN
INCLUDING KARUAH RIVER BASIN
APRIL MEDIAN RAINFALL**

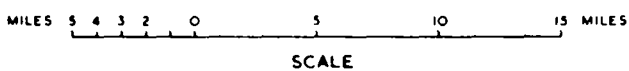
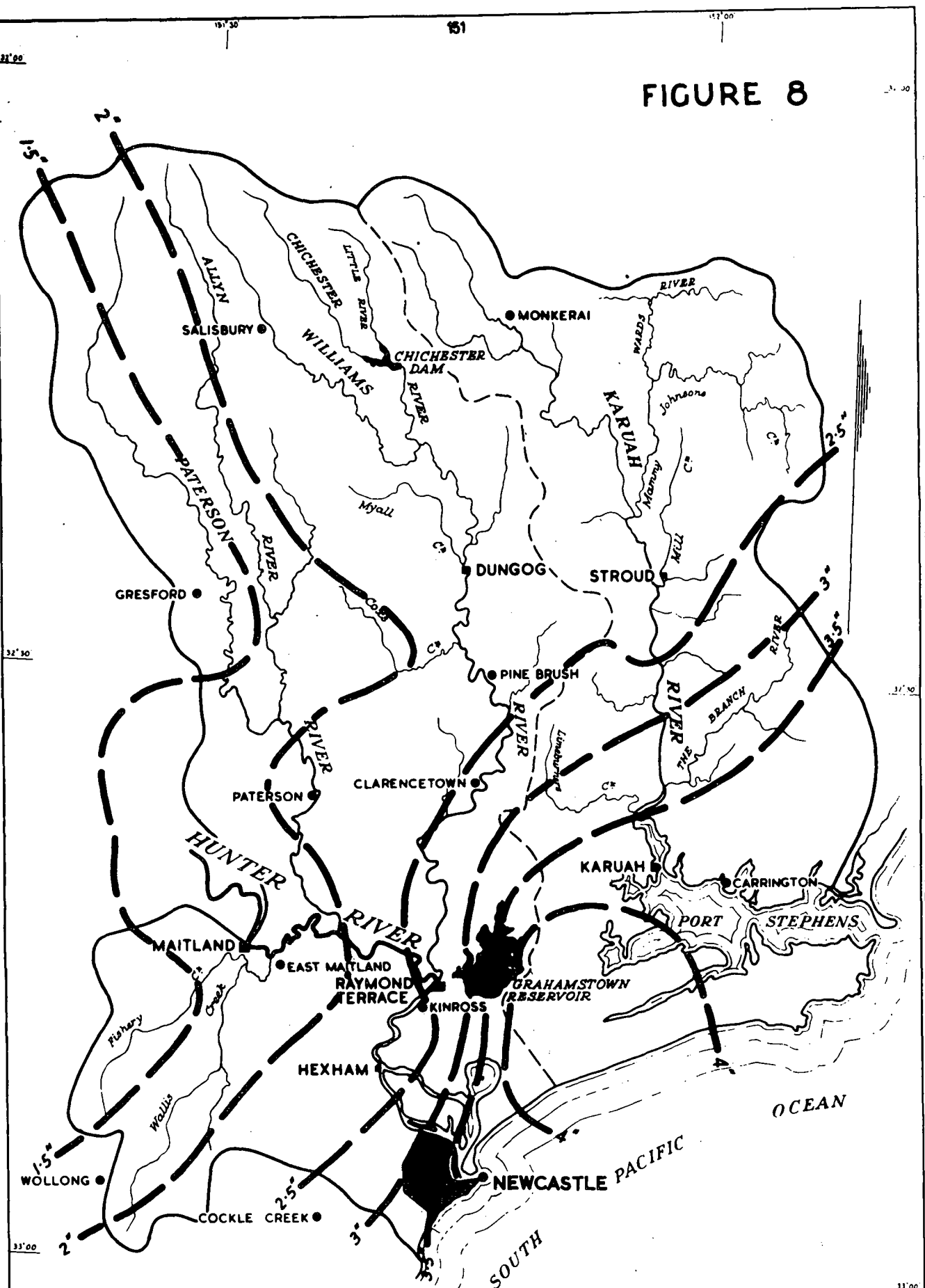
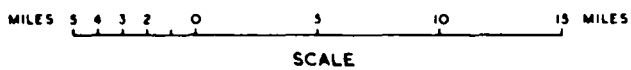


FIGURE 8

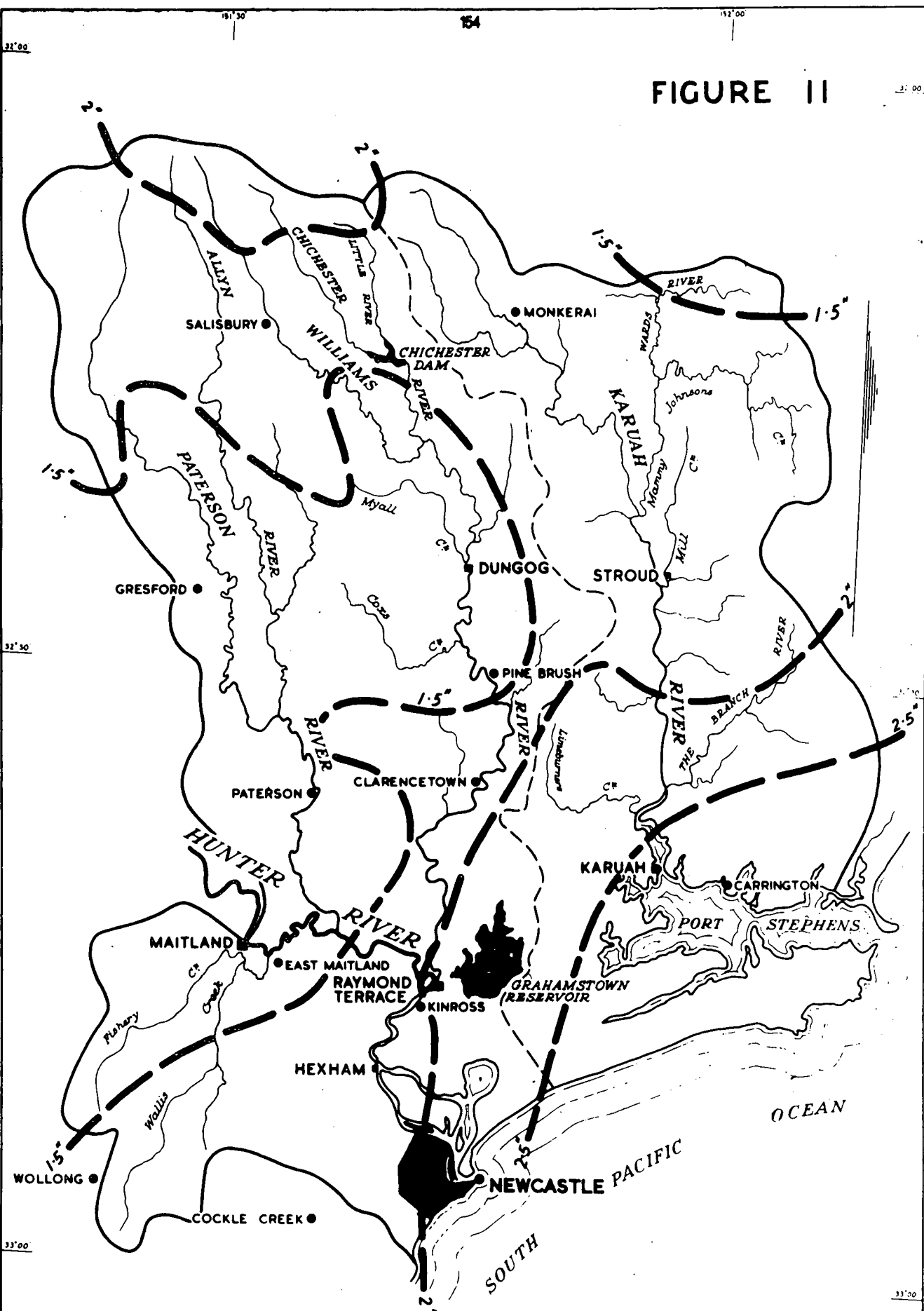


WATER CONSERVATION & IRRIGATION COMMISSION
LOWER HUNTER RIVER BASIN
INCLUDING KARUAH RIVER BASIN
MAY MEDIAN RAINFALL



SCALE

FIGURE II



WATER CONSERVATION & IRRIGATION COMMISSION
LOWER HUNTER RIVER BASIN
INCLUDING KARUAH RIVER BASIN
AUGUST MEDIAN RAINFALL

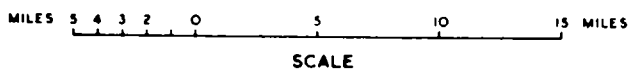
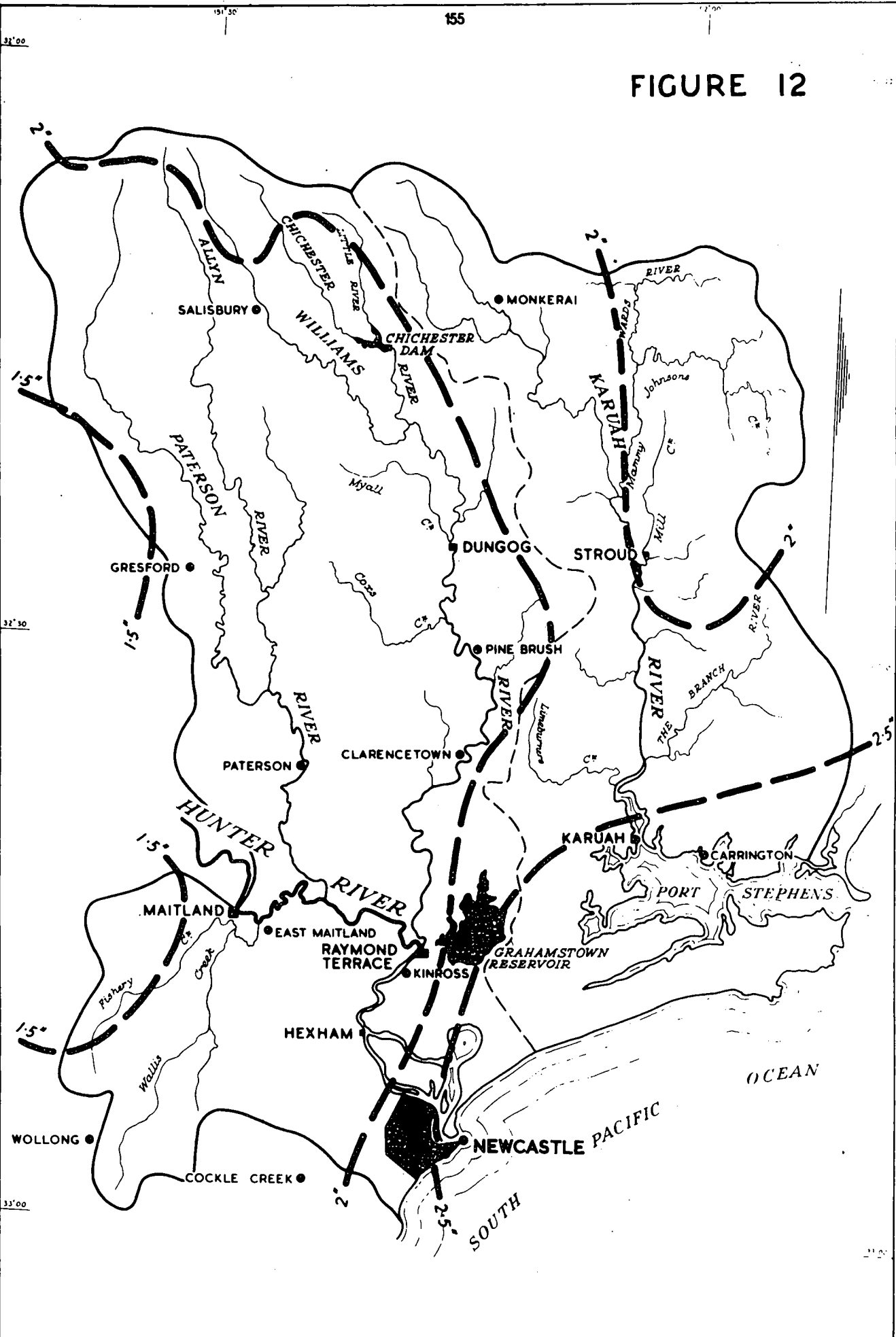


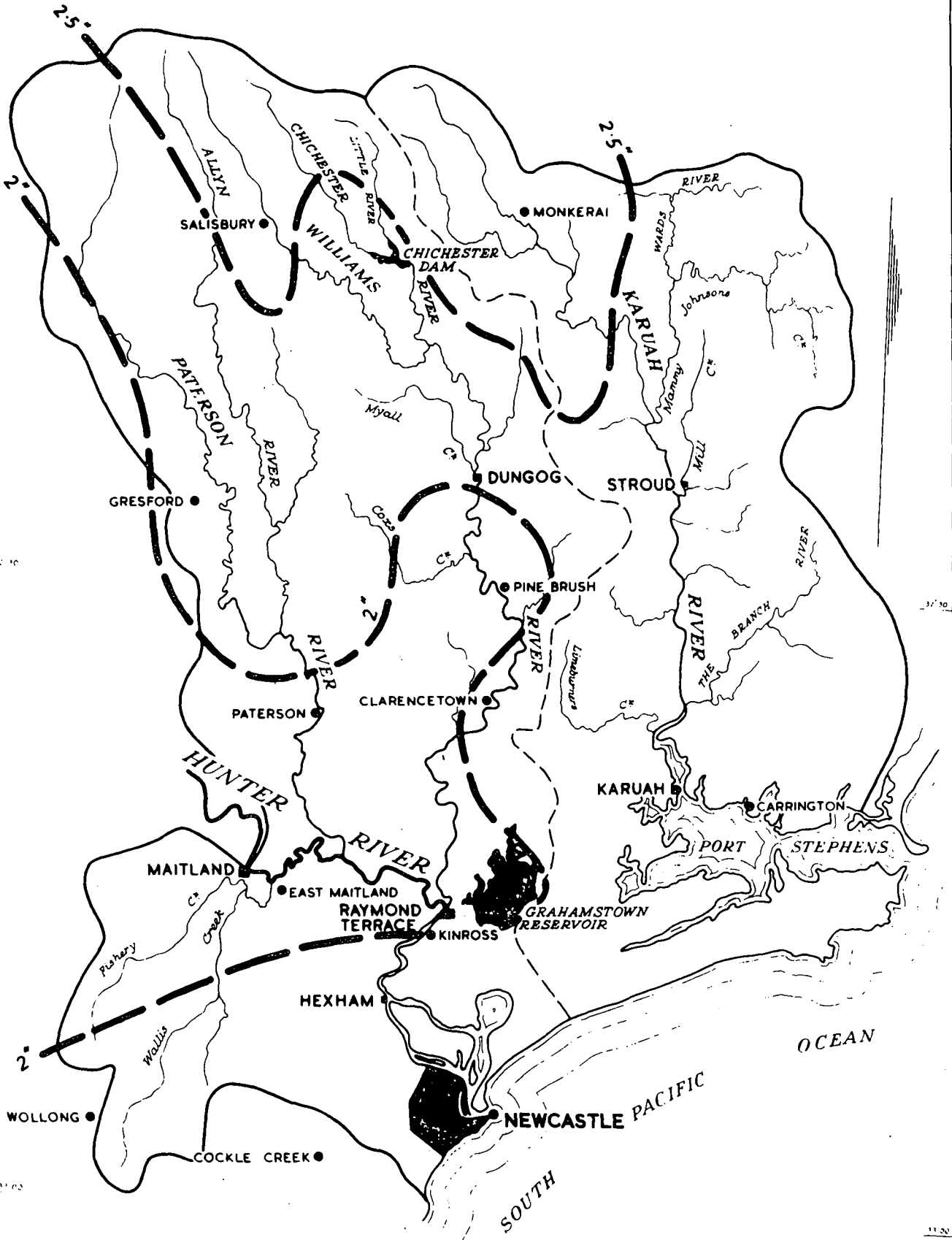
FIGURE 12



WATER CONSERVATION & IRRIGATION COMMISSION
LOWER HUNTER RIVER BASIN
INCLUDING KARUAH RIVER BASIN
SEPTEMBER MEDIAN RAINFALL



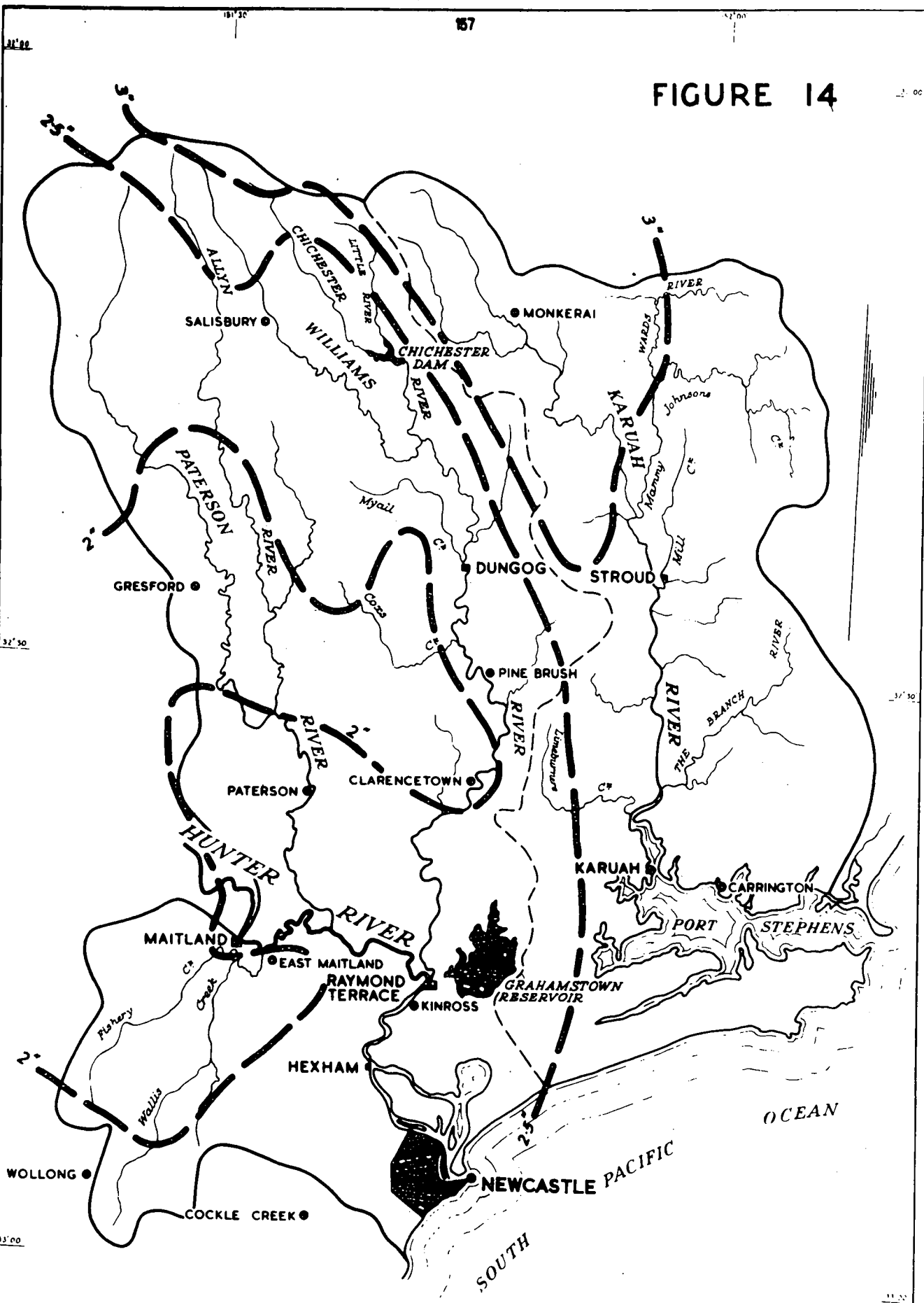
FIGURE 13



WATER CONSERVATION & IRRIGATION COMMISSION
LOWER HUNTER RIVER BASIN
 INCLUDING KARUAH RIVER BASIN
OCTOBER MEDIAN RAINFALL

MILES 5 4 3 2 0 5 10 15 MILES
 SCALE

FIGURE 14



WATER CONSERVATION & IRRIGATION COMMISSION
LOWER HUNTER RIVER BASIN
 INCLUDING KARUAH RIVER BASIN
NOVEMBER MEDIAN RAINFALL

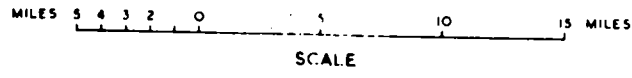
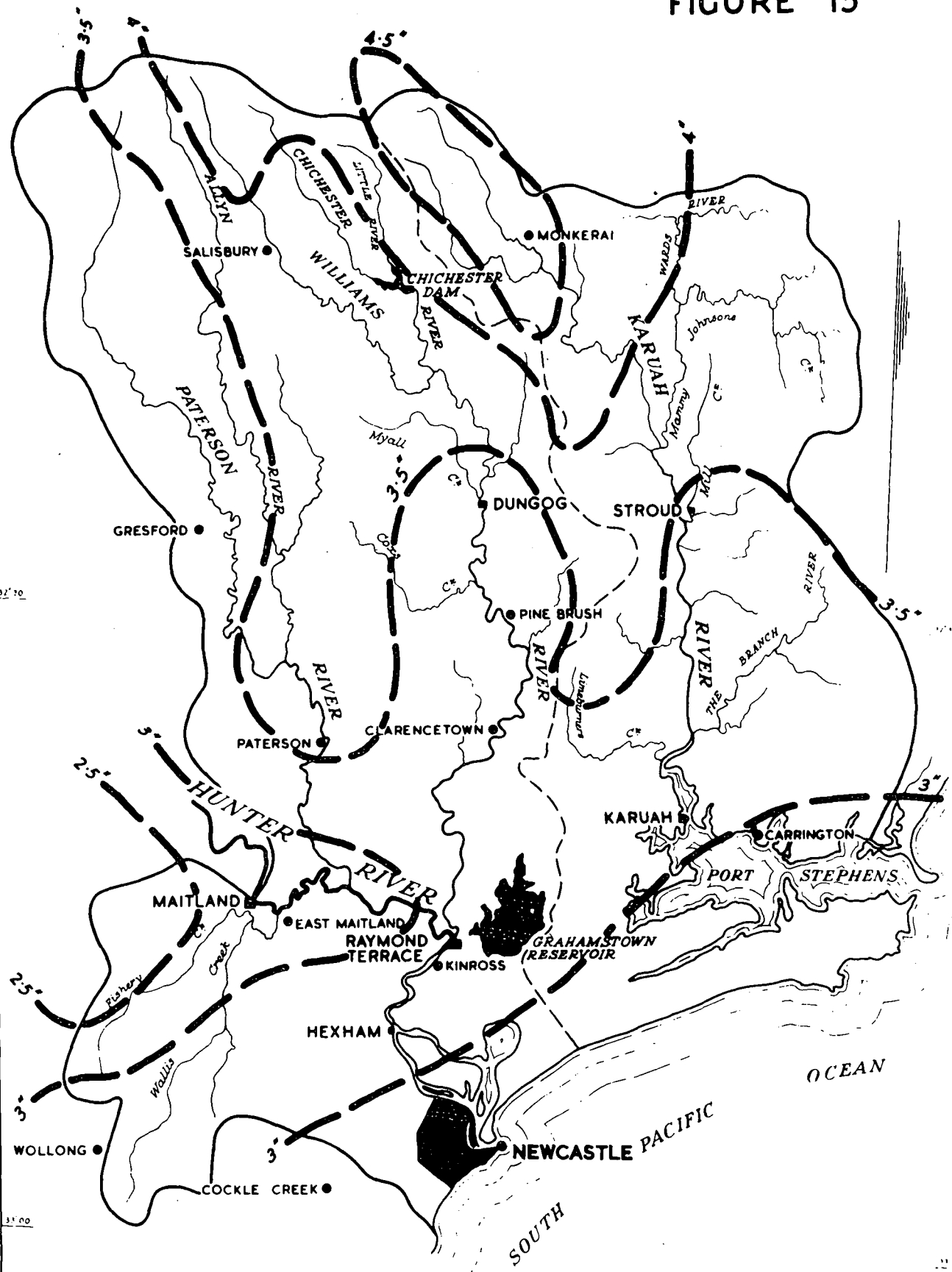


FIGURE 15



WATER CONSERVATION & IRRIGATION COMMISSION

LOWER HUNTER RIVER BASIN
INCLUDING KARUAH RIVER BASIN
DECEMBER MEDIAN RAINFALL



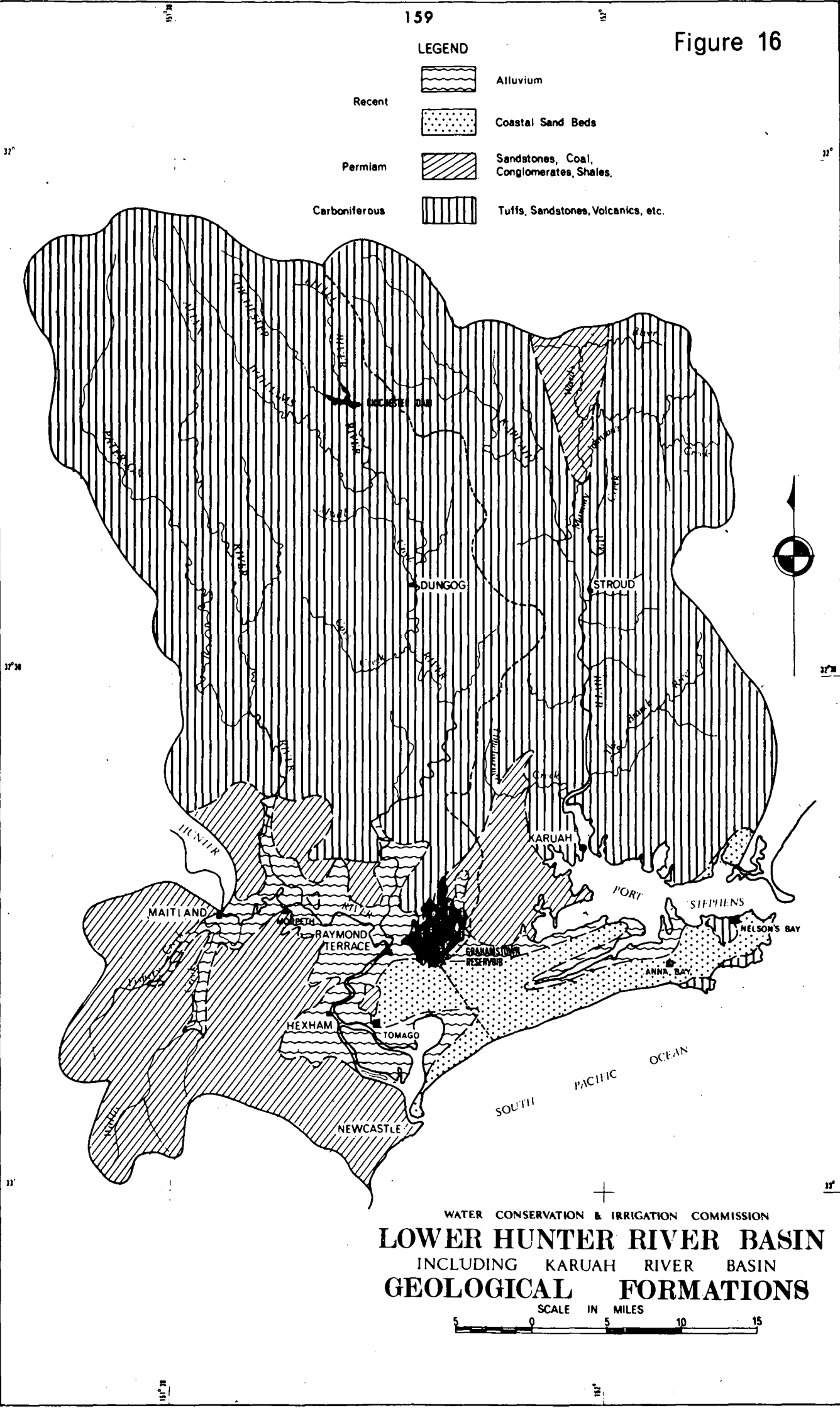




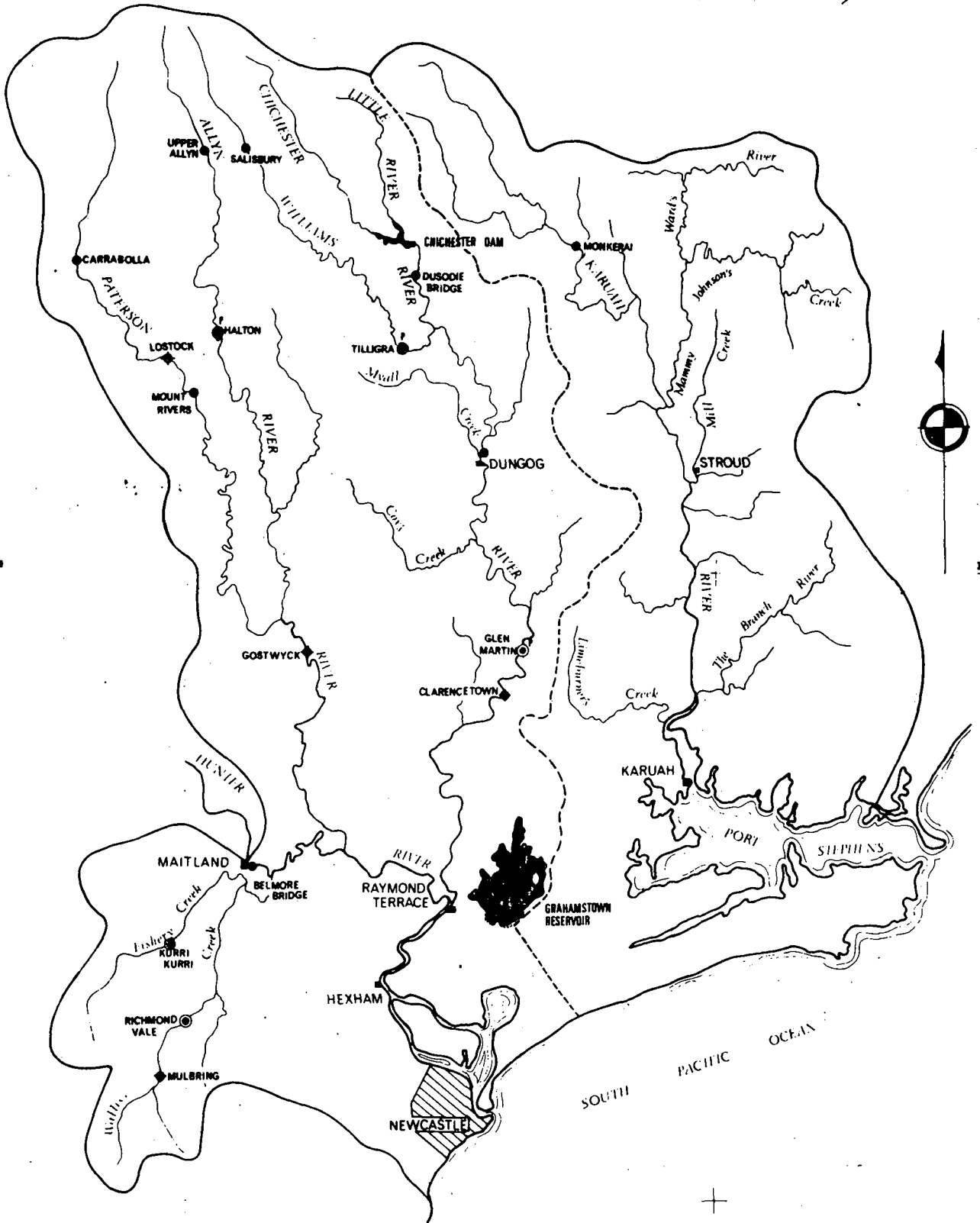


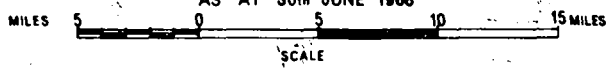
Figure 17

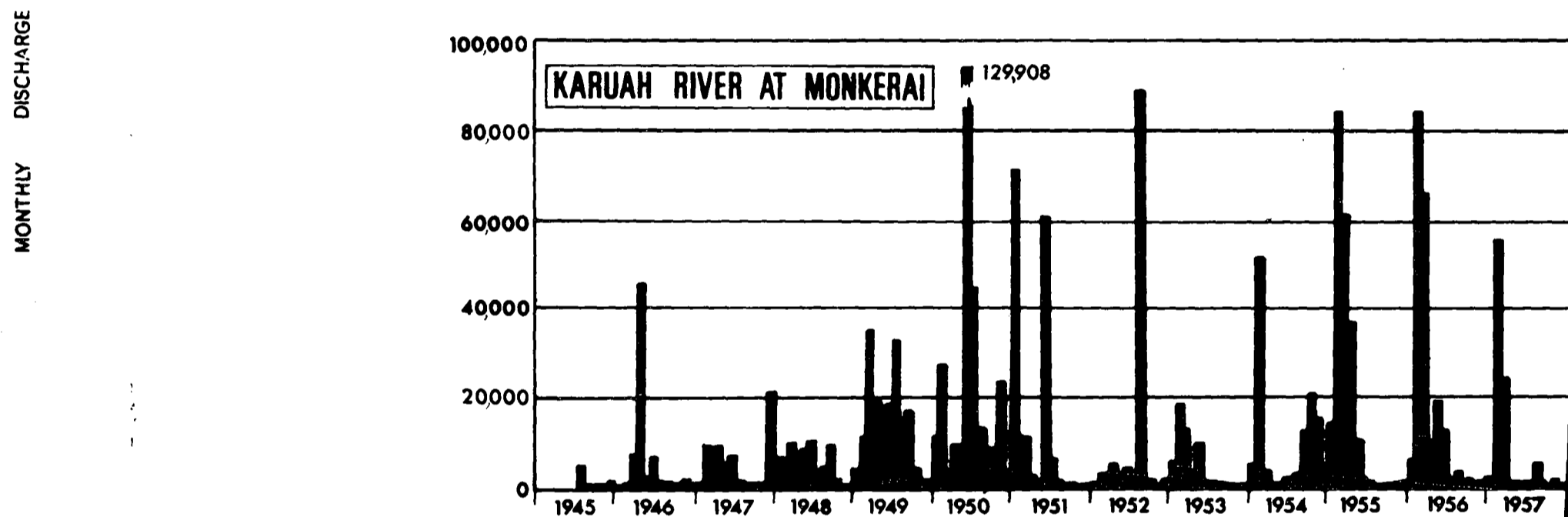
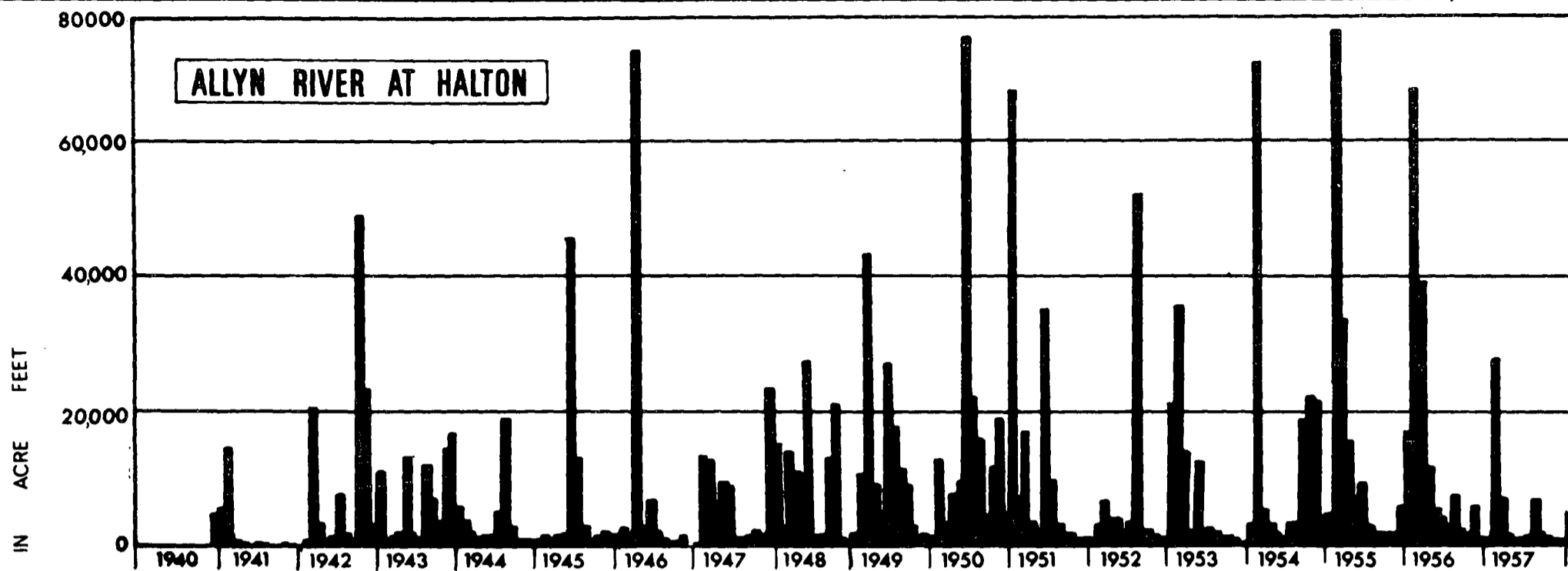
LEGEND

- Staff Gauges 
- Automatic Recorders (Pressure Type) 
- (Float Type) 
- Discontinued Stations 



WATER CONSERVATION & IRRIGATION COMMISSION
LOWER HUNTER RIVER BASIN
 INCLUDING KARUAH RIVER BASIN
GAUGING STATIONS
 AS AT 30th JUNE 1966





HYDROGRAPHS OF MONTHLY DISCHARGES

ALLYN RIVER AT HALTON

KARUAH RIVER AT MONKERAI

HUNTER RIVER AT BELMORE BRIDGE

600,000

400,000

200,000

80,000

FIGURE 18

60,000

40,000

20,000

0

1958 1959 1960 1961 1962 1963 1964 1965

100,000

182,438

FEET

ACRE

IN

DISCHARGE

0

1958 1959 1960 1961 1962 1963 1964 1965

MONTHLY

60,000

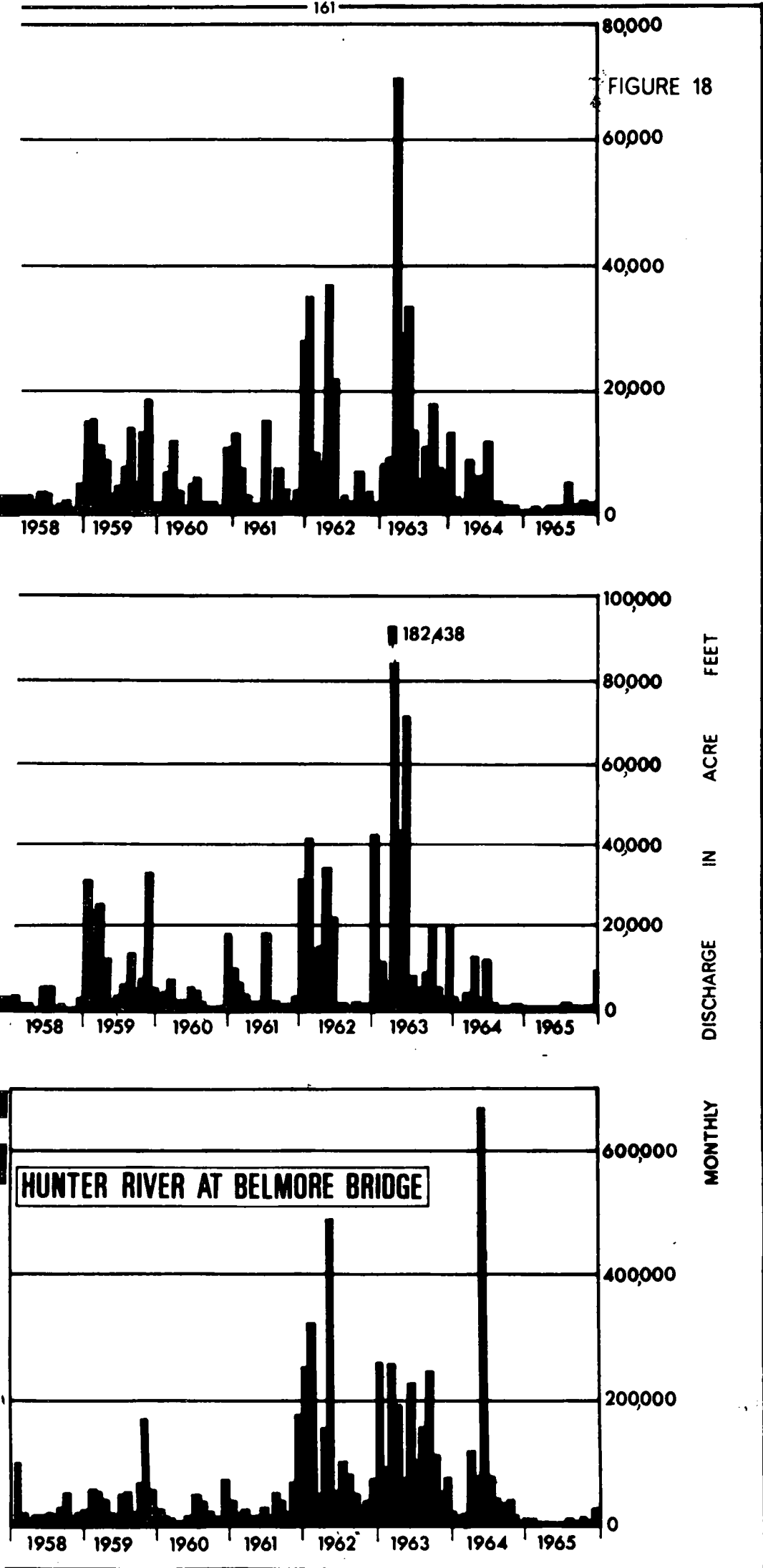
40,000

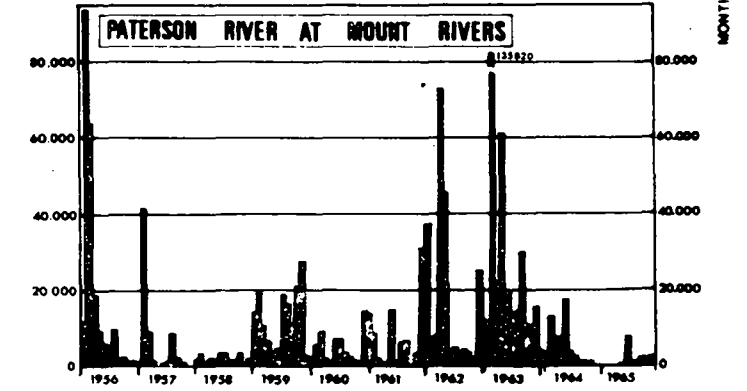
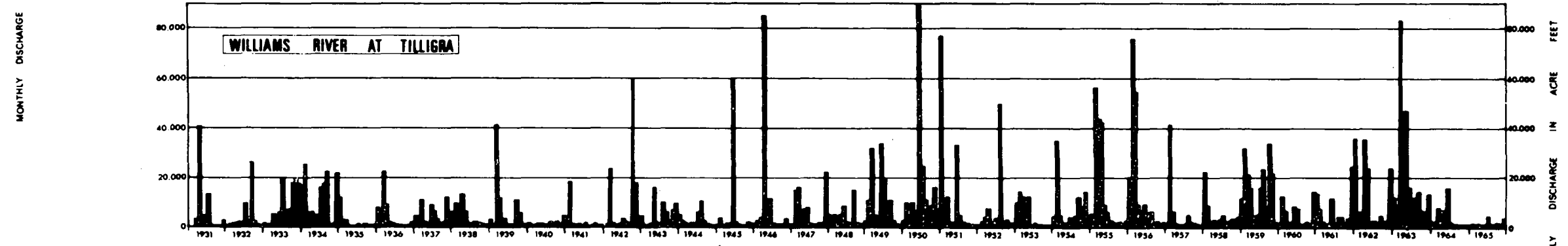
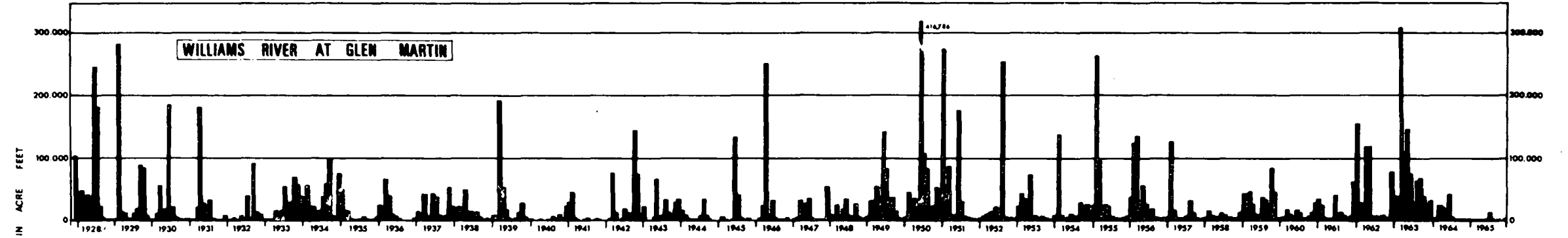
20,000

0

1958 1959 1960 1961 1962 1963 1964 1965

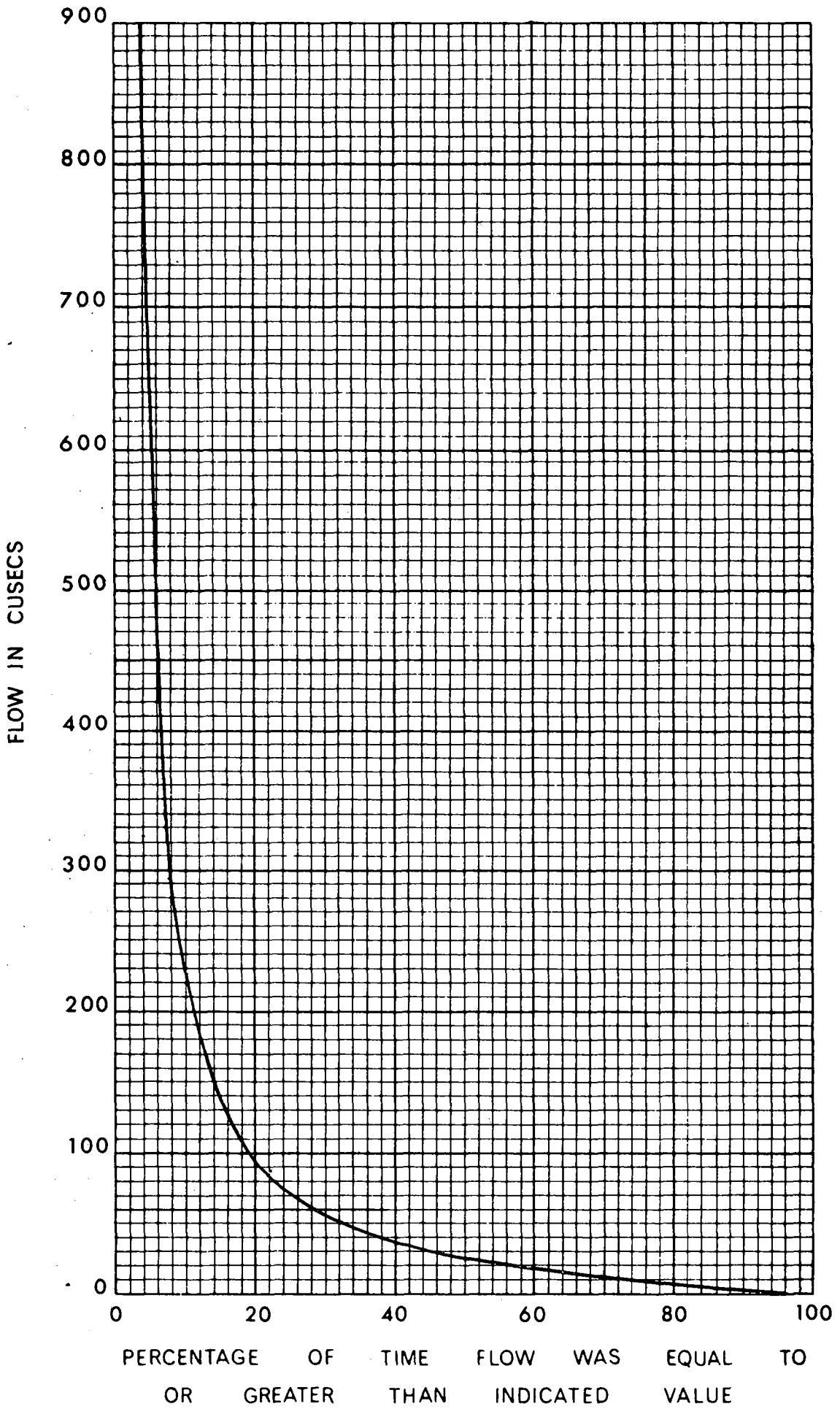
HUNTER RIVER AT BELMORE BRIDGE



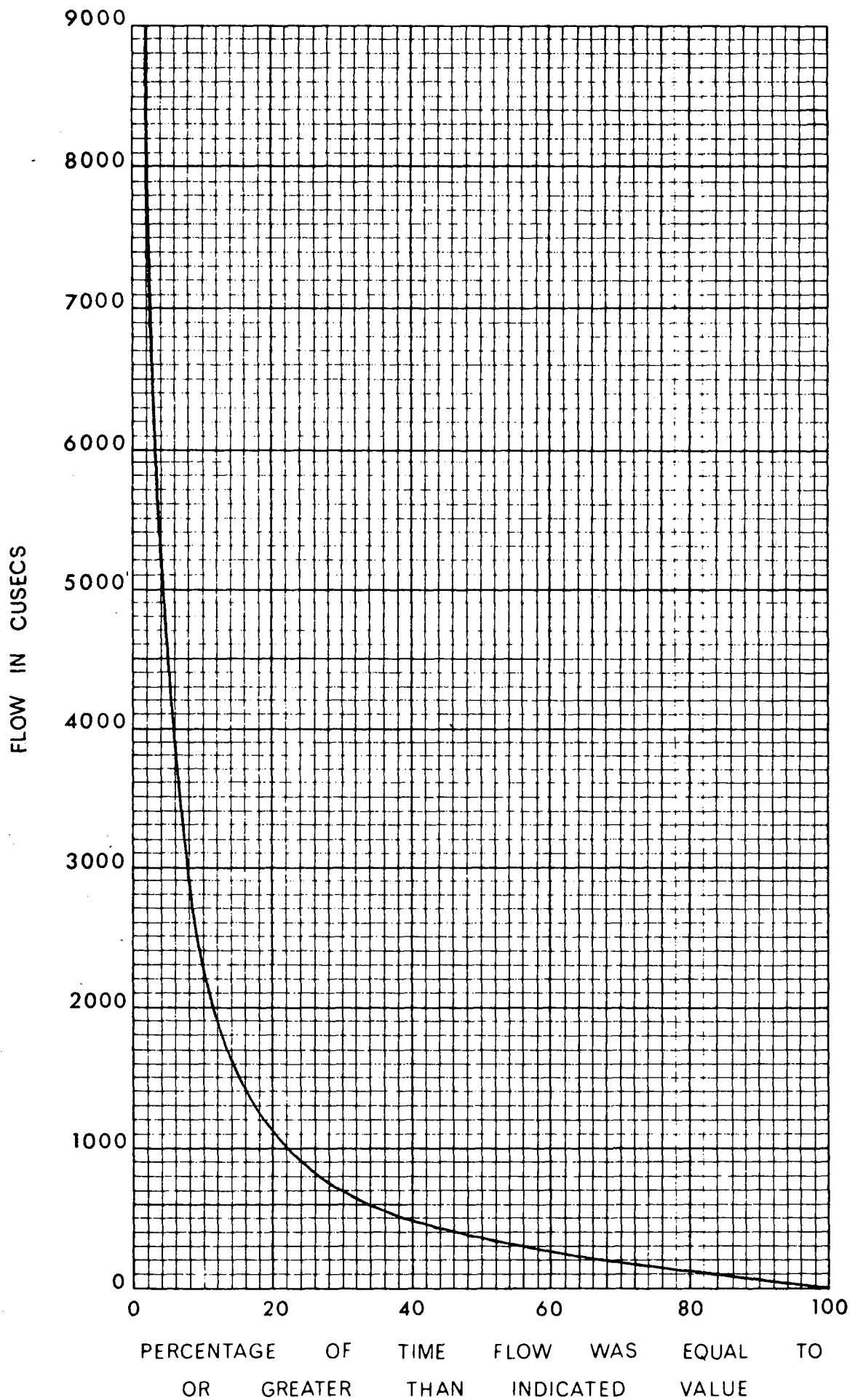


HYDROGRAPHS OF MONTHLY DISCHARGES

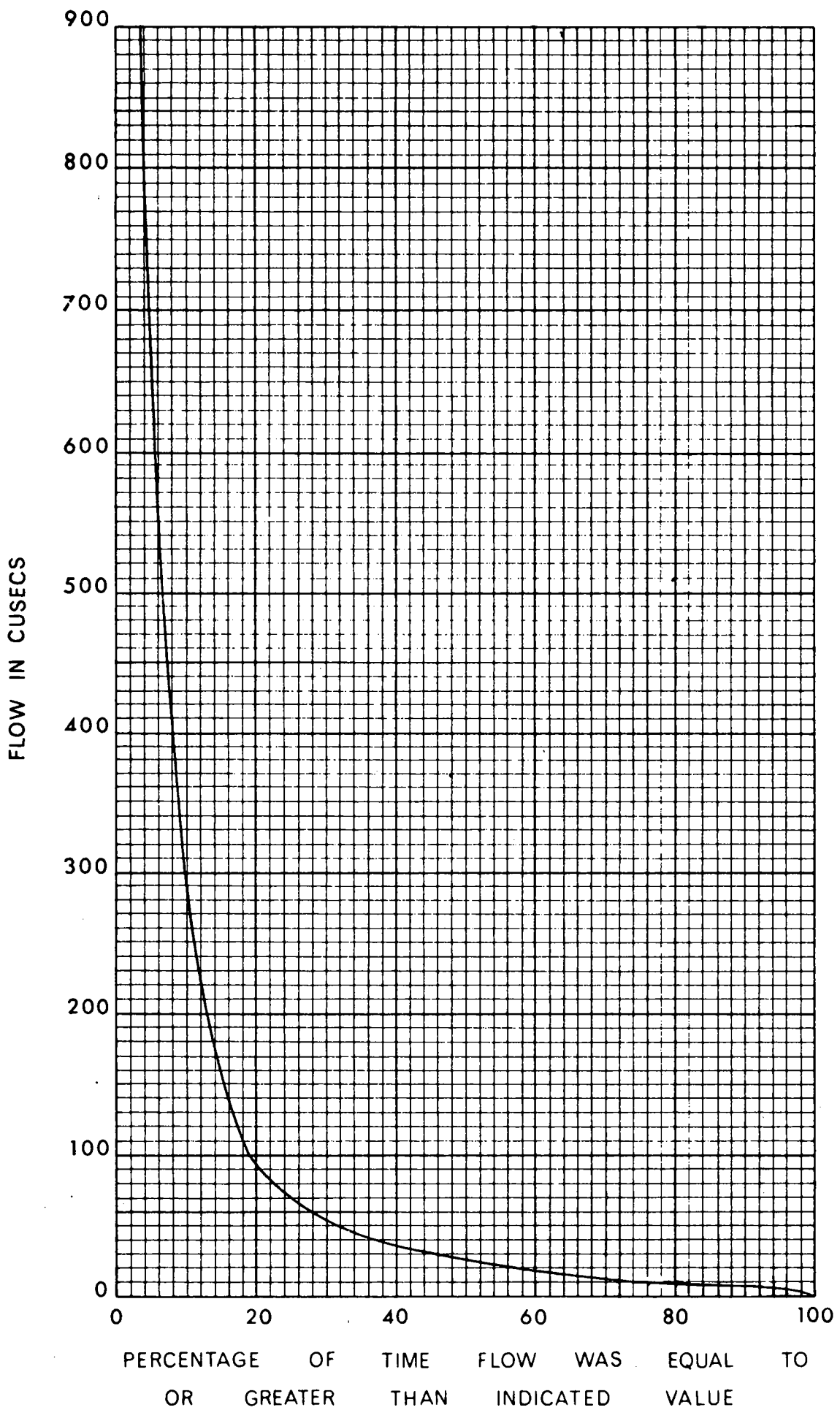
- WILLIAMS RIVER AT GLEN MARTIN
- WILLIAMS RIVER AT TILLIGRA
- PATERSON RIVER AT MOUNT RIVERS



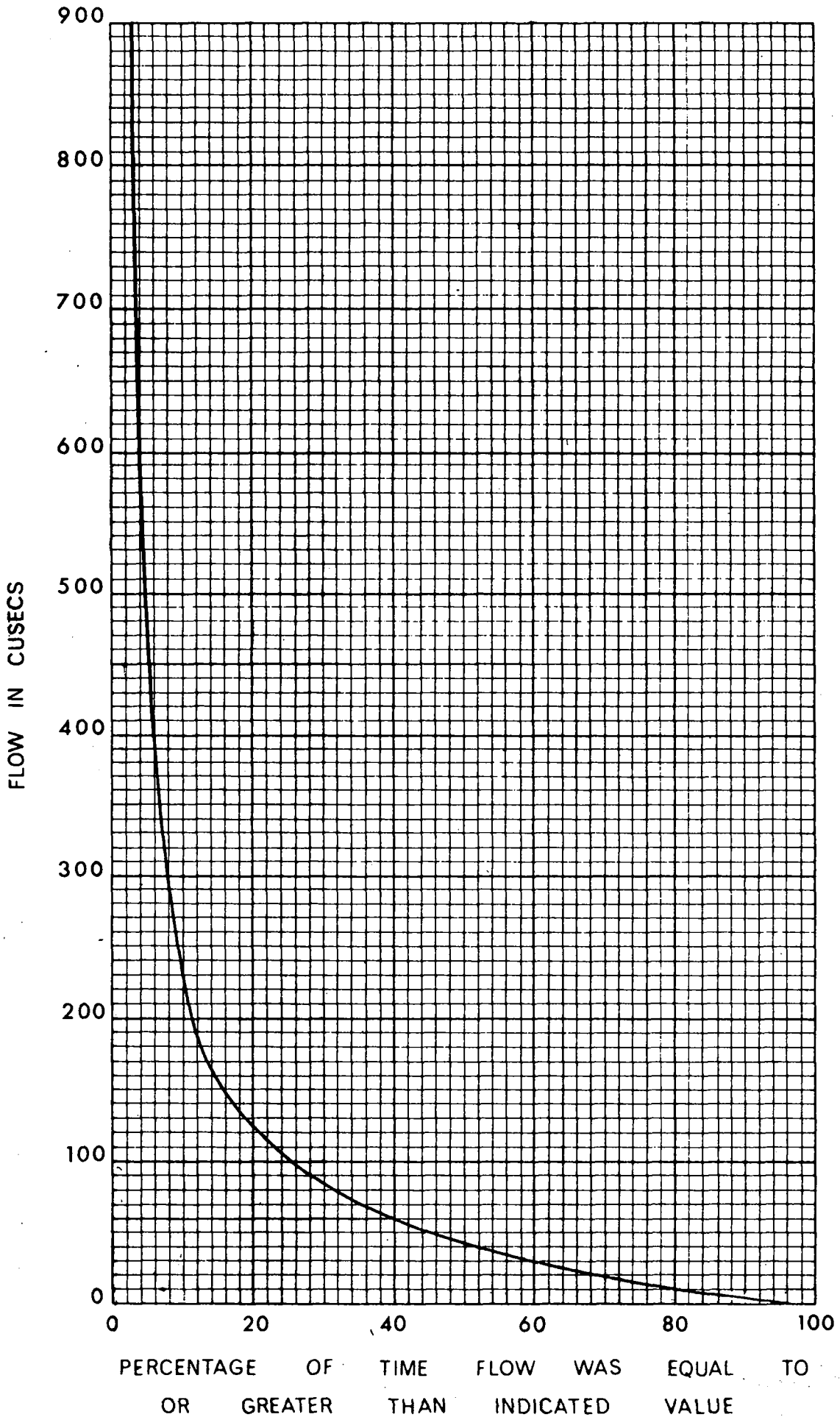
**FLOW DURATION CURVE FOR
ALLYN RIVER AT HALTON**



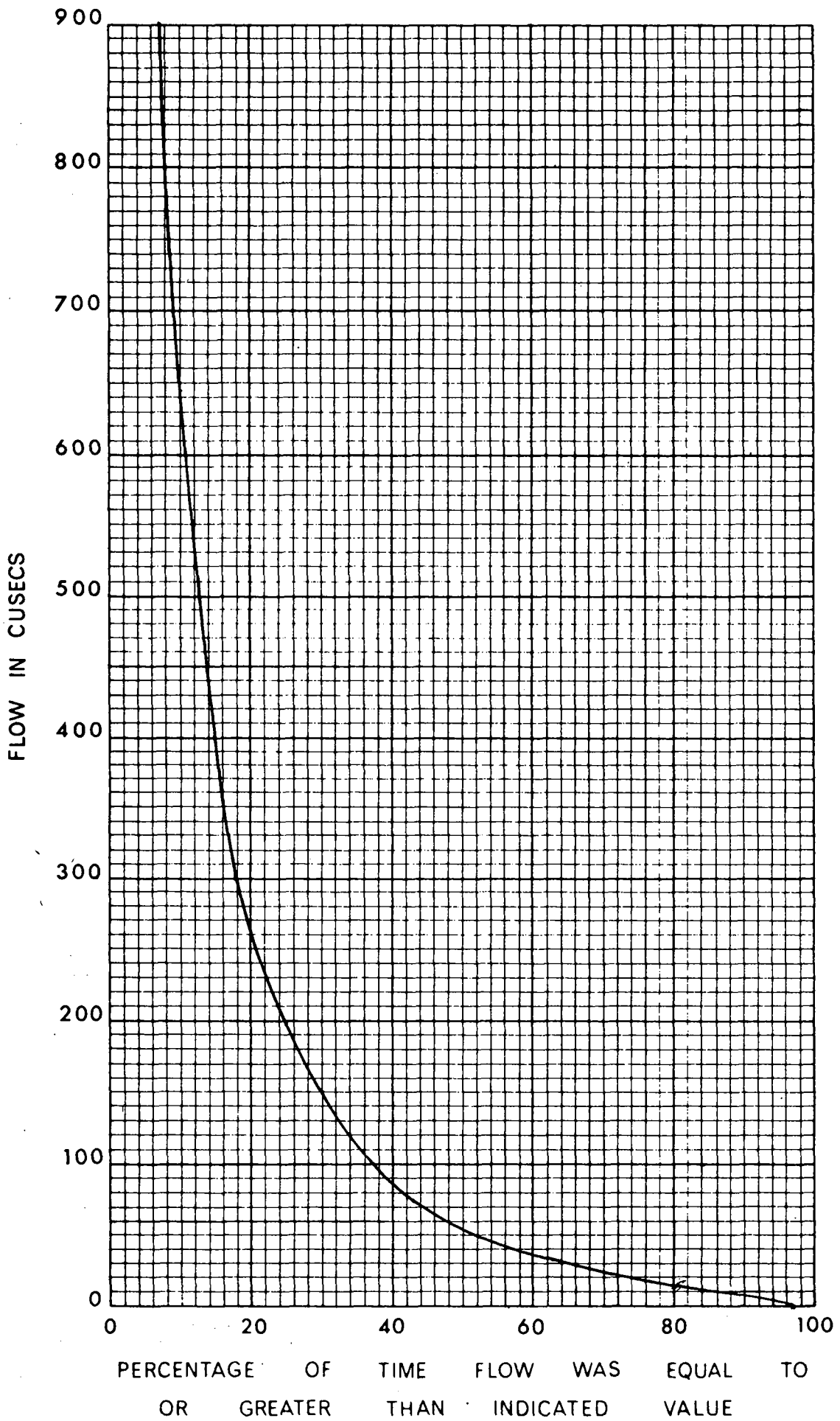
**FLOW DURATION CURVE FOR
HUNTER RIVER AT BELMORE BRIDGE**



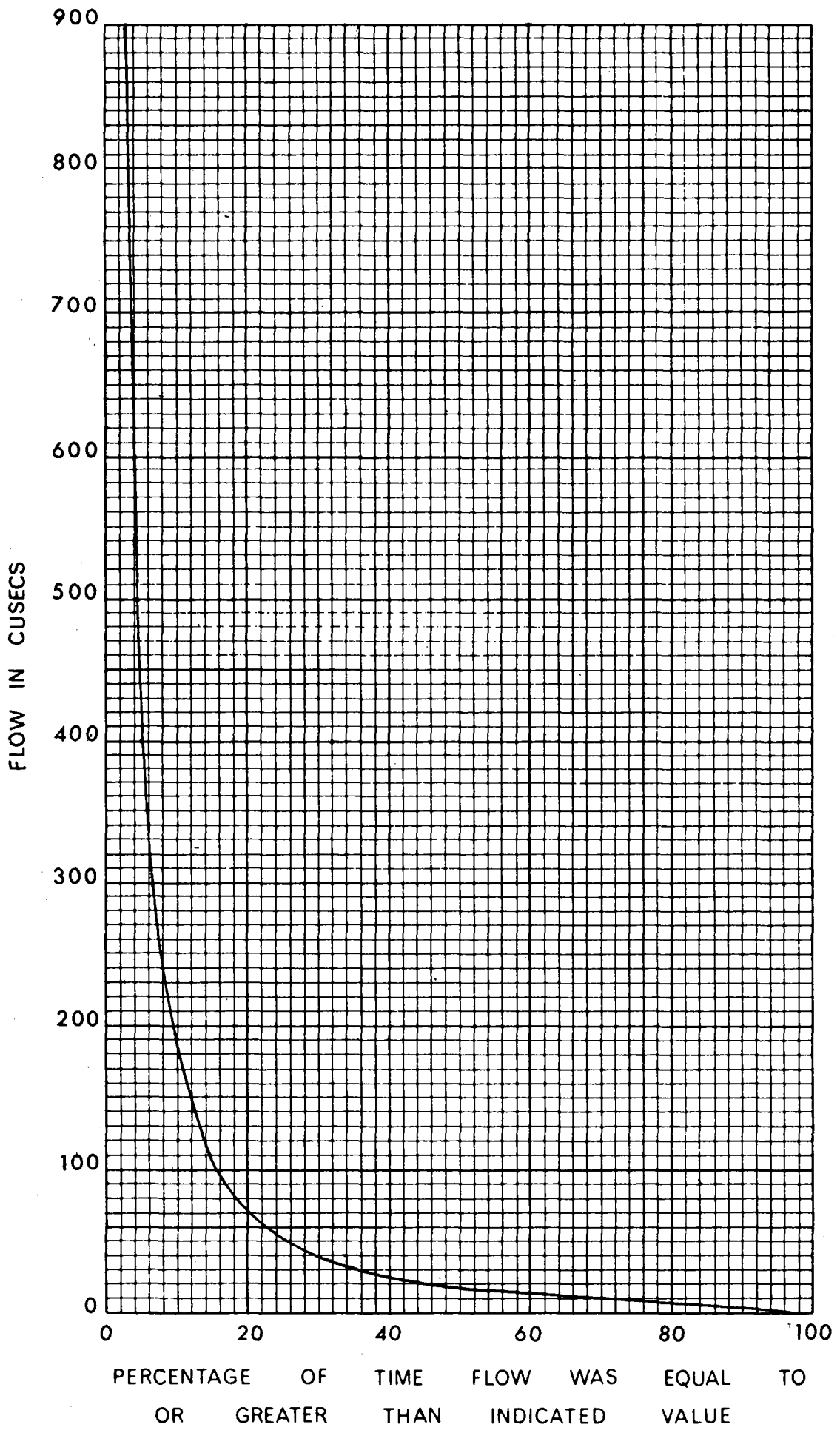
**FLOW DURATION CURVE FOR
KARUAH RIVER AT MONKERAI**



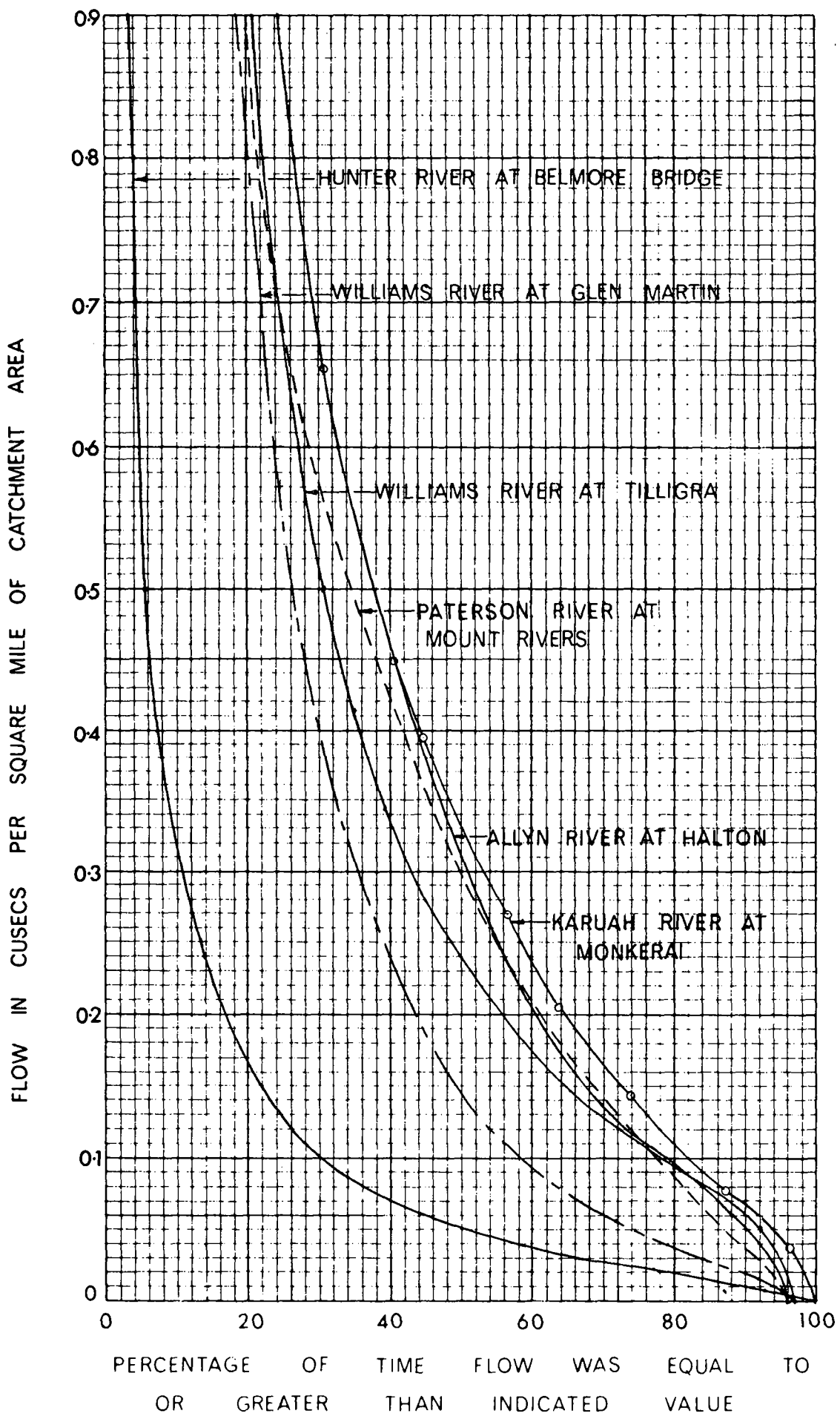
**FLOW DURATION CURVE FOR
PATERSON RIVER AT MOUNT RIVERS**



**FLOW DURATION CURVE FOR
WILLIAMS RIVER AT GLEN MARTIN**



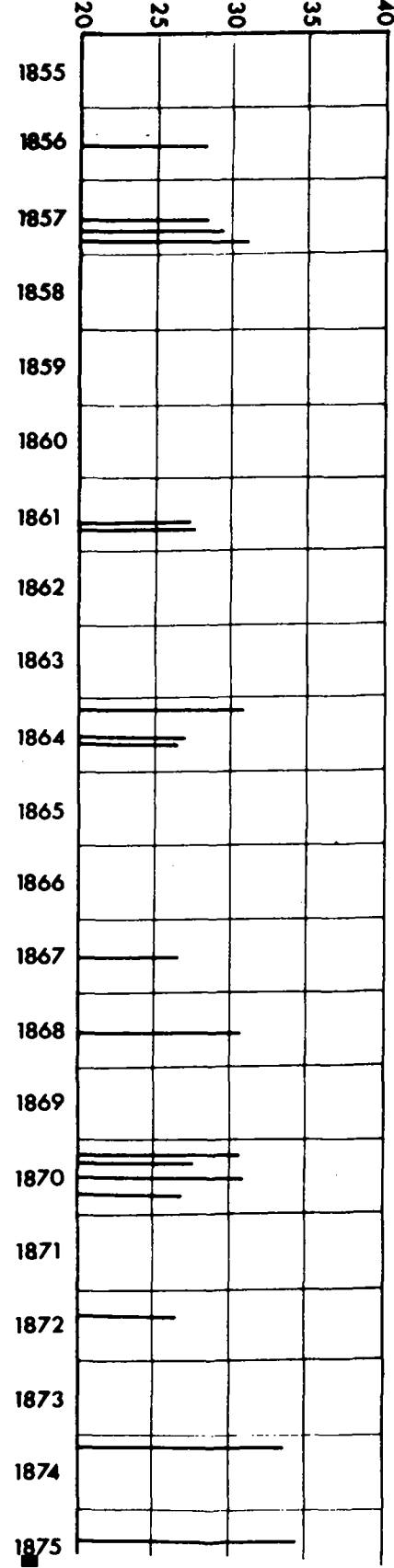
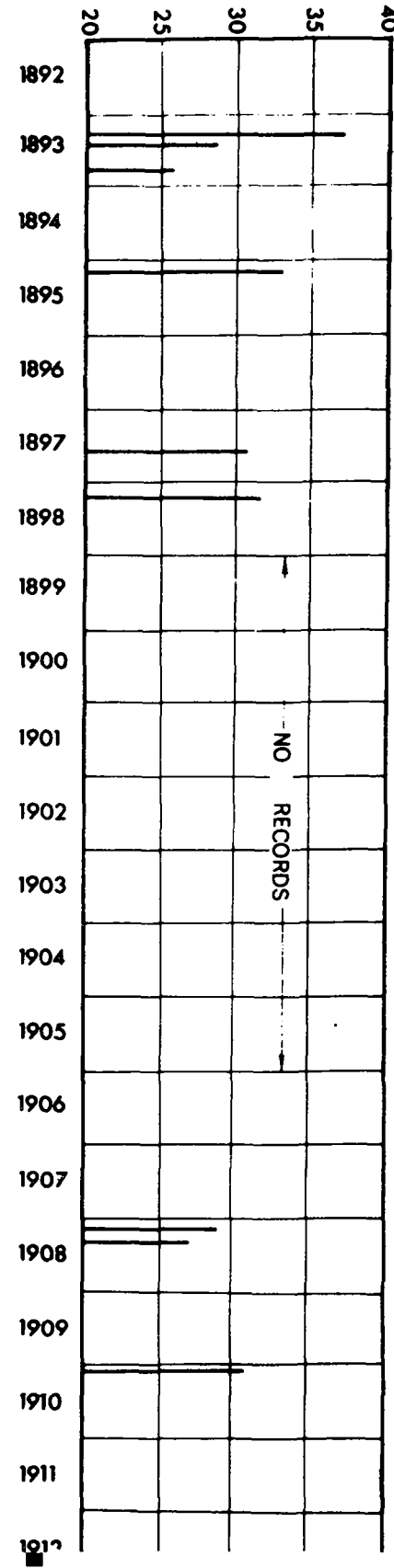
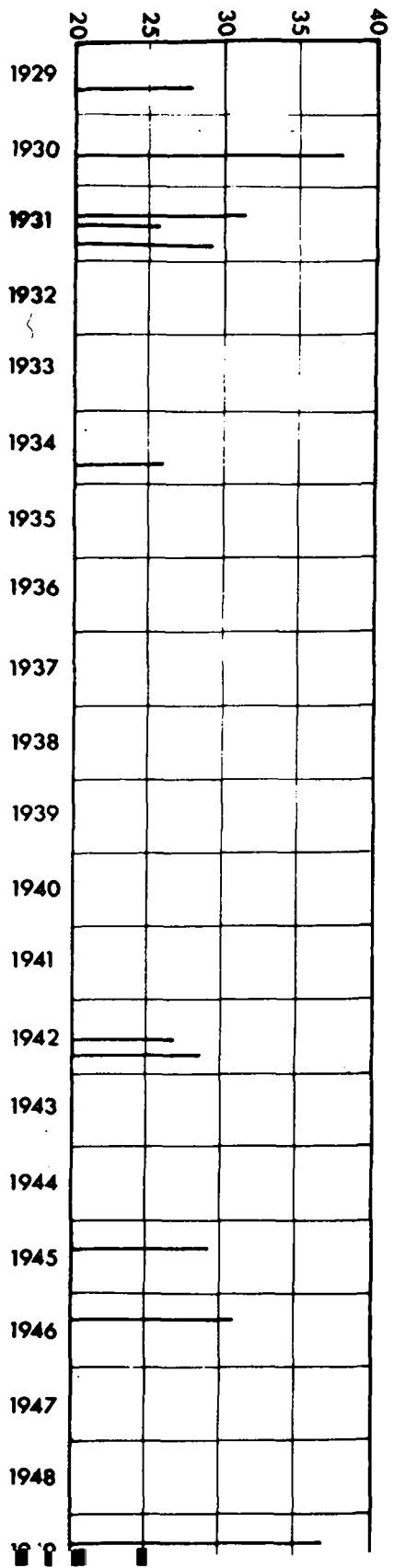
**FLOW DURATION CURVE FOR
WILLIAMS RIVER AT TILLIGRA**

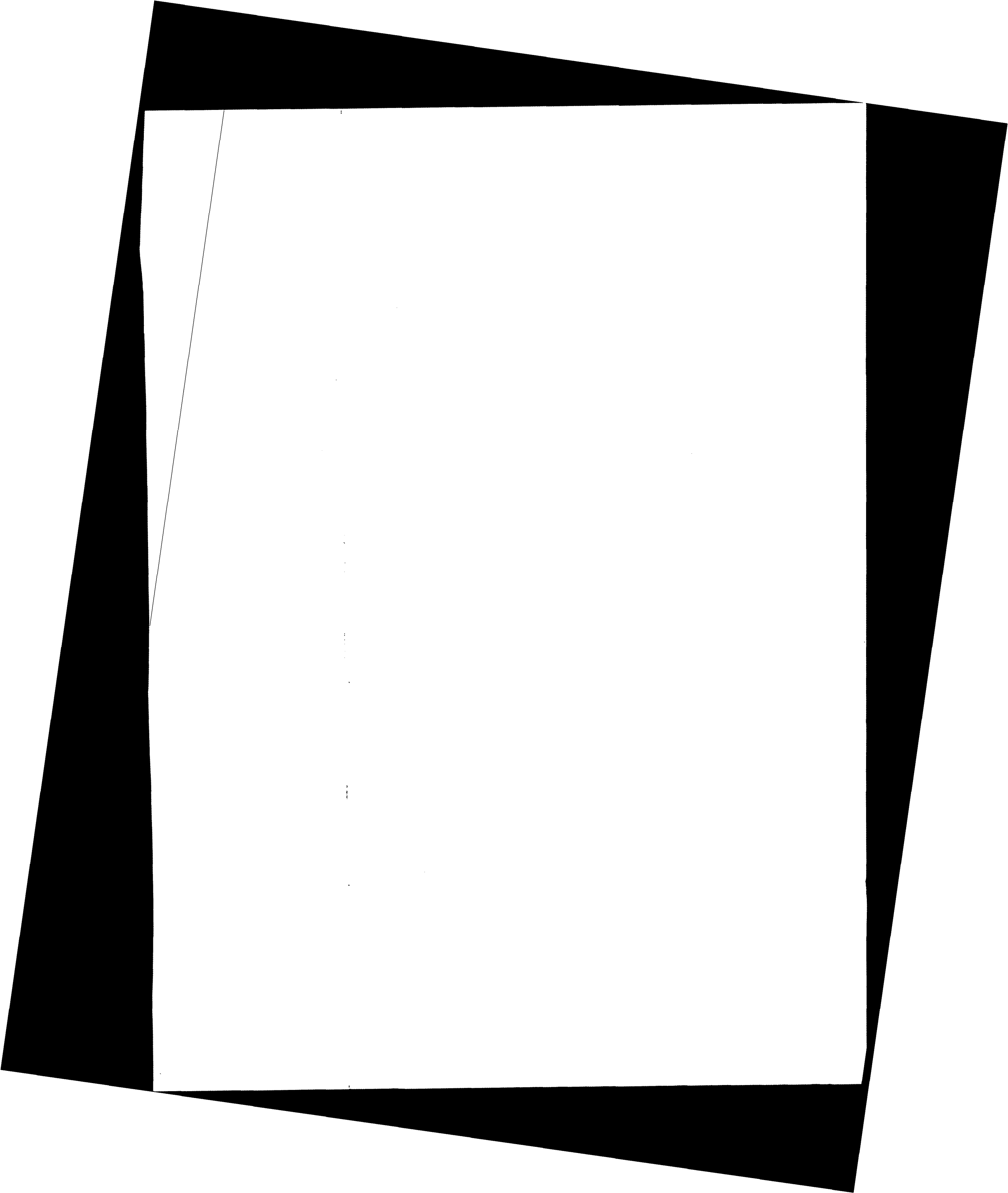


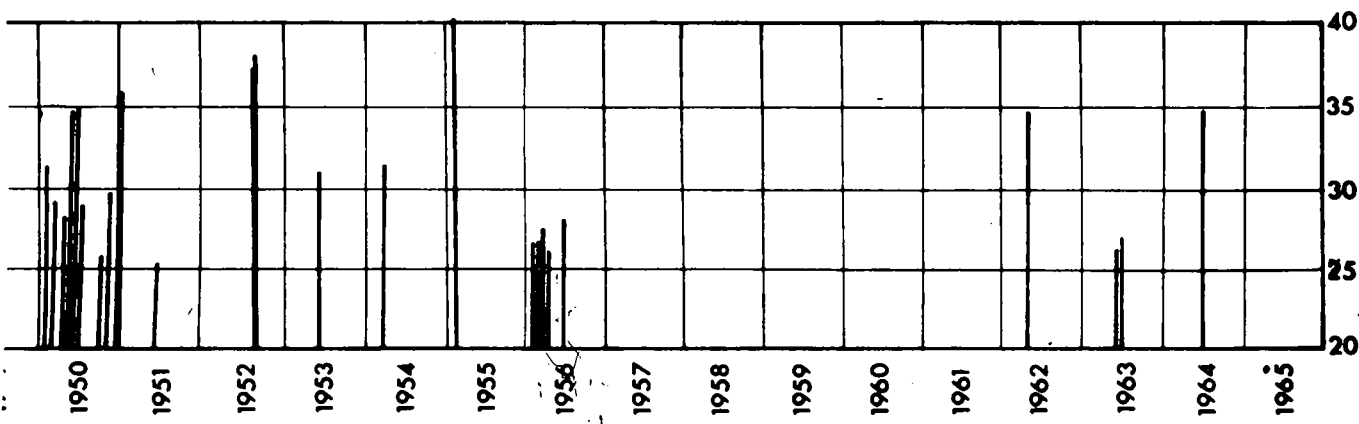
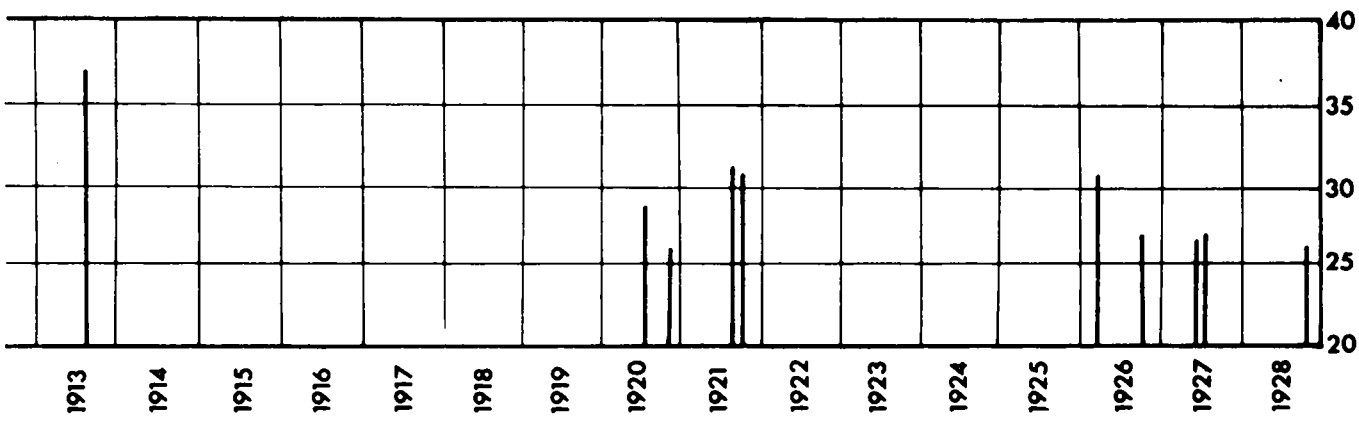
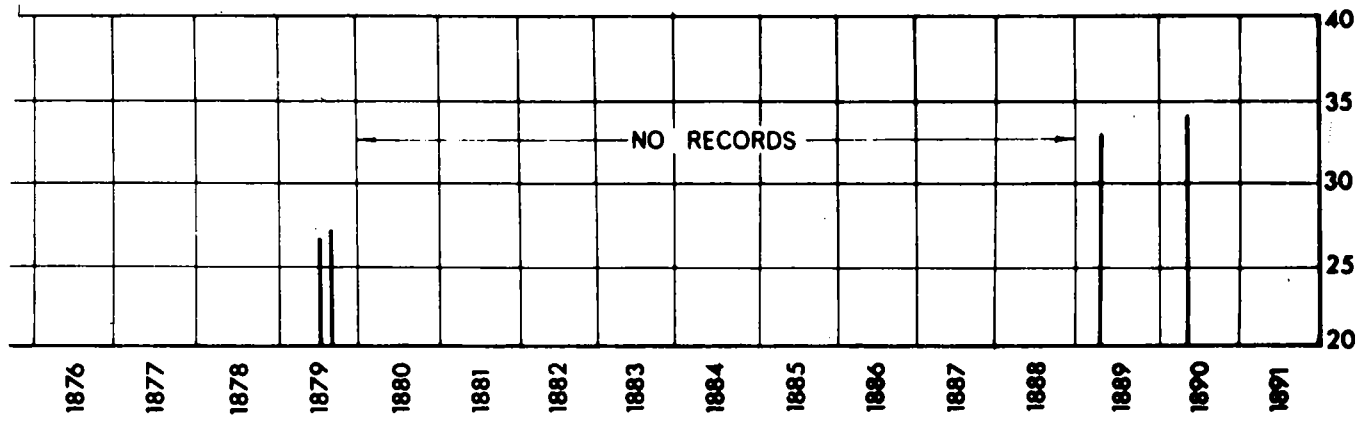
FLOW DURATION CURVES FOR LOWER HUNTER RIVER VALLEY

FLOOD PEAKS EXCEEDING 25 FEET AT

GAUGE HEIGHT AT BELMORE BRIDGE - FEET



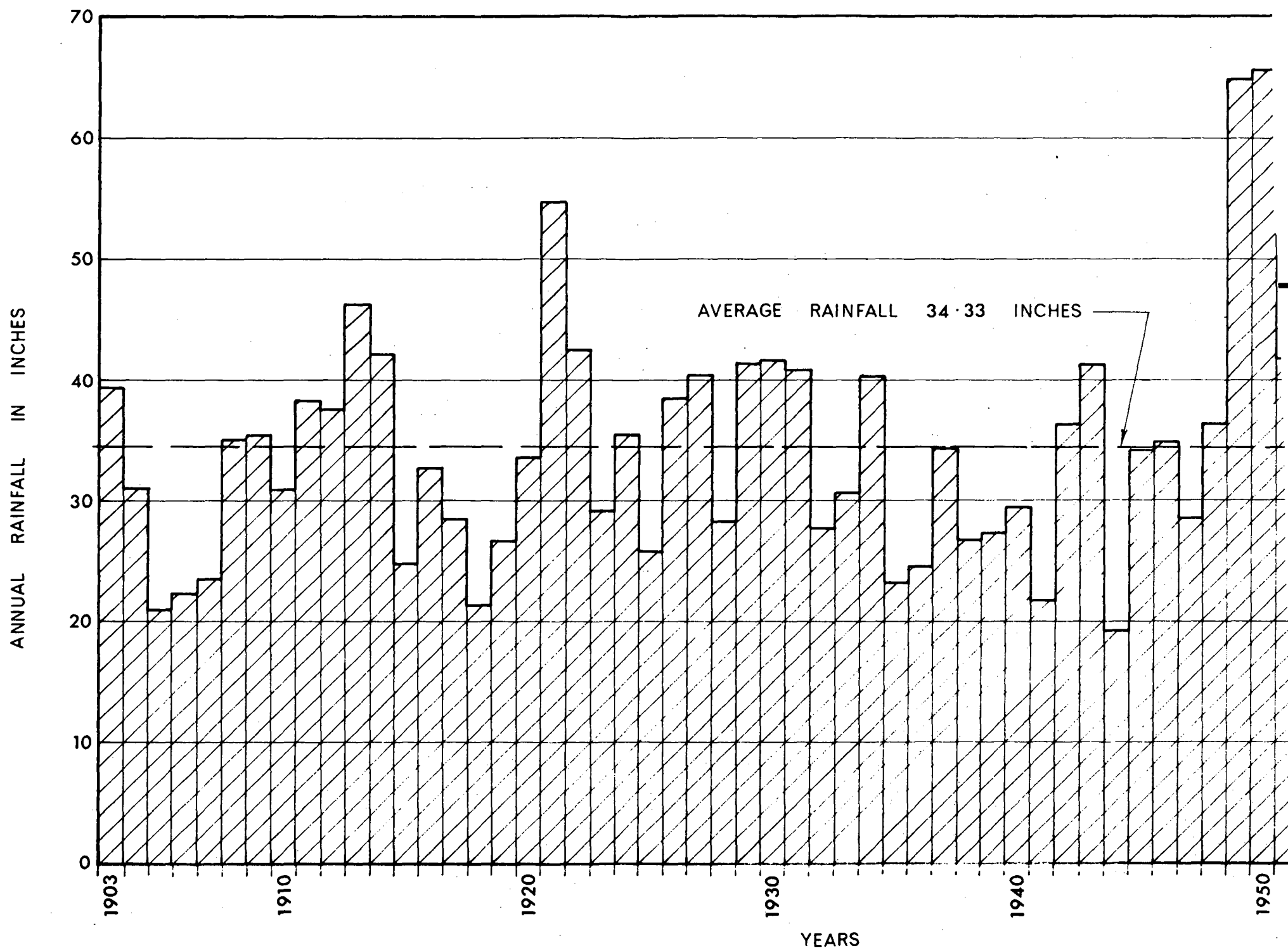




BELMORE

BRIDGE

MAITLAND



ANNUAL RAINFALLS AT EAST MAITLAND

PERIOD 1903 to 1965

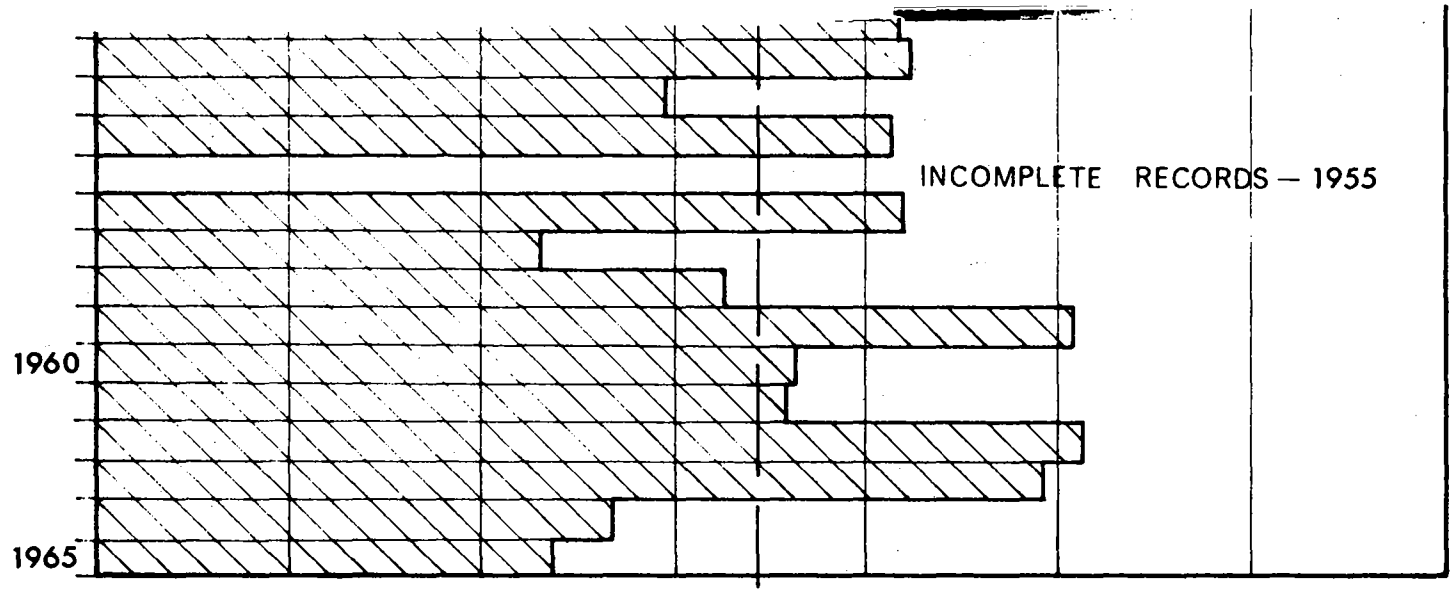
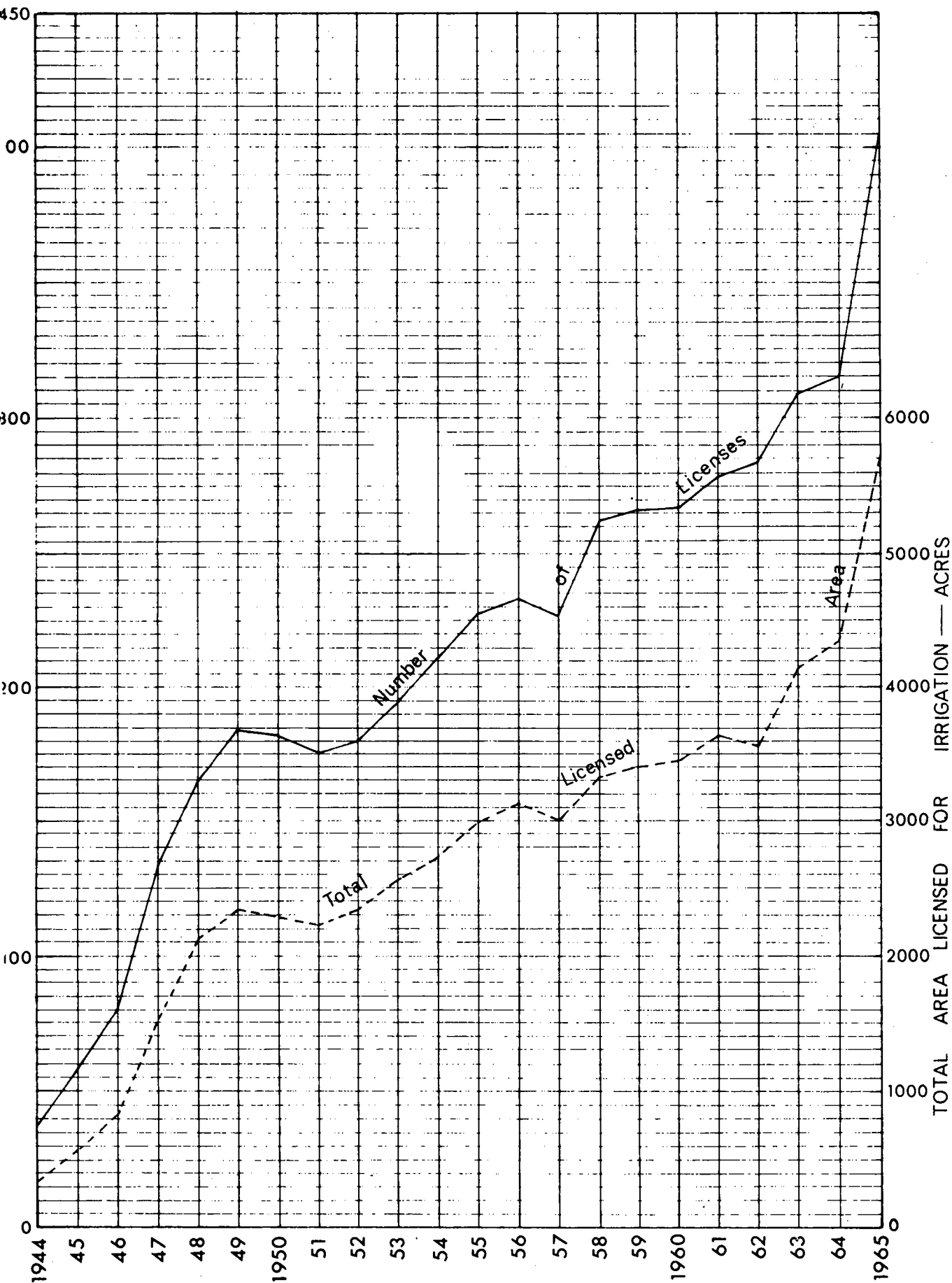


FIGURE 28



IRRIGATION LICENSES

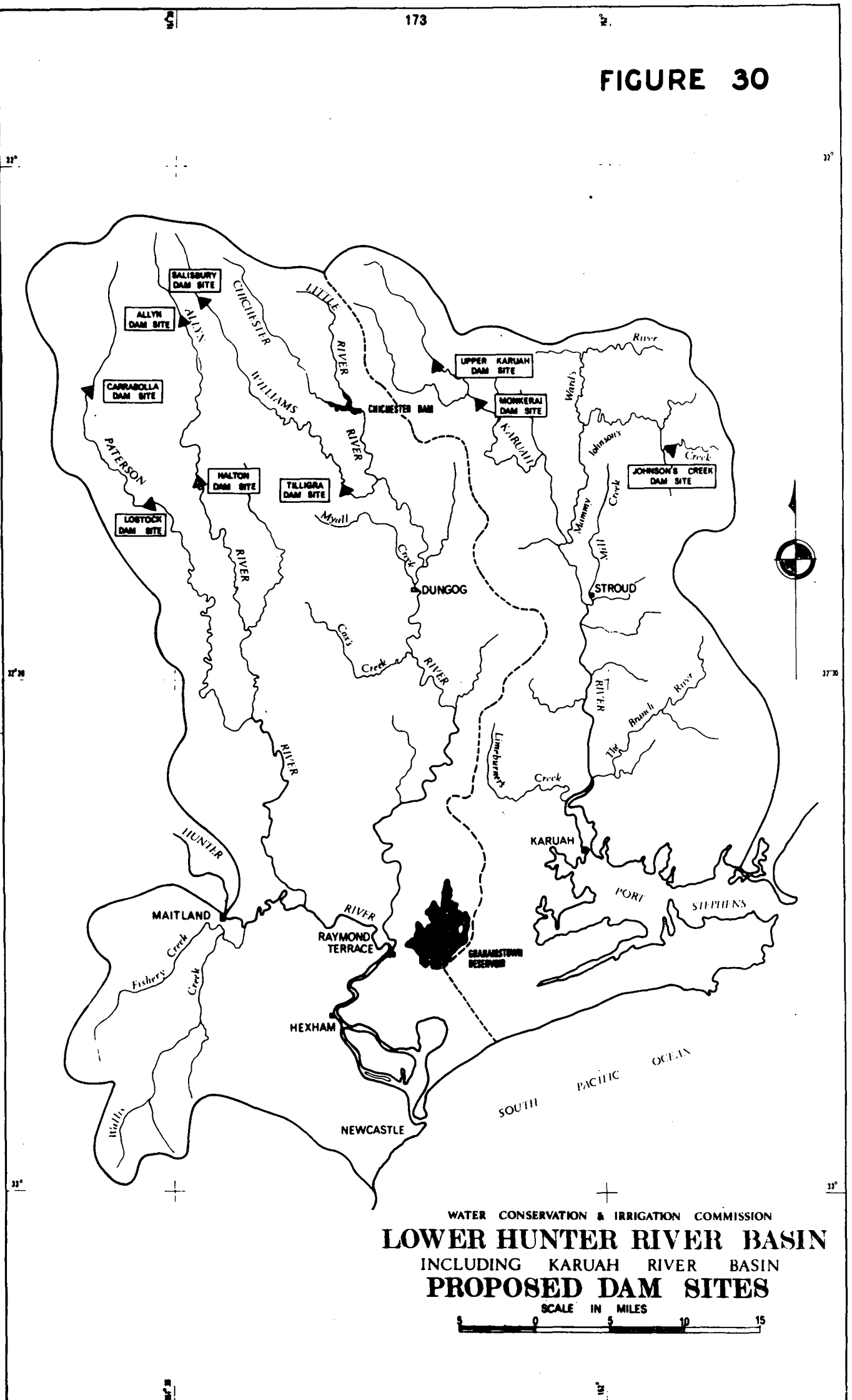
ISSUED BY

WATER CONSERVATION AND IRRIGATION COMMISSION

IN

LOWER HUNTER RIVER VALLEY

FIGURE 30



WATER CONSERVATION & IRRIGATION COMMISSION
LOWER HUNTER RIVER BASIN
INCLUDING KARUAH RIVER BASIN
PROPOSED DAM SITES

SCALE IN MILES
0 5 10 15