WATER RESOURCES

OF THE

TUROSS VALLEY

SURVEY OF THIRTY TWO N.S.W. RIVER VALLEYS

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WATER RESOURCES OF THE TUROSS VALLEY

PREFACE

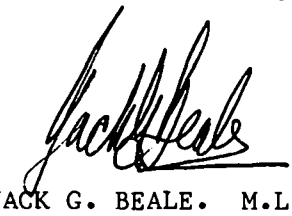
BY THE HON. J.G. BEALE, M.E., A.S.T.C. Mech. Eng.,
F.I.E. Aust., M.ASCE., M.A.S.M.E., M.A.S.A.E., M.L.A.
MINISTER FOR CONSERVATION
NEW SOUTH WALES

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, which is the largest and most comprehensive study of its type ever undertaken, involves the preparation of twenty eight reports covering thirty two major river valleys of the State.

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

Reports are being prepared progressively and those issued to date have covered twenty four major valleys and a number of minor valleys. This report on the water resources of the Tuross Valley is the twentieth to be issued.



JACK G. BEALE. M.L.A.

August, 1970.

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WATER RESOURCES OF THE TUROSS RIVER VALLEY

1. INTRODUCTION

Water is necessary for life. Without adequate water, neither man himself nor the animals, fish and plants on which he is dependent for food could survive.

The continuous minimum daily requirements of an adult has been estimated at about three quarters of a gallon, this volume being required to replenish the daily losses from the human body; which itself is composed of more than seventy percent of water.

Apart from these basic requirements for life, there are very few items used by man which do not depend, at some stage of their creation or manufacture, on water.

Water demands in a large modern city may approach 300 gallons per day, however such averages may be somewhat misleading as water demands due to industry, home gardens, parks and public services are included in determining the average demand.

Industrial water demands can be comparatively high in relation to domestic requirements. About 300 tons of water are required to make a ton of steel, 60 tons of water are used in producing a ton of paper and about 2½ tons of water are necessary to grow the grain and produce a loaf of bread. In addition it has been estimated that over thirty tons of water are used in producing a normal daily diet for an adult.

The annual water requirements of crops usually range between two to three feet, and during a drought period it is necessary to provide a major proportion of these requirements by irrigation. The relative magnitude of this demand can be assessed when it is realised that a depth of three feet over an area of only one acre represents over 800,000 gallons of water (more than 3,500 tons).

The overall amount of water on Earth has been estimated to be of the order of 320 million cubic miles and as each cubic mile is equivalent to about a million million gallons it is difficult to visualise the astronomical magnitude of this resource in terms of gallons.

Obviously there is a preponderance of this resource on the surface of the earth, over 74 percent of the total area being covered by the oceans and polar icecaps whilst the remaining 26 percent, comprising the land masses, is frequently covered by surface water in lakes or streams or by water vapour in clouds.

However, the major proportion of this resource is stored in the oceans or polar icecaps to such an extent that the amount of water in lakes or rivers represents only about 0.004 percent of the total. Furthermore, the available water resources are neither evenly distributed in time nor are they normally located in areas suitable for water resources development.

The aim of water conservation works is to reduce these variations by storing water during flood periods for subsequent release during droughts and by constructing water distribution works to enable supplies to be delivered to areas remote from river systems.

In comparison with all the other continents Australia has the least average annual rainfall, the average being only about 1½ feet whereas Africa, Asia, Europe and North America all receive about 2 feet and South America receives an average of almost 4½ feet.

However, when losses due to the natural processes of evaporation, transpiration and seepage are deducted from the average rainfalls of the continents, the residuals (or surface water resources), show that Australia's runoff is much lower than indicated by the average rainfalls. The average annual surface water resources of the Australian mainland have been assessed at about 240 million acre feet per annum which is equivalent to a depth of less than 2 inches over the continental area. In comparison, runoffs for other continents are 7 inches in Africa, 9 inches in Asia and 11 inches in North America and about 19 inches in South America

In addition to the relatively low average annual runoff over the continent, Australian streams tend to exhibit great variability in flows. Therefore, it is necessary to construct relatively large water conservation storages if assured water supplies are to be maintained over the full period of each drought.

The water resources of a nation are of major importance to national economy, the welfare of the community depending to a large extent on their proper development and use. Water conservation in Australia is therefore a service of prime national importance, increasing living standards and overall national wealth.

The average annual surface water resources of the Tuross River Valley have been assessed as averaging about 420,000 acre feet which is equivalent to a percentage runoff of 28 percent of the average valley rainfall of about 34 inches.

2. PHYSIOGRAPHIC FEATURES

The Tuross River Valley is located in the south east coastal region of New South Wales and comprises a total area of about 840 square miles. The boundaries of the valley, as adopted for the purposes of this report, are those enclosing the catchment area of the Tuross River and its tributaries, together with the catchment areas of all seaboard streams draining into the South Pacific Ocean between the vicinities of Mullimburra Point in the north and Tilba Tilba Lake in the south.

The adopted boundaries of the Tuross River Valley are shown at Figure 1, together with the location of the principal streams, towns and geographical characteristics of the valley.

The Tuross Valley is bounded on the north by the Moruya Valley, on the west by the Murrumbidgee Valley and on the south by the Bega Valley.

The general topography of the Tuross River Valley is similar to the other rugged valleys on the New South Wales south coast, such as the Clyde, Moruya, Bega and Towamba Valleys. The valley is predominantly mountainous, this terrain extending from the extreme western boundary to within about five miles from the coast. Even near the coastline the terrain is undulating to steep with no extensive areas of flat land.

The headwaters of the Tuross River rise in the south-west of the catchment in the Kybeyan Range at elevations of about 4,000 feet. The main peak in this area being Kydra Peak at an elevation of 4,050 feet, and Mount Wadbilliga which rises to nearly 4,400 feet.

Dolondundale Creek and Back River comprise the headwaters of the system, and join to form the Tuross River about 7 miles north of Kydra Peak.

The Tuross River flows generally in a northerly direction for about 20 miles being joined by Guinea Creek on the left bank, which rises in the Kybeyan Range near Countegany. A notable peak to the east of the Tuross River near Countegany is Mount Jillicambra with an elevation of nearly 3,400 feet.

The western boundary of the Tuross Valley north of the Kybeyan Range is the Tuross Range, the northern limit of this Range being at Big Badja Hill with an elevation of about 4,500 feet. Both the Kybeyan and Tuross Ranges form part of the Great Dividing Range along this section of the coastal catchments.

East of Mount Jillicambra the Tuross River is joined on the left bank by Woila Creek which rises in the vicinity of Big Badja Hill. Below this junction the Tuross River turns to the south east and is joined on the right bank by the major tributary of the Wadbilliga River about five miles east of Mount Belowra. The main tributary of Wadbilliga River is the Yowrie River which rises in the southern boundary of the catchment between Mounts Wadbilliga and Murrabrine.

Wandellow Creek is another southern major tributary of the Tuross River and rises near Mount Murrabrine at an elevation of over 2,500 feet. A notable peak in its catchment is Peak Alone which rises to over 3,100 feet.

The mid northern section of the valley is drained by the main tributaries of Belimba and Gulph Creeks, the former passing the village of Belowra and the latter passing Nerrigundah.

The only remaining significant tributary of the Tuross River is Reedy Creek which rises to the west of the two peaks of Mount Dromedary which rises to about 2,600 feet above sea level.

A number of small coastal streams in the valley drain into coastal lakes which discharge into the South Pacific Ocean. In addition to Tuross Lake, into which the Tuross River flows, these lakes include Coila, Mummuga, Wagonga, Nangudga, Corunna and Tilba Tilba Lakes between the coastal extremities of the valley.

Because of its topographical shape and proximity to the ocean, the climate throughout the valley is influenced to a great degree by the elevation of the landform.

The undulating country near the coast supports an active dairying industry with associated fodder cropping on a number of holdings. Because of the small proportion of coastal plain areas in the valley, the dairying industry is not as prominent as in the adjacent Moruya or Bega River Valleys. Apart from small areas near the coastal township of Narooma, cultivation in the coastal plain is uncommon.

The densely forested elevated western sections of the valley are mostly unsuitable for agricultural or grazing pursuits. Only in small pockets in the vicinity of Belowra, Yowrie and Wandellow is the terrain suitable for cattle grazing and dairying activities.

The generalised land slopes of the Tuross River Valley are shown at Figure 2. Rugged and mountainous terrain, comprising land slopes greater than 15 degrees, predominates throughout the valley and it is assessed that about 81 percent of the total catchment area would be contained within this classification. Figure 2 indicates that these steep slopes extend to within a short distance from the coast, thereby limiting significant development of agricultural and grazing pursuits in the greater part of the valley.

Hilly to steep terrain (land slopes between 8 to 15 degrees) provides a transition along the south coastal area of the catchment between the mountainous country and the undulating coastline and comprises about 6 percent of the total catchment area.

The remainder of the catchment is comprised mainly of undulating to hilly terrain (land slopes between 3 and 8 degrees) with isolated areas of flat land (slopes less than 3 degrees) adjacent to the coastal lakes and estuaries. The undulating country occurs mainly along the coastline, containing most of the dairying and cropping holdings, and comprising about 12 percent of the total catchment area. Flat land is very sparse in the valley and only totals about 1 percent of the catchment area.

Timber resources in the Tuross Valley are plentiful with about 20 percent of the total catchment area dedicated as either State Forests or Timber Reserves; the largest individual area being the Dampier State Forest and Timber Reserve with an area of about 90,000 acres. Large areas of heavily timbered Crown and private lands also exist in the mountainous western regions of the valley. Timber getting is a major industry in the valley and saw mills near the coast provide large quantities of commercial timber mainly of the hardwood species. The Blackbutt and Spotted Gum species of hardwoods are the most predominant in the valley with small amounts of Stringy Bark and Iron Bark species also in existence.

3. CLIMATIC FEATURES

Rainfall

Orographic effects control the general distribution of rainfall over the Tuross Valley, rainfall increasing with land elevation. Along the central western section of the Tuross Valley, a marked rainshadow exists. Elsewhere, rainfall generally increases with increasing elevation. Annual median rainfalls range from less than 30 inches over the rain shadow areas to more than 45 inches over the higher peaks of the western boundary of the catchment. The coastal section of the region has an annual median rainfall of between 30 and 35 inches. (The median is that rainfall equalled or exceeded on 50 percent of occasions). The distribution of annual median rainfall across the region is shown at Figure 3 and monthly rainfall distributions are shown at Figures 4 to 15 inclusive.

The river valley is sheltered from moist south to west airstreams by the Australian Alps. These airstreams are the major rain producing airstreams over southern New South Wales in winter and spring. Consequently, the period August through November is relatively dry, receiving only about 25 percent of the annual rainfall. August, which receives about 5% of the annual rainfall on the average, is the driest month. In this month median rainfalls vary from approximately 1 inch in the north to 2 inches in the south of the region. Median rainfalls in the wettest month which may occur in any one of the summer months December, January or February, depending on location, are between 2½ and 3 inches.

Monthly and annual rainfalls recorded at Bermagui South, Bodalla, Bodalla State Forest, Cobargo, Countegany, Krawarree, Narooma Post Office, Nerrigundah and Tilba Tilba are given in Appendices 1 to 9.

Very heavy storm rainfalls occur over the catchment from time to time when an active depression is centred off the New South Wales coast to the north of the valley. Storms of this nature occur on an average of about twice per year. The estimated extreme 24 hour fall for a point in the catchment is of the order of 15 inches. The highest fall on record for a station in the catchment for a 24 hour period ending 9.a.m. is 11.55 inches at Bodalla on 9th April, 1945.

Maximum monthly totals on record are generally about 25 to 30 inches on the coast decreasing to about 16 inches over the sheltered valleys of the upper reaches of the river. Maximum yearly totals range from more than 75 inches on the coast to 50 inches inland. The Tables at Appendix 10 show on a monthly and annual basis for Bermagui South, Bodalla, Bodalla State Forest, Cobargo, Countegany, Krawarree, Narooma Post Office, Nerrigundah and Tilba Tilba the following data:-

(1) The maximum and minimum rainfall totals on record

(2) The 10th, 30th, 50th, 70th and 90th percentiles.

(A rainfall observation less than the 10th percentile can be expected once in ten years on the average. Similarly a rainfall observation less than the 70th percentile can be expected seven times in ten years, or alternatively, a rainfall observation greater than the 70th percentile can be expected on an average of three years in ten).

Tables for Bodalla and Cobargo indicating the minimum cumulative rainfalls on record commencing in any month of the year and continuing for up to 12 months are shown at Appendix 11.

Although low rainfall totals may be recorded over a few consecutive months on occasions it is rare for the valley to experience prolonged dry spells. On 90 percent of occasions at least 6 inches are recorded in any six consecutive months. The corresponding median value is about 12 inches. Stations in the catchment rarely record an annual total of less than 20 inches.

Temperature

Temperature averages for Moruya located on the coast to the north of the valley, and Bodalla are presented in Tables 1 and 2. These stations are representative of the coast and the lower parts of the valley inland from the coast respectively. Averages for the higher parts of the catchment may be estimated by decreasing the averages for Bodalla by 4°F. per 1000 feet increase in elevation above Bodalla.

TABLE 1

MORUYA (Elevation 55 feet)

Average Temperature (°F.) Based on 30 Years of Record

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average Maximum	73.5	74.5	72.9	69.5	65.2	61.3	60.0	61.7	64.7	67.3	69.2	71.8	67.6
Average Minimum	61.1	62.1	59.8	55.1	49.7	45.5	43.7	44.4	47.9	52.2	55.6	59.1	53.0
Average Daily	67.3	68.3	66.4	62.3	57.4	53.4	51.9	53.1	56.3	59.8	62.4	65.4	60.3
Highest on record 111.0°F.							Lowest on record 31.5°F.						

TABLE 2.

BODALLA (Elevation 40 feet)

Average Temperature (^{o}F) Based on 25 Years of Record

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Average Maximum	76.2	77.6	75.4	71.1	66.5	62.9	62.1	64.0	67.5	70.2	72.2	74.9	70.0
Average Minimum	58.2	59.2	55.9	50.4	44.2	39.0	37.4	39.1	43.2	48.4	52.6	56.4	48.7
Average Daily	67.2	68.4	65.7	60.7	55.3	50.9	49.7	51.5	55.3	59.3	62.4	65.7	59.3
Highest on record 113.0^{o}F.							Lowest on record 25.5^{o}F.						

Very hot days are experienced on occasions in the summer. On the coastal fringe temperatures exceeding 100 degrees are recorded on an average of slightly less than one day per year while temperatures exceeding 90 degrees are experienced on an average of 4 days per year. Over the lowest parts of the valley inland from the coast, temperatures exceeding the above limits occur more frequently.

On occasions of clear skies and light winds in winter, very low overnight temperatures can occur particularly over the higher parts of the catchment. Bodalla has recorded an extreme minimum temperature of 26 degrees. It is expected that temperatures as low as 16 degrees could occur over parts of the catchment above 1,500 feet.

Frost.

Frost incidence increases from almost nil on the coast to more than 50 per year over the higher parts of the hinterland where frosts can occur in any month of the year. Severe frosts, however are usually confined to the months May through September, over the higher parts of the catchment. The season shortens rapidly in length with decreasing elevation and decreasing distance from the coast.

Sunshine

Estimates of the average number of hours bright sunshine per day in each month for the valley are shown in Table 3. These estimates are based on cloud amount observations.

TABLE 3

Average Duration of Sunshine in Hours per Day

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
8.1	7.9	7.4	7.3	6.5	6.0	6.5	6.8	7.5	8.1	8.3	8.2	7.4

Evaporation

Estimates of the average monthly and annual evaporation from an Australian sunken tank are shown in Table 4 together with the estimates of the standard deviation. These estimates are based on radiation, air temperature and humidity considerations.

TABLE 4

Estimated Average Monthly and Annual

Evaporation in Inches for the Tuross Valley

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Evaporation	5.4	4.4	3.8	2.3	1.7	1.2	1.4	1.7	2.4	3.2	4.8	5.3	37.6
Standard Deviation	0.7	0.8	0.7	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.6	0.8	2.7

Wind

The region experiences strong winds on occasions under the following meteorological conditions:-

(1) Easterly to southerly winds with average speeds of up to 50 miles per hour and gusts up to 70 miles per hour or more may occur on the coast when an active depression is located off the New South Wales coast.

(2) Strong north to north-west winds with average speeds of 50 miles per hour may occur as the pressure gradient tightens ahead of an approaching southerly change.

(3) Violent wind gusts are associated with severe local storms such as thunderstorms.

Table 5 shows the extreme wind gust likely to be experienced at a point in the region for various return periods.

TABLE 5

Estimated Extreme Wind Gusts to be Expected with Given Return Periods

Return Period (Years)	10	20	50	100
Extreme Wind Gust Equalled or Exceeded (Miles per Hour)	85	90	100	105

4. GROUNDWATER POTENTIAL

There is practically no data available on the availability of groundwater within the catchment area of the Tuross River. Only eight bores and wells are registered, and records of most of these are incomplete. This section of the report will therefore consist of a brief summary of the geological conditions in the area, followed by a generalised statement of the groundwater potential of the valley.

The catchment lies within the belt of folded Palaeozoic rocks which extends up the eastern coast of Australia. The oldest rocks exposed are of Cambrian age. These have been subjected to a number of major earth movements during which they have been folded and fractured, so that now they are cut by an intricate system of joints. Rock types represented are mainly sedimentary, including chert, shale, siltstone, sandstone and conglomerate, with minor amounts of volcanic agglomerate and lava. The outcrop is restricted to a small area extending northwest from the coast south of Narooma.

The most widely distributed of the Palaeozoic rocks, which underlie most of the catchment area, are of Ordovician age and include slate, phyllite, siltstone, sandstone, schist, quartzite , greywacke and limestone. They are also strongly folded and jointed, to a degree comparable with the deformation of the Cambrian rocks.

During the Silurian Period, and much of the Devonian Period, no sedimentary rocks were formed in this area, but the main deformation of the older rocks took place. During the Devonian Period, granite was intruded and this rock now outcrops extensively in the western areas of the valley.

Rock formation recommenced in the Upper Devonian, with the extrusion of volcanic rocks such as rhyolite. This was followed by the deposition of a sequence of shale and sandstone mainly of continental origin, grading up into conglomerate, sandstone and shale. As shown at Figure 16, these beds were gently folded and a meridional belt across the central part of the catchment east of Eurobodalla consists of a shallow synclinal structure. Another large area of outcrop is present in the south-western part of the catchment.

The only rocks of Cretaceous (Mesozoic) age in the area are of igneous nature and outcrop in the extreme south-east, west of Cape Dromedary, where there is a relatively large body of monzonite and related rocks.

Tertiary deposits occur in a number of localities but in no case are they very extensive. They consist of unconsolidated sand, gravel and clay with some consolidated sandstones and lignite beds, and were deposited under generally continental conditions in a lacustrine or estuarine enviroment. They have a maximum known thickness of about 100 feet, and many of them occupy relatively elevated situations as a result of fluctuations in sea level. There are a few small outcrops of Tertiary basalt in the catchment area, but because of their limited extent they are unimportant for groundwater development purposes.

Unconsolidated deposits of Tertiary or Recent age occur in beach and dune areas along the coast, and in alluvial deposits along the Tuross River. In the Tuross River estuary, the deposits have had a marine influence, with black marine and estuarine muds overlying and interbedded with the river deposits. Further upstream, fluvial deposits occur more or less continuously for about 30 miles. The width of the body of alluvium is never more than about a mile, and generally much less.

Very little is known of the specific nature of the deposits, the only subsurface data being from five test bores at Eurobodalla. These indicate a maximum depth of about 70 feet, with dominantly sandy clay and silt. Sand and gravel lenses occur at various levels but are mostly quite thin. Alluvial deposits associated with other minor coastal streams within the catchment are of negligible extent, both along the Tuross River and in its estuary.

The availability of groundwater in the Cambrian and Ordovician rocks is dependent on the degree to which the joints and fractures in them transmit water. Generally, the system of joints is such that water is transmitted, although slowly, and rocks of this nature commonly provide small supplies of groundwater.

Yield and salinity will depend largely on the topography around any specific site, but bores sunk at suitable locations could be expected to produce supplies of the order of a few hundred gallons per hour. Water salinity may often be marginal or too high for general domestic use, but should generally be suitable for stock use. Only one bore has been recorded in Ordovician strata in the area, and it obtained 400 gallons per hour from a depth of 200 feet in a shale and sandstone sequence. The water was suitable for domestic use.

No data is available on the availability of groundwater in the areas underlain by granite, but prospects are probably variable. Individual sites would have to be examined to establish the prospects, but drilling in these rocks would be a rather speculative venture.

No bores have been recorded in the Devonian strata, but it is anticipated that small to moderate stock supplies should be obtainable from suitable sites, although salinity may be a problem. Groundwater prospects in the Cretaceous (Mesozoic) igneous rocks are thought to be very limited.

The Tertiary unconsolidated and semiconsolidated deposits probably contain good aquifers, and should provide useful stock and domestic supplies, and perhaps even small irrigation supplies, where they occur in low lying areas with good recharge conditions.

The (Tertiary) or Recent deposits in the estuaries of the Tuross and other smaller rivers, are subject to intrusion of saline sea water, and will also contain connate salt. Therefore in these deposits the potential for large scale groundwater development is poor. Small fresh supplies can probably be obtained locally from shallow wells or spear points in natural levee banks, where these occur. Aquifers in these will be replenished by direct infiltration of rainwater, but overpumping would cause intrusion of the underlying salt water.

The alluvium along the main valley of the Tuross River from the upper limit of tidal influence to about Wattle Grove, probably contains a relatively large volume of low salinity water. The aquifers within this alluvium do not, however, appear to be very thick or extensive and a considerable amount of test drilling would be necessary to locate the most suitable formations for each production bore. It is probable that useful small to moderate irrigation supplies can be obtained from this body of alluvium although no major overall development is likely.

The amount of groundwater available from the small volumes of alluvium associated with the other rivers in the area is undoubtedly small, but stock and domestic supplies would probably be available locally.

Useful small domestic supplies may be available from some of the dune areas, but these are of limited extent and no major groundwater development seems possible.

5. STREAM GAUGING STATIONS

The intensities and variations in streamflows in a particular river valley are basically controlled by climatic and physiographic factors. The main climatic control is the amount and distribution of precipitation over the valley and secondary climatic controls are the evaporation and transpiration process which occur virtually continuously.

Physiographic factors include the size, shape and slope of the catchment area; permeability and capacity of groundwater formation; presence of lakes and swamps; land use; and river channel characteristics. Many of these factors are interdependent and their overall effect determines the runoff characteristics of a particular river valley.

The measurement of streamflow is an essential step in the assessment of water resources potential and governs the economic and engineering aspects of schemes for irrigation development, town and country water supply and hydro-electric generation. Intensive research into methods of estimating runoff from meteorological and catchment factors such as rainfall, evaporation, transpiration and deep seepage has been in progress for many years but, has not yet provided a method of sufficient accuracy to displace actual streamflow measurement.

Two basic steps are involved in streamflow measurement, the first being the measurement of river levels, or gauge height, in relation to a constant datum and the second being the correlation of measured height with stream discharge.

River heights may be obtained at gauging stations by visual observation of water level on graduated scale or staff, which is installed on the river bank or on bridge piers. If a sufficient number of accurate observations is made manually each day to reflect the changes in water level, this procedure is satisfactory for the computation of discharge. At key stations or stations in isolated areas, the continuous variations in stream level are usually recorded mechanically. These continuous records are usually produced by an automatic graphical recorder activated by a float or pressure operated system.

Individual measurements of stream discharge for a known gauge height are made by use of a current meter to measure flow velocities, and survey methods to measure the area of effective flow. The product of flow velocities, in feet per second, and effective areas, in square feet, gives discharge of the stream in cubic feet per second or cusecs.

Graphical relations, termed rating curves, are established between gauge heights and corresponding individual discharge measurements. These relationships tend to remain relatively constant in stable channels but are subject to change in channels composed of erosive material. As most natural channels are subject to varying degrees of erosion and changing hydraulic properties created by alterations in vegetation and marine growth, systematic stream gauging is necessary to detect changes or confirm the constancy of the station rating.

The gauge height-discharge relationships are employed to estimate stream discharges for periods when gauge heights, but not measured flows, are available for the station. It is therefore possible to derive continuous streamflow records at any station using gauge height data and the gauge height-discharge relationship.

Stream discharges are normally given in terms of cusecs; one cusec flowing for twelve hours being approximately equal to one acre foot or the volume of water which would cover an area of one acre to a depth of one foot. An additional unit which is frequently used in catchment yield studies is inches depth over the total catchment area. For smaller projects, such as town water supply or spray irrigation schemes, discharge is usually expressed in gallons; a flow of one cusec is approximately equal to 374 Imperial gallons per minute.

Stream gauging in the Tuross River Valley commenced with the installation of a station on the Tuross River at Tuross in 1924. This station was maintained until 1931 when it was discontinued because of the unavailability of gauge readers. Records obtained during this period of operation of this station were inadequately defined in the medium and high flow discharge range as the gauging site was inaccessible to hydrographic staff during freshets or floods.

It was not until 1948 that further streamflow measurements were made in the Tuross Valley, when a gauging station was established on the Tuross River at Tuross Vale, about three river miles downstream of Tuross. Further stations were subsequently established on the Tuross River with installations at Belowra in 1954, Wattlegrove in 1959 and downstream of Wadbilliga River Junction in 1964.

The assessment of streamflow contributions from principal tributaries of the Tuross River commenced with the installation of a gauging station on the Yowrie River at Yowrie in 1958. This installation was followed by the establishment of a station on the Wandellow Creek at Wandella in 1966.

The locations of all gauging stations in the Tuross River Valley are shown at Figure 17 and relevant details concerning each station are given in Table 6.

TABLE 6

Stream	Station	Catchment Area (Square Miles)	Type of Gauge	Period of Operation
Tuross River	Belowra	205	Pressure Recorder	1954 to date
Tuross River	Downstream of Wadbilliga River Junction	365	Pressure Recorder	1964 to date
Tuross River	* Tuross	35	Staff Gauge	1924 to 1931
Tuross River	* Tuross Vale	60	Pressure Recorder	1948 to 1961
Tuross River	* Wattlegrove	534	Staff Gauge	1959 to 1962
Wandellow Creek	Wandella	21	Pressure Recorder	1966 to date
Yowrie River	Yowrie	51	Pressure Recorder	1958 to date

* Discontinued stations.

At present, there are four stream gauging stations in the valley which are operated by the Water Conservation and Irrigation Commission of New South Wales and these stations measure the runoff from about 50 percent of the Tuross River Valley. The density of gauging stations in this valley of about 4.8 stations per thousand square miles, exceeds the density for Coastal

New South Wales of 3.6 stations per 1,000 square miles and is substantially greater than the New South Wales and Australian averages of 2.2 stations and 0.5 stations per 1,000 square miles, respectively.

Some difficulties have been experienced in maintaining continuous operation of stream gauging stations in the valley and as a result two stations have been discontinued on the Tuross River since 1961. The gauging station at Tuross Vale ceased operation in 1961 due to the unavailability of gauge readers and the Wattlegrove station was discontinued in 1962 because of unstable features of the river control. During this period however, streamflow behaviour of the Tuross River was recorded at the Belowra gauging station.

It is intended to expand the existing network of stream gauging stations by the installation of automatic float recorders on the Wadbilliga River downstream of the Yowrie River junction and on the Tuross River downstream of the Wadbilliga River junction. A pressure recorder is to be installed at Tuross Vale.

The proposed coverage will result in a density of 7 stations per thousand square miles or more than three times the density for the State. The expanded network will measure flows from about three-quarters of the total valley area and should provide sufficient data for the appraisal of the majority of any future water conservation or utilisation schemes in the valley.

6. CATCHMENT YIELDS

The annual water yield, or runoff, from a natural catchment is dependent on many factors, the main ones being annual rainfall, catchment area, topography and geology. To a lesser extent, annual yield is influenced by other factors which control the runoff resulting from individual storms, such as rainfall intensity, vegetal cover, and soil moisture.

The systematic recording of streamflows in the Tuross River Valley has provided a considerable volume of data for estimation of water yield from the various sections of the valley.

Over a fourteen year period commencing in January, 1955 the average discharge of the Tuross River at Belowra was 168,000 acre feet per annum which is equivalent to an average discharge of 230 cusecs (86,000 gallons per minute). At the upstream gauging station on the Tuross River at Tuross

Vale, the average discharge recorded for a twelve year period commencing in January 1949 was 48,200 acre feet which is equivalent to 66 cusecs (24,700 gallons per minute). Measurement of flow from the Yowrie River at Yowrie, a principal tributary of the Tuross River, established that the average annual discharge was 38,000 acre feet or 52 cusecs (19,500 gallons per minute) over a ten year period commencing in January, 1959.

For comparative purposes the yields at various streamflow stations in the valley over the respective periods of complete years of record, are given in Table 7. Details of monthly maximum, minimum and mean flows for the gauging stations located on the Tuross River at Belowra and Tuross Vale, and the Yowrie River at Yowrie are given in Appendices 12 to 14 inclusive.

TABLE 7

Stream	Station	Complete Years of Records	Average Annual Yield Over Period of Complete Years of Records		
			Acre Feet	Cusecs	Gallons Per Minute
Tuross River	Belowra	14	168,000	230	86,000
Tuross River	* Tuross Vale	12	48,200	66	24,700
Yowrie River	Yowrie	10	38,000	52	19,500

* Discontinued station.

7. AVERAGE ANNUAL RUNOFF

In comparison with many river valleys in the State, streamflow records collected in the Tuross River Valley are of comparatively short duration. An estimate of the long term annual surface water resources of the Tuross Valley has therefore been necessarily based on approximate streamflow correlations with the adjoining Shoalhaven River Valley for which streamflow records are available from 1909.

The results of these correlations indicate that the average annual surface water resources of the Tuross Valley are of the order of 420,000 acre feet (114,000 million gallons) equivalent to a continuous rate of 215,000 gallons per minute. On a square mile of catchment area basis these resources are about 29 percent greater than the average for Coastal New South Wales and are equivalent to about 6 times the average for the Australian mainland.

A previous estimate of the long term average annual runoff for the Tuross River Valley was given in the 1963 publication "Review of Australia's Water Resources" as 380,000 acre feet per annum. The increase in the current estimate of annual runoff is due to the effect of additional periods of more reliable streamflow records now available.

In the following Table 8 the estimated long term annual runoff of the Tuross River Valley is compared with the corresponding runoffs for other valleys on the New South Wales south coast.

TABLE 8

Valley	Catchment Area in Square Miles	Estimated Long Term Average Annual Runoff		
		Acre Feet Per Annum	Acre Feet Per Annum Per Square Mile	Percentage Runoff
Tuross Valley (Including Streams South to Cape Dromedary)	840	420,000	500	28%
Clyde Valley	1,260	750,000	600	25%
Moruya Valley	600	340,000	570	32%
Bega Valley	740	400,000	540	27%
Shoalhaven Valley	2,820	1,460,000	520	28%

The average annual runoff of the Tuross Valley is equivalent to about 28 percent of the average annual rainfall which is of similar order to runoff percentages estimated for adjacent valleys. Because these valleys experience similar climatic conditions, have similar topography, vegetal cover, and land use practices, a similarity in long-term runoff characteristics is to be expected.

8. VARIABILITY OF STREAMFLOWS

In general, the pattern of annual runoff is similar to that of annual rainfall, but modified to some extent by the hydrologic characteristics of each catchment. Variations in streamflow throughout the year are closely related to rainfall distribution and seasonal differences, and fluctuations in the normal pattern of rainfall throughout the year will produce variations in the pattern of runoff from month to month.

Therefore while average annual flows are suitable for comparison of long term yields from catchments they do not indicate the surface water resources which could be available in a particular year or the probable extent to which the valley's surface water resources could be utilised without the construction of conservation works.

In the planning of water resource projects, the object of which is to stabilise flow by conserving above average flows for release during drought periods, it is necessary to study the variability of streamflow on a monthly or even daily basis.

In common with the majority of other streams in New South Wales the streams of the Tuross Valley exhibit a high degree of variability. An indication of the variability of streamflow at selected stations in the valley is given in Table 9 which shows the maximum, minimum and mean discharges recorded at three stations over the periods of available records.

TABLE 9

Stream	Station	Period of Records	Recorded Discharges		
			Maximum	Minimum	Mean
Tuross River	Belowra	1954 to 1968	28,100 cusecs (10,500,000 g.p.m.)	0.5 cusecs (190 g.p.m.)	230 cusecs (86,000 g.p.m.)
Tuross River	Tuross* Vale	1948 to 1961	4,800 cusecs (1,800,000 g.p.m.)	0	66 cusecs (24,700 g.p.m.)
Yowrie River	Yowrie	1958 to 1968	7,400 cusecs (2,800,000 g.p.m.)	0.1 cusecs (40 g.p.m.)	52 cusecs (19,500 g.p.m.)

* Discontinued Station

As indicated in Table 9 the maximum rate of flow at the station on the Yowrie River at Yowrie occurred in October 1959 when 7,400 cusecs or 146 cusecs per square mile were recorded. However the runoff intensity during this flood which occurred on the Tuross River at Belowra was about 63 cusecs per square mile. This result is in accordance with experience which normally indicates that the intensity of flood runoff per unit of catchment area decreases with increase in catchment area for evenly distributed storms.

However, a combination of physical catchment characteristics and the intensity and distribution pattern of rainfall may result in a larger catchment experiencing greater runoff intensity, the smaller catchment recording lower rainfalls. For example, the distribution of rainfall during the November 1961 flood was such that the Belowra gauging station recorded a peak intensity of 137 cusecs per square mile while the Yowrie gauging station registered 121 cusecs per square mile.

As previously indicated, the frequency with which low flows are experienced is related to the type and seasonal distribution of annual rainfall. Because it is comparatively rare for the valley to experience prolonged periods of low rainfall, extended periods of extremely low flows are not of regular occurrence. The minimum recorded flows at the selected gauging stations are shown in Table 9. Over the periods of available records streamflows in the valley have receded to extremely low values with minimums of 0.5 cusecs (190 gallons per minute) and 0.1 cusecs (40 gallons per minute) being recorded at the Belowra and Yowrie gauging stations respectively. During the period of available record, the Tuross River at Tuross Vale has ceased to flow for a period of 2 days in January 1952.

Reference to Table 9 shows that the maximum recorded instantaneous flow for the Tuross River at Belowra has exceeded the mean flow by 12,000 percent, whereas the minimum flow has receded to about a quarter of one percent of the mean flow. Similar variations are displayed in the streamflow records of the Yowrie River at Yowrie. At this station the maximum and minimum flows recorded were 14,000 percent and 0.2 percent of the mean flow respectively. Over the period of available records for the Tuross River at Tuross Vale, discharges have fluctuated from zero to almost 7,300 percent of the mean flow.

When expressed in terms of monthly discharges, streamflow records indicate that the maximum monthly flows recorded at the stations at Belowra, Yowrie and Tuross Vale have been 8, 9 and 20 times the mean monthly flows respectively. The minimum monthly flows recorded at the above stations have all been less than 3 percent of their respective mean monthly flow.

As expected, the annual variations in streamflow exhibit a lesser degree of variability than both daily or monthly discharges. Extreme maximum and

minimum annual flows at Tuross Vale over a period of 12 years have been 320 percent and 18 percent of the mean annual flow. Deviations from the mean annual flows recorded for the Yowrie River at Yowrie and the Tuross River at Belowra are also similar. Over the periods of available records the maximum and minimum annual streamflows at Yowrie have been 270 and 2 percent of the mean annual flow, whereas Belowra gauging station has recorded a maximum flow of 230 percent and a minimum flow of 5 percent of the mean flow.

Histograms of monthly streamflows recorded at the stream gauging stations at Tuross Vale, Belowra, and Yowrie are given in Figure 18 which shows the chronological sequence and magnitudes of monthly flows for the period of available records and illustrates the high degree of variability of streamflows in the valley.

The variations in average monthly rainfalls at Cobargo and Krawarree over periods of 81 years and 67 years respectively are shown at Figure 19. These locations can be considered to be representative of the coastal and inland sections respectively, of the valley. Reference to Figure 19 shows that, for both locations, the highest average rainfall occurs in late summer while the lowest average rainfall occurs in late winter.

Average monthly streamflows shown at Figure 20 for Yowrie and Belowra exhibit distributions similar to average rainfall except that average runoff during January and February is considerably below other months experiencing similar rainfalls. The low runoff during during these months is attributed mainly to seasonal conditions when high evaporation and transpiration losses occur and partly to the relatively short period of records used in computing the streamflow averages.

9. PERSISTENCE OF STREAMFLOWS

In common with the majority of South Coast streams, those of the Tuross River Valley exhibit reasonably sustained streamflows during extended dry weather periods. The high persistence of these streams is apparently due to a significant groundwater supply which contributes to streamflow for extended periods during times of low flow, at a gradually diminishing rate.

A method commonly employed to describe the flow characteristics of a stream is the flow duration curve. The flow duration curve shows the

percentage of time in the period of record in which the flow was equal to or greater than any given rate. Thus the flow duration curve may be used to determine the probability of occurrence of flows of any magnitude in the record. As such, this curve indicates the percentage reliability of experiencing flows of a greater magnitude.

The flow duration curve of the Tuross River at Belowra is given at Figure 21 and the relative frequencies of flow are given in Table 10.

TABLE 10

Percentage of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gallons per Minute
10%	480	179,500
30%	137	51,200
50%	75	28,000
70%	34	12,700
90%	10	3,700
95%	5	1,900
100%	0.5	190

The duration curve of discharge for the Tuross River at Tuross Vale is shown at Figure 22 and the flow frequency statistics for this station are given in Table 11.

TABLE 11

Percentage of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gallons per Minute
10%	200	74,800
30%	36	13,500
50%	15	5,600
70%	6.5	2,400
90%	1.3	490
95%	0.7	260
100%	0	0

The flow duration curve for the Yowrie River at Yowrie is appended at Figure 23 and the flow frequency data are given in the following Table 12.

TABLE 12

Percentage of Time Flow Equalled or Exceeded	Corresponding Flows	
	Cusecs	Gallons per Minute
10%	90	33,700
30%	26	9,700
50%	13	4,900
70%	6	2,200
90%	1.3	490
95%	0.7	260
100%	0.1	40

Although the flow duration curves shown at Figures 21 to 23 indicate the frequency of different flows at individual stations, they do not provide a direct comparison of runoff characteristics between sub-catchments in the valley. A convenient form of comparison between duration curves is afforded by dividing the discharge scale of each flow duration curve by the catchment area above the gauge. A duration curve constructed in this manner will give the flow in cusecs per square mile and allows a direct comparison to be made with other flow duration curves.

The curves shown at Figure 24 indicate that of the three stations selected for comparison, the Tuross River at Belowra exhibits a slightly higher persistence of flow than that observed at other stations. The reason for this higher flow is attributed to higher average runoff from the upper Tuross River and its tributaries which drain the steep and elevated western sections of the catchment.

10. OCCURRENCE OF FLOODING

Figure 25 which has been compiled from available flood data for the Tuross River at Belowra, indicates that the occurrence of floods in the Tuross River Valley is not uncommon. This figure shows the number of floods which have equalled or exceeded a critical gauge height of 10 feet which is the height at this station at which flooding in the vicinity of Belowra commences. The highest flood at Belowra since records commenced occurred in November 1961

when the Tuross River reached a height of 22 feet. This flood exceeded the second highest recorded flood of April 1963 by approximately 5 feet.

The majority of floods in the Tuross River Valley are generated as a result of intense rainfall over the upper reaches of the catchment, where high relief and steep slopes combine to produce rapid concentration of flood waters in the stream channels. Because the stream channels are deep and narrow in the upper reaches, the flood wave does not experience any appreciable degree of attenuation in its passage downstream. In the lower reaches of the Tuross River, where bed slopes and surrounding country are flatter, inundation of low lying areas is experienced and the intensity of major floods can be aggravated if flood waters coincide with high tides.

As there are no major centres of population located in the Tuross River Valley, major floods at present do not create any great degree of hardship except for the inundation of low lying areas adjacent to the river and the disruption of traffic on flood-affected roads.

Major flood peaks for the Tuross River at Belowra since 1954 are compared in Table 13 with those recorded on the Yowrie River at Yowrie since 1958 when records commenced at the latter station.

TABLE 13

Stream	Station	Dates and Peak Discharges of Major Recorded Floods (Cusecs)						
		1955	1956	1959	1960	1961	1963	1966
		May	June	October	July	November	April	November
Tuross River	Belowra	15,200	13,300	13,000	14,800	28,000	15,700	14,500
Yowrie River	Yowrie	No Flood Data	No Flood Data	7,400	3,300	6,195	4,280	3,510

11. DROUGHT PERIODS

The term "drought" is difficult to define as it denotes different states of water shortage in different localities and may be described in various ways. Deficiencies in rainfall and runoff, a decline in soil moisture, reduction in groundwater levels, and a deficit in artificial storage required to meet water demands, have been used as indicators of drought conditions.

Droughts cannot be satisfactorily defined in terms of rainfall shortage alone because this definition does not take into account the amount of water needed or soil moisture conditions at the beginning of the dry period.

In general, an area is considered to be under drought conditions when the soil moisture is insufficient for the requirements of the majority of crops during the growing season or when water shortages for domestic, industrial or municipal purposes are experienced. A prime indication of drought conditions is a diminished rate of streamflow.

A graph showing annual rainfalls at Bodalla, Cobargo and Krawarree is given at Figure 26. This graph indicates that the lowest calendar year rainfall at Bodalla was 18.39 inches in 1968. Records at Cobargo, which commenced 13 years after Bodalla in 1888, indicated that the lowest annual rainfall also occurred in 1968 and was 18.06 inches. The lowest annual rainfall recorded at Krawarree since 1898 was 8.47 inches in 1904.

Reference to Figure 26 indicates that the most prolonged sequence of low rainfalls, when simultaneous records were available at the three stations, was recorded during the periods from 1937 to about 1944. A second significant period of low rainfalls appears to have occurred in the valley from 1901 to 1910 but in the absence of complete records at Cobargo, the period cannot be confirmed at this station. This period of low rainfall at Krawarree was interrupted by above average rainfall in 1908. As indicated at Figure 26 other shorter periods of below average rainfall have occurred but these have been relieved to some extent by above average rainfalls during preceding or following years.

Although large deficits in average rainfall have been experienced on a number of occasions throughout the period of record, it is not possible to assess the severity of previous droughts from rainfall records alone. It would seem however, that the periods of diminished rainfalls referred to above would coincide with the worst droughts experienced in the valley since 1900. Based on Bodalla rainfall data, indications are that a fairly severe drought also occurred during the 1880's.

Since the commencement of regular recording of streamflows of the Tuross River at Belowra in 1954, the minimum twelve-monthly flow of 9,524

acre feet occurred from December 1967 to November 1968. This flow corresponds to only 6 percent of the average annual discharge at this station.

At the gauging station located on the Tuross River at Tuross Vale, which commenced recording in 1948 but was discontinued in 1961, the minimum flow during a twelve-monthly period occurred from March 1954 to February 1955 and was 4,960 acre feet. This flow is equivalent to 10 percent of the average annual flow.

Table 14 gives the minimum twelve-monthly flows at selected stations in the Tuross River Valley and also expresses these flows as percentages of their respective average annual flows.

TABLE 14

Stream	Station	Minimum Twelve-Monthly Flow		
		Period	Acre Feet	Percentage of Average Annual Flow
Tuross River	Belowra	December 1967 to November 1968	9,524	6%
Tuross River	Tuross River	March 1954 to February 1955	4,960	10%
Yowrie River	Yowrie	December 1967 to November 1968	1,752	"5%

The minimum thirty day and sixty day volumes of flow which have been recorded at the three selected stations are shown in the following Table 15.

TABLE 15

Stream	Station	Minimum Recorded Flow (Acre Feet)	
		30 Days	60 Days
Tuross River	Belowra	101 acre feet (December 1954 to January 1955)	300 acre feet (September 1968 to November 1968)
Tuross River	Tuross Vale	11 acre feet (January 1952 to February 1952)	105 acre feet (December 1951 to February 1952)
Yowrie River	Yowrie	9 acre feet (November 1968 to December 1968)	24 acre feet (October 1968 to December 1968)

A comparison of Tables 14 and 15 shows that, with the exception of the 60 day period for Belowra, the minimum thirty day and sixty day volumes did not occur during the period of minimum twelve monthly flow at these stations.

12. THE 1964-1966 AND 1968 DROUGHTS

Commencing late in 1964, the Tuross River Valley entered a period of extremely low rainfall which generally prevailed through the valley until the end of 1968. Details of the recorded monthly rainfalls at Bodalla, Cobargo and Gaerloch (previously Countegany) since the commencement of the dry period in July 1964 through to December 1968 are given in Table 16.

TABLE 16

Month	Rainfall (Points)		
	Bodalla	Cobargo	Gaerloch*
July 1964	48	66	123
August 1964	486	549	488
September 1964	59	81	111
October 1964	312	345	330
November 1964	221	258	132
December 1964	271	252	194
January 1965	57	29	NR.
February 1965	35	89	NR.
March 1965	35	30	NR.
April 1965	162	139	120
May 1965	250	140	40
June 1965	158	102	103
July 1965	85	75	56
August 1965	128	314	323
September 1965	204	173	225
October 1965	633	444	402
November 1965	143	141	135
December 1965	383	382	243
January 1966	249	144	120
February 1966	431	196	312
March 1966	445	405	468
April 1966	33	27	35
May 1966	75	77	85
June 1966	803	559	260
July 1966	193	116	115
August 1966	183	134	60
September 1966	285	314	272
October 1966	425	300	355
November 1966	798	832	1,160
December 1966	434	339	348
January 1967	319	331	402
February 1967	104	66	58
March 1967	386	197	84
April 1967	86	43	35
May 1967	62	94	88
June 1967	241	223	233
July 1967	41	41	99
August 1967	500	566	710
September 1967	519	528	639
October 1967	228	168	290
November 1967	71	55	123
December 1967	104	85	31
January 1968	216	219	278
February 1968	35	21	14
March 1968	257	207	58
April 1968	39	29	25
May 1968	478	389	421
June 1968	41	59	NR.
July 1968	71	80	NR.
August 1968	39	66	69
September 1968	0	4	6
October 1968	42	50	99
November 1968	127	177	262
December 1968	494	505	427
Annual Rainfalls			
1964	3,293	3,761	2,516
1965	2,273	2,058	Incomplete Records
1966	4,354	3,443	3,590
1967	2,661	2,397	279
1968	1,839	1,806	Incomplete Records

* Initially Countegany.

Critical periods of low rainfall in the Tuross Valley occurred during the months from about November 1964 to May 1966 and from about October 1967 to December, 1968.

From November 1964, the valley generally experienced a period of eleven consecutive months of below average rainfalls. Very high temperatures in February 1965, combined with below average rainfalls, culminated in the driest and most severe summer for over 20 years and as a result of the deterioration in rural conditions, the region was proclaimed a drought relief area in March 1965.

Conditions remained poor with low rainfalls prevailing until August 1965. However, following above average rainfall in August, October and December, 1965, the drought proclamation was removed from the area in December, 1965.

Below average rainfalls again occurred in January, 1966 and during the first five months of 1966, only March registered above average rainfalls. Because of the deficiency in rainfall, rural conditions again deteriorated rapidly in January and February 1966 and resulted in the re-introduction of the Tuross Valley as a drought proclaimed area in February, 1966.

Heavy rainfalls in June 1966 alleviated drought conditions in the valley and following further above average rainfalls in September and October, 1966, the proclamation of drought conditions was lifted during October 1966.

From November 1966 to September 1967 rainfalls of about average were recorded although some months of below average values also occurred. These rainfalls during 1967 generally maintained rural conditions in the valley at a satisfactory level.

Rainfalls in the Tuross Valley again diminished from October 1967 and in the seven month period from October 1967, the valley received rainfalls well below average.

The severity of the dry conditions which had prevailed from October, 1967 resulted in the valley again being proclaimed a drought area during January 1968 and this proclamation remained for the whole of 1968.

In May, 1968, 24 hour rainfalls of 2 to 3 inches were recorded at numerous centres within the Tuross Valley but these falls apart from partially replenishing farm storages and domestic supplies did little to improve the general drought situation. Conditions worsened in June 1968 when only about 10 percent of the average June rainfall was received. The deficiency of rainfall in subsequent months considerably aggravated drought conditions such that by the beginning of November, 1968 farm water supplies in many locations were non-existent.

Above average rainfalls were recorded in December, 1968 and coupled with good rainfalls in February and April, 1969, resulted in the removal of the proclamation of the Tuross Valley as a drought area. This proclamation had been in existence for a total of 15 months.

Because of the lack of adequate water supplies on the far South Coast, the New South Wales Government organised emergency road transport to bring water to drought-striken South Coast residents. The cartage of water commenced on 8th November, 1968, and road tankers capable of delivering approximately 100,000 gallons per day delivered water to strategically located centres at Cobargo, Tilba Tilba and Bega from which farmers were able to collect water. The supplementing of water supplies using road tankers was discontinued in January, 1969, following good rainfalls in December, 1968.

The deficiency in adequate rainfalls during the 1964-1966 drought and the 1968 drought was reflected in the runoff from the Tuross River and its tributaries during these periods.

During the 26 month period from September, 1964 to October, 1966, the recorded monthly discharges for the Tuross River at Belowra and Yowrie were, in every month of the period, less than their respective average monthly flows. At Belowra, the total discharge in this period was about 172,000 acre feet which is equivalent to a continuous flow of about 80 cusecs or about 32 percent of the average flow of 247 cusecs, over the period of records. The total discharge at Yowrie from September, 1964 to October 1966 was only about 10,800 acre feet which corresponds to only 12 percent of the average flow.

During the 1968 drought streamflows in the Tuross River and its tributaries receded to the lowest discharge ever recorded. In November-December, 1968, the streamflow at Belowra fell to 0.5 cusecs and remained at this discharge for 5 days. A discharge of 0.5 cusecs had been recorded previously at Belowra in January, 1955, when a flow of 0.5 cusecs occurred for 5 days.

The minimum flow of 0.1 cusecs recorded at Yowrie in November-December, 1968, was the lowest flow recorded since the gauging station was established in September, 1958. During November-December, 1968, the flow at Yowrie was less than 0.2 cusecs for 47 consecutive days. The previous minimum recorded flow at Yowrie prior to 1968 was 0.7 cusecs in November, 1958, when this discharge continued for 10 consecutive days.

To indicate the severity of the 1964-1966 and the 1968 droughts within the Tuross Valley, the minimum twelve monthly flows recorded at Belowra and Yowrie during both these periods together with the minimum recorded twelve monthly flows prior to the 1964-1966 drought are shown in Table 17.

TABLE 17

Stream	Station	Minimum 12 Monthly Flow Recorded in Period Indicated				Average Anual Discharge Cusecs	Percentage of Average Anual Discharge
		Period		Discharge			
				Ac.Ft.	Cusecs		
Tuross River	Belowra	Prior to 1964-1966 Drought	March 1958 to February 1959	41,434	57	230	25%
		1964-1966 Drought	December 1964 to November 1965	19,900	27	230	12%
		1968 Drought	December 1967 to November 1968	9,524	13	230	6%
Yowrie River	Yowrie	Prior to 1964-1966 Drought	March 1962 to February 1963	23,309	32	52	62%
		1964-1966 Drought	December 1964 to November 1965	2,880	4	52	8%
		1968 Drought	December 1967 to November 1968	752	1	52	2%

The minimum twelve monthly discharges as given in the above Table 17 show that the lowest volume since the commencement of records, occurred at both stations during the 1968 drought. As the gauging station on the Tuross River at Tuross Vale was discontinued in 1961, no records during the drought periods of 1964-1966 and 1968 are available for this station.

A schedule of the minimum thirty day and sixty day discharges at Belowra and Yowrie is given in Table 18. This table indicates the order of low flows during recorded critical periods.

TABLE 18

Stream	Station	Minimum Total Flow for 30 and 60 Day Periods (Acre Feet)					
		30 Days			60 Days		
		Prior to 1964-66 Drought	1964-66 Drought	1968 Drought	Prior to 1964-66 Drought	1964-66 Drought	1968 Drought
Tuross River	Belowra	101 (December 1954 to January 1955)	516 (March 1965 to April 1965	120 (October 1968 to November 1968)	509 (December 1954 to February 1955)	1,233 (March 1965 to April 1965)	300 (September 1968 to November 1968)
Yowrie River	Yowrie	86 (October 1958 to November 1958)	120 (April 1966 to May 1966)	9 (November 1968 to December 1968)	197 (October 1958 to December 1958)	248 (April 1966 to May 1966)	24 (October 1968 to December 1968)

As indicated in Table 18, the minimum thirty day and sixty day flows recorded during the 1964-66 drought exceeded those recorded at Belowra within the period December, 1954 to February, 1955, and at Yowrie within the period October, 1958 to December, 1958. Although the low flow volumes during the earlier years were significantly less than the 1964-1966 drought volumes, the earlier drought was not as widespread in effect as the 1964-1966 drought.

However, it is evident from Table 18 that the depletion of streamflow at Belowra and Yowrie during the 1968 drought was of a considerably greater magnitude than previously experienced in the valley since regular streamflow measurements commenced at Belowra in 1954. During 1968, the minimum total flow for the thirty day period at Belowra was only slightly greater than recorded in December, 1954 to January, 1955. However, at Yowrie only 9 acre feet passed this gauging station in November to December, 1968, compared to the previous recorded minimum of 86 acre feet in the period October to November, 1958.

For the sixty day period the flow volumes at both Belowra and Yowrie during the 1968 drought were the lowest ever recorded. At Belowra, only 300 acre feet, equivalent to a continuous flow of 2.5 cusecs passed this station within the period September to November 1968. This corresponds to only about one percent of the average flow of 230 cusecs.

The sixty day flow volume at Yowrie of 24 acre feet which is equivalent to a continuous flow of 0.2 cusecs is only about 0.4 percent of the average flow of 52 cusecs.

13. WATER REQUIREMENTS FOR CURRENT DEVELOPMENT

The principal rural activities undertaken in the Tuross River Valley are dairying and beef cattle raising. Secondary rural activities include the growing of fodder crops, maize, and oats, and pig raising.

The area authorised for irrigation by license under the Water Act increased from 3 acres at 30th June, 1944 to 443 acres at 30th June, 1969 and the total number of licenses has increased from 1 in 1944 to 21 in 1969. The variation in total area and number of licenses for authorised irrigation over the period from June, 1944 to June 1969 are shown at Figure 27.

The total area authorised for irrigation in the valley has increased considerably since 1944. However, licensed irrigation was practised on a small scale prior to 1954 when the total authorised area amounted to only 29 acres. This area increased significantly from June, 1954 to June, 1956 at which time the total area was 103 acres. Following the receipt of above average rainfall in 1956, the total area authorised showed a slight decline during 1957. Dry conditions which followed in 1957 and 1958 produced an upward trend in the area irrigated which continued until June, 1962 when the total area reached 195 acres.

A slight decrease in area authorised for irrigation occurred after 1962, the area falling from 195 acres in 1963 to 170 acres in 1965. This trend was only temporary and by 1969 the area authorised had risen to 443 acres. Most of the irrigation being currently practised in the valley is directed towards the supplemental irrigation of improved pastures and fodder crops.

The increase in licenses follows a similar trend to that of authorised area. The average irrigable area applicable to each license has increased from 3 acres at June, 1944 to about 21 acres at June, 1969.

At the end of June, 1969 there was a total of 8 licenses for the diversion of up to 2,018 gallons per minute for industrial, town and stock water supply purposes. Except for a relatively small dam located on Wandellow Creek, there are no significant storages in the valley. The Wandellow Creek storage has an estimated capacity of 2,000,000 gallons and is operated by the Mumbulla Shire Council for Cobargo town water supply purposes.

An extensive water supply scheme in the Tuross River Valley, which is designed to augment the existing Narooma water supply and to supply the township of Bodalla and coastal holiday resorts in the valley, is being developed by the Eurobodalla Shire Council. This scheme has been designed to pump directly from the Tuross River downstream of Eurobodalla at an initial rate of 300,000 gallons per day and with provision to increase this rate to 1,500,000 gallons per day at a later date.

Water is to be reticulated by pipeline to a number of strategically located service reservoirs from which points it will be distributed as the demand required. It is envisaged that, when completed, the scheme will provide for full development of the area south of Tuross Heads to the boundary of Wallaga Lake which is situated directly outside the southern boundary of the valley.

The distribution of areas authorised for irrigation on the various tributaries in the valley at 30th June, 1969, together with the estimated total demands (including town and industrial water supplies) and riparian usage, but excluding transmission losses, are given in Table 19.

TABLE 19

Stream	Area Authorised For Irrigation at 30th June, 1969 (Acres)	Estimated Total Demand	
		Cusecs	Gallons per Minute
Tuross River	242	5.2	1940
Wandellow Creek	0	1.1	400
Yowrie River	35	0.6	220
Tuross Lake Tributaries	0	0.2	70
Minor Streams of Tuross Valley	4	0.1	40
Corunna Lake	20	0.3	110
Nangudga Creek	1	0.2	80
Tilba Tilba Lake Tributaries	127	2.6	980
Wagonga River and Tributaries	14	0.7	260
TOTALS	443	11.0	4,100

The estimated maximum water requirements under present conditions for irrigation under license, water supply and riparian usage (not including transmission losses) are given in Table 20.

TABLE 20

Requirement	Estimated Maximum Requirements Under Present Conditions	
	Cusecs	Gallons per Minute
Irrigation under license (2 feet per 8 month season)	1.8	670
Town, commercial and stock water supplies	5.8	2,170
Riparian Usage	3.4	1,260
TOTALS	11.0	4,100

It should be noted that the foregoing requirements given in Tables 19 and 20 do not include any transmission losses due to evaporation and seepage. The evaporation losses from a stream can be quite substantial while seepage losses are directly related to ground water conditions. Both losses can be expected to vary widely depending on streamflows and antecedent meteorological conditions.

14. POSSIBLE IRRIGATION DEVELOPMENT

Because of the mountainous nature of the major area of the drainage system within the Tuross Valley, most streams flow within narrow, steeply sloping valleys. It is only as the Tuross River approaches the coast that a limited degree of alluvial plain development is evident. Under these conditions areas of land topographically suited to irrigation are quite limited. An assessment of the area which appears suitable for irrigation has been undertaken with the assistance of aerial photographs. The extent and distribution of these areas is summarised in Table 21.

TABLE 21

Stream	Area Assessed as Suitable for Irrigation (Acres)
Tuross River and tributaries above Wadbilliga River Junction	360 acres
Tuross River between Wadbilliga River Junction and the limit of tidal influence	950 acres
Tuross River below the limit of tidal influence	3,100 acres
Yowrie River	260 acres
Wandellow Creek	500 acres
Gulph Creek	290 acres
Other tributaries of the Tuross River	220 acres
Corunna Lake and tributaries	100 acres
Tilba Tilba Lake tributaries	120 acres
Wagonga River and tributaries	200 acres
Total	6,100 acres

Of the areas assessed as suitable for irrigation approximately half the total area is located on the flats of the Tuross River below the limit of tidal influence where river water is normally too saline for irrigation use particularly in drought times when the intrusion of salt water upstream is greatest.

The effective development of irrigation in this area would be dependent on the provision of a fresh water supply conveyed to the irrigable areas by pipeline or channel.

Other factors which would limit the degree of ultimate irrigation development include the liability to flooding of downstream areas and the possibility of major element deficiencies in some of the soil types in the valley.

In the remainder of the valley, the areas of land suitable for irrigation on tributary streams are concentrated on the Yowrie River, Wandellow Creek and Gulph Creek.

Present irrigation development within the area is mainly confined to irrigation of improved pastures and lucerne for daity herds and grazing cattle. Following the provision of a reliable water supply particularly to those areas on the river flats, supplementary irrigation of improved pastures, lucerne, vegetables and fodder crops could be expected.

The topography of much of the valley is unsuitable for the construction of farm dams and little development of this source of irrigation supply has occurred to date in the valley.

However, the temporal rainfall pattern over the valley is such as to permit the economic construction of farms dams and it could be expected that small water supplies for supplemental irrigation will be provided in the future from farm dams constructed at suitable locations.

15. INVESTIGATION OF STORAGE PROPOSALS

Following requests for investigation of conservation storages on the Yowrie River and Wandellow Creek, an inspection of storage sites on these streams was undertaken in 1957. The site inspected on the Yowrie River is located above all potentially irrigable land and possesses a good granite rock foundation. However, it is considered to possess very limited storage potential and consequently is not favoured for construction of a major dam.

The site on Wandellow Creek is located approximately 4½ miles below that of the present water supply storage serving the town of Cobargo and above those areas which appear to be suitable for irrigation. The creek at this site is relatively steep and would not provide the necessary capacity for extensive development. The position of sites on the Yowrie River and Wandellow Creek is as shown in Figure 28.

Field investigations for a major conservation storage in the Tuross Valley have not yet been undertaken but a study of aerial photographs and other available data indicate that the site which appears to possess the greatest potential is located on the Tuross River above the junction of Wadbilliga River. The site would command almost all the potentially irrigable land along the Tuross River.

The tidal reaches extend some seven miles up the Tuross River so that a considerable proportion of the alluvial flats are without access to fresh water. An inspection was undertaken in 1956 to determine possible weir sites, for the purpose of providing a fresh water frontage adjacent to these lands.

A site was selected immediately below the intake to Bumbo Lake but subsequent investigations indicated that the foundation material consisted of sand to a considerable depth and this was consequently unsatisfactory. A similar condition was found to exist at a number of other sites.

The prospect of aggravating local flooding at sites located on the lower river led to consideration of a diversion weir as an alternative. Two diversion weir sites were tentatively selected at locations shown on Figure 28. From these sites a pipe line or open channel would be required to convey fresh water to the lower river flats.

The Government's long term programme for development of the State's Water Resources provides for a major conservation storage on the Tuross River and a weir on its lower reaches. Whilst the existence of tentative sites for both a major storage and weir is known, these sites have yet to be confirmed by survey, foundation drilling and testing of construction materials.

16. ACKNOWLEDGMENTS

The Water Conservation and Irrigation Commission gratefully acknowledges the assistance provided by the Director, Bureau of Meteorology in supplying the section on climatic features, the Rainfall Statistical Data and the Median Rainfall Maps for inclusion in this report, by the Public Works Department and the Eurobodalla Shire Council in supplying information on existing and proposed water supply schemes in the valley and by the Forestry Commission in providing data on timber resources.

BERMAGUI SOUTH RAINFALL STATISTICS

(Points)

Appendix 1
Sheet 1

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1925	465	219	194	59	2244	356	155	94	10	161	128	17	4102
1926	105	17	514	373	396	261	222	136	380	100	0	281	2785
1927	278	61	159	761	112	32	98	14	271	265	300	19	2370
1928	350	534	742	180	151	666	62	19	32	90	51	52	2929
1929	43	1395	180	651	105	23	47	368	139	172	559	508	4190
1930	47	0	190	182	780	457	173	59	35	449	128	323	2823
1931	278	160	444	360	533	144	277	26	189	177	187	131	2906
1932	11	235	307	152	471	40	432	318	218	652	221	394	3451
1933	600	6	334	300	222	191	403	181	239	221	352	497	3546
1934	1645	739	153	992	363	687	909	632	222	252	309	108	7011
1935	367	523	91	882	100	270	78	26	166	320	304	350	3477
1936	413	296	867	148	98	403	314	203	87	104	225	710	3868
1937	677	76	701	71	41	1072	89	401	147	319	82	207	3883
1938	270	333	260	58	149	163	103	227	153	303	305	2	2326
1939	349	93	618	1156	182	148	72	586	56	112	168	60	3600
1940	174	70	26	693	234	33	177	41	298	88	107	404	2345
1941	378	148	203	347	21	60	47	110	169	148	134	130	1895
1942	37	120	606	42	197	98	95	6	75	318	903	27	2524

Appendix 1
Sheet 2

BERMAGUI SOUTH RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1943	200	66	57	101	461	115	10	482	116	396	287	247	2538
1944	50	23	144	403	757	6	76	189	17	130	65	45	1905
1945	423	115	60	582	130	257	100	65	110	213	123	160	2338
1946	226	337	140	205	91	803	0	0	100	225	767	107	3001
1947	68	525	80	847	69	348	12			NO RECORDS			
1948							NO RECORDS						
1949	NO RECORDS			86	440	862	177	80	612	235	468	247	
1950	566	1345	1264	644	621	663	527	397	189	627	255	183	7281
1951	297	788	40	25	164	1098	80	417	853	395	72	58	4287
1952	80	84	681	1135	237	841	291	406	40	820	873	520	6008
1953	197	104	121	10	1186	16	14	243	74	293	117	239	2614
1954	288	893	0	65	8	164	68	90	37	195	433	169	2410
1955	315	681	191	197	555	148	116	31	192	314	130	648	3518
1956	280	1249	1109	316	1342	1334	448	35	200	365	235	86	6999
1957	176	487	279	17	32	374	317	862	85	60	50	239	2978
1958	560	635	232	64	40	302	120	195	187	136	39	345	2855
1959	191	180	1286	74	0	484	334	65	167	990	481	354	4606
1960	245	79	505	69	306	208	417	183	818	366	217	735	4148

BERMAGUI SOUTH RAINFALL STATISTICS
(Points)

Appendix 1
Sheet 3

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1961	239	246	785	110	33	403	557	433	769	272	1033	566	5446
1962	406	303	193	87	208	7	132	319	590	209	262	784	3500
1963	301	269	300	452	1474	1138	610	354	188	61	344	832	6323
1964	25	387	321	1287	227	370	34	452	109	236	340	242	4030
1965	89	73	28	256	257	139	102	266	95	428	119	238	2090
1966	114	176	250	13	52	861	84	137	153	234	469	514	3051
1967	284	93	219	37	73	261	172	495	408	229	89	177	2537

BODALLA RAINFALL STATISTICS
(Points)

Appendix 2
Sheet 1

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1876	147	206	61	92	374	231	341	43	442	708	1128	79	3852
1877	91	133	455	188	516	14	343	5	469	616	6	166	3002
1878	300	2339	168	69	45	27	153	220	418	40	394	256	4429
1879	510	812	1250	80	872	77	86	617	1090	315	310	260	6279
1880	92	440	557	594	130	34	809	56	290	172	852	189	4215
1881	365	203	341	86	205	214	14	98	161	759	401	219	3066
1882	47	147	271	851	164	448	228	234	77	709	108	261	3545
1883	453	583	113	582	266	5	38	43	238	221	142	200	2884
1884	279	74	261	808	374	99	107	51	11	464	93	107	2728
1885	428	154	173	37	36	128	163	73	42	100	285	331	1950
1886	293	228	331	175	27	27	176	231	29	310	418	439	2684
1887	1078	326	343	430	95	468	140	376	129	191	418	552	4546
1888	205	183	223	5	90	85	3	66	201	116	70	1030	2277
1889	356	312	149	209	607	142	124	169	231	184	424	97	3004
1890	343	626	1855	55	214	422	309	40	376	141	155	129	4665
1891	501	307	19	434	15	2186	356	431	539	187	534	297	5806
1892	341	80	722	461	113	58	115	275	1799	1384	211	366	5925
1893	634	318	522	747	121	459	660	20	99	345	471	502	4898

Appendix 2
Sheet 2

BODALLA RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1894	636	399	1932	427	39	348	0	73	280	148	45	187	4514
1895	867	727	91	55	280	25	14	271	180	18	29	103	2660
1896	221	551	249	7	846	950	10	229	100	140	347	141	3791
1897	575	742	80	276	117	609	165	333	176	191	30	395	3689
1898	144	1964	5	11	223	508	36	762	101	222	4	32	4012
1899	223	15	60	626	306	858	310	887	233	226	319	59	4122
1900	293	130	208	549	2064	455	414	46	183	32	530	279	5183
1901	279	62	385	147	57	108	174	1171	304	188	107	75	3057
1902	410	97	281	54	4	70	579	168	121	386	182	783	3135
1903	41	177	128	53	215	266	347	278	723	173	94	386	2881
1904	149	176	109	436	198	0	794	76	20	86	65	77	2186
1905	194	115	303	343	186	143	25	76	41	395	34	271	2126
1906	148	134	1557	90	228	14	0	375	262	104	144	198	3254
1907	612	61	355	147	176	652	23	73	0	72	149	175	2495
1908	64	729	235	610	68	32	48	786	178	171	326	71	3318
1909	295	490	45	31	4	722	550	66	31	174	26	186	2620
1910	1087	65	443	31	5	120	423	7	107	224	191	270	2973
1911	2168	145	550	0	397	136	173	291	213	205	149	307	4734

Appendix 2
Sheet 3

BODALLA RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1912	100	343	704	120	240	298	1054	22	43	24	296	125	3369
1913	88	33	545	401	895	1263	143	10	250	355	89	78	4150
1914	223	102	1891	899	73	45	730	33	708	179	385	578	5846
1915	292	120	112	299	58	215	37	88	664	108	66	242	2301
1916	303	530	390	339	36	64	129	51	835	1193	475	826	5171
1917	463	224	447	320	410	216	25	55	212	152	616	229	3369
1918	867	224	83	169	41	18	822	71	247	56	154	33	2785
1919	27	1327	136	115	598	6	25	66	179	198	413	561	3651
1920	1009	103	333	85	74	50	271	139	162	97	192	884	3399
1921	173	704	173	397	360	401	43	46	30	230	131	530	3218
1922	626	503	30	80	98	283	1108	229	491	201	42	125	3816
1923	163	211	36	83	18	249	161	38	403	312	213	531	2418
1924	351	196	257	330	71	120	352	66	77	119	545	867	3351
1925	458	215	173	60	3058	405	139	90	0	100	196	15	4909
1926	270	15	517	179	289	270	215	100	313	221	6	438	2833
1927	322	25	197	915	341	20	55	21	263	397	303	100	2959
1928	330	743	981	41	96	651	105	43	28	41	25	45	3129
1929	66	1473	262	460	65	15	70	687	102	194	501	248	4143

BODALLA RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1930	65	34	194	125	849	754	92	46	48	504	84	345	3140
1931	230	296	312	672	508	179	171	13	244	276	333	172	3406
1932	10	169	485	133	365	25	327	265	348	284	494	363	2368
1933	885	80	327	505	268	320	379	55	166	301	439	439	4164
1934	1836	1086	105	1022	253	653	991	386	207	217	470	104	7330
1935	285	394	129	630	53	167	87	7	178	453	625	381	3389
1936	342	306	981	230	220	316	242	120	152	70	109	1035	4103
1937	557	203	906	25	57	570	58	378	168	301	195	255	3673
1938	375	341	142	84	190	58	152	475	117	488	290	30	2742
1939	468	94	701	461	74	38	97	394	128	180	329	112	3076
1940	162	63	27	782	166	26	41	22	343	62	273	589	2556
1941	450	349	410	467	82	62	34	210	169	138	125	149	2645
1942	26	143	630	102	234	118	60	30	58	592	712	82	2787
1943	314	106	75	104	826	116	0	388	200	575	317	452	3473
1944	134	10	32	375	942	33	135	191	42	144	102	194	2334
1945	828	239	177	1700	149	968	127	40	92	296	159	352	5127
1946	456	504	235	411	130	675	6	69	114	202	1251	136	4189
1947	103	671	83	873	117	316	17	420	71	115	602	1243	4631

BODALLA RAINFALL STATISTICS

(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1948	1149	407	66	151	972	610	40	5	81	296	199	247	4223
1949	345	384	491	81	442	1144			NO RECORDS				
1950-1954					NO RECORDS								
1955	N.R.	813		NO RECORDS					115	269	NO RECORDS		
1956	330	1503	1117	318	882	1718	512	62	85	575	222	104	7428
1957	105	413	203	8	0	333	865	606	60	35	72	252	2952
1958	707	692	233	38	0	400	96	131	131	159	73	225	2885
1959	227	244	1033	141	31	597	470	59	202	1583	720	269	5576
1960	280	67	707	71	88	101	468	200	578	172	209	937	3878
1961	349	226	1169	106	0	401	695	486	623	322	1561	784	6722
1962	542	496	250	92	275	0	127	264	1005	185	317	689	4242
1963	323	245	679	869	932	770	518	203	299	157	375	1396	6766
1964	32	134	209	886	249	386	48	486	59	312	221	271	3293
1965	57	35	35	162	250	158	85	128	204	633	143	383	2273
1966	249	431	445	33	75	803	193	183	285	425	798	434	4354
1967	319	104	386	86	62	241	41	500	519	228	71	104	2661

Appendix 2
Sheet 5

Appendix 3
Sheet 1

BODALLA STATE FOREST RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1936				NO	RECORDS			194	124	90	176	926	
1937	389	262	994	55	41	803	45	506	292	281	95	266	4029
1938	475	406	229	82	150	186	143	416	83	507	195	16	2888
1939	576	99	773	625	63	66	184	458	127	174	303	80	3528
1940	153	64	22	664	161	17	41	28	382	106	151	622	2411
1941	500	309	485	398	106	69	35	206	207	118	119	99	2651
1942	57	299	864	167	209	132	60	22	75	706	822	80	3493
1943	313	99	75	119	919	121	2	383	183	718	425	380	3737
1944	141	3	68	436	818	15	108	166	40	111	56	105	2067
1945	536	182	118	1275	156	582	139	44	106	214	123	241	3716
1946	342	349	183	363	82	487	0	72	175	176	776	107	3102
1947	68	525	80	847	69	348	12	348	54	81	362	798	3592
1948	930	233	65	159	758	461	11	11	45	283	216	262	3434
1949	337	375	567	67	474	1334	250	56	311	204	639	129	4743
1950	772	1242	1742	991	619	1360	908	323	193	473	317	173	9113
1951	456	1234	74	55	36	1496	107	336	1082	473	117	36	5502
1952	109	226	676	1756	342	1393	274	643	27	1376	777	507	8106
1953	306	142	97	42	1569	63	7	195	144	372	97	267	3301

Appendix 3
Sheet 2

BODALLA STATE FOREST RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1954	181	902	48	69	14	181	78	53	65	203	431	122	2347
1955	288	935	261	114	843	146	70	41	168	349	201	422	3838
1956	217	1251	NO RECORDS		771	1597	453	72	98	489	172	66	
1957	139	466	206	8	2	449	1022	555	66	48	151	178	3290
1958	638	680	301	68	55	389	136	191	173	133	56	329	3149
1959	221	348	1163	140	26	538	508	53	228	1462	668	411	5766
1960	311	48	658	105	340	118	465	130	753	209	160	855	4152
1961	272	260	1159	75	25	427	755	595	623	375	NO RECORDS		

COBARGO RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1887						NO RECORDS					172	712	
1888	240	67	144	16	113	0	0	159	287	0	76	838	1940
1889	283	140	0	138	789	159	46	108	206	230	373	100	2572
1890	186	615	1266	83	293	750	424	74	27	122	213	118	4171
1891	493	203	3	523	32	2734	206	205	521	635	495	24	6074
1892						NO RECORDS							
1893						NO RECORDS							
1894						NO RECORDS							
1895	937	264	8	58	177	84	0	397	101	37	0	80	2143
1896	239	750	109	0	754	741	22	228	79	173	263	403	3761
1897	348	643	37	255	102	456	183	187	100	104	4	257	2676
1898	83	2570	15	0	289	423	5	638	65	214	8	0	4310
1899	276	29	43	562	166	571	219	722	130	183	204	90	3195
1900	197	188	218	271	2050	267	394	11	379	23	350	104	4452
1901	34	64	159	233	49	162	207	1419	301	354	123	18	3123
1902	314	42	253	54	20	118	955	240	135	422	118	1527	4198
1903						NO RECORDS							
1904						NO RECORDS							

Appendix 4
Sheet 2

COBARGO RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1905	108	170	391	254	152	159	68	63	130	514	289	362	2660
1906							NO RECORDS						
1907	502	74	291	285	159	466	0	65	0	44	94	150	2130
1908		NO RECORDS			224	63	N.R.	763	387	N.R.	126	N.R.	
1909	301	116	56	0	0	780	341	35	1	179	70	165	2044
1910	1055	0	418	22	4	142	294	0	141	186	183	142	2587
1911	1451	148	703	0	150	158	134	205	140	88	119	190	3486
1912	113	246	512	99	211	336	1057	23	39	60	262	201	3159
1913	146	60	853	372	1072	1240	116	11	249	402	100	153	4774
1914	129	76	1505	609	82	19	684	16	687	355	365	389	4916
1915	367	40	103	348	42	237	55	146	664	120	33	228	2383
1916	279	472	252	240	39	111	149	133	787	1270	437	765	4934
1917	491	270	466	339	259	232	8	51	157	131	759	209	3372
1918	827	317	116	170	19	28	767	63	88	35	250	62	2742
1919	43	1568	118	163	430	45	79	112	107	132	523	625	3945
1920	915	105	179	64	37	45	168	117	182	162	171	710	2855
1921	140	920	143	394	221	210	48	51	25	269	100	549	3070
1922	695	386	33	40	96	166	1687	265	475	151	36	193	4223

Appendix 4
Sheet 3

COBARGO RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1923	94	73	15	34	20	208	187	43	625	288	212	542	2341
1924	312	244	195	334	84	88	285	66	77	109	379	833	3006
1925	415	208	209	69	2212	450	128	20	0	120	139	30	4000
1926	191	13	336	149	165	279	73	42	340	128	4	217	1937
1927	225	61	142	497	212	29	84	10	184	305	280	18	2047
1928	408	655	926	75	84	687	76	30	29	80	34	33	3117
1929	66	1632	193	380	124	33	40	562	85	220	515	189	4039
1930	48	61	255	43	526	457	95	37	39	441	138	322	2462
1931	157	93	195	311	517	133	107	2	189	168	181	75	2128
1932	33	138	338	244	240	25	288	316	394	322	385	266	2989
1933	565	11	263	365	179	464	276	96	233	260	390	412	3514
1934	1923	1252	100	993	240	615	840	575	170	198	335	114	7355
1935	305	489	91	955	16	148	80	10	302	340	323	363	3422
1936	446	302	1084	186	77	412	221	129	81	63	243	827	4071
1937	473	222	671	43	32	559	59	186	156	327	138	432	3298
1938	316	340	157	68	168	79	100	488	232	388	286	2	2624
1939	401	245	553	641	111	33	74	577	32	118	222	66	3073
1940	219	68	29	635	140	17	29	34	392	32	127	425	2147

Appendix 4
Sheet 4

COBARGO RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1941	410	163	287	210	67	74	51	80	113	115	199	52	1821
1942	30	217	427	61	192	88	80	2	75	608	1278	67	3125
1943	272	89	82	113	519	96	0	353	125	450	318	202	2619
1944	35	7	152	255	1307	8	78	120	0	125	60	59	2206
1945	625	232	85	1044	117	465	66	31	16	244	90	216	3231
1946	235	303	182	153	106	756	0	52	57	60	539	72	2515
1947	78	873	74	628	25	161	0	162	41	91	565	901	3599
1948	795	285	48	259	715	510	0	9	64	257	193	283	3418
1949	264	356	520	58	492	786	217	2	431	128	641	193	4088
1950	612	889	1317	790	522	475	454	271	142	758	377	142	6749
1951	475	1276	16	42	77	1135	41	345	690	407	97	72	4673
1952	119	102	659	1784	223	1679	366	451	18	1391	842	530	8164
1953	176	114	104	26	1454	21	9	222	66	316	96	276	2880
1954	97	1128	26	17	15	257	43	27	50	252	534	168	2614
1955	225	702	177	158	903	98	52	36	158	407	126	541	3583
1956	245	2599	1142	369	1224	1474	512	23	174	453	183	152	8550
1957	93	387	104	15	14	329	978	705	82	67	100	216	3090
1958	529	647	170	39	59	374	134	141	132	94	34	203	2556

COBARGO RAINFALL STATISTICS

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1959	291	225	934	139	13	491	566	86	190	1356	371	307	4969
1960	264	88	421	55	209	101	624	162	851	267	278	877	4197
1961	543	291	1189	141	56	430	724	455	961	358	1692	719	7559
1962	451	516	216	84	147	0	199	276	927	167	239	758	3980
1963	371	336	365	732	928	684	490	286	326	216	296	581	5611
1964	33	304	289	1177	161	246	66	549	81	345	258	252	3761
1965	29	89	30	139	140	102	75	314	173	444	141	382	2058
1966	144	196	405	27	77	559	116	134	314	300	832	339	3443
1967	331	66	197	43	94	223	41	566	528	168	55	85	2397

COUNTEGANY RAINFALL STATISTICS
(Points)

Appendix 5
Sheet 1

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1897	NO RECORDS			52	90	489	212	222	369	124	43	250	
1898		1200	37	9	125	351	101	387	145	285	32	65	2823
1899	147	22	186	547	289	373	470	442	119	178	159	118	3050
1900	252	367	436	269	1385	153	707	95	200	18	294	117	4293
1901	144	68	220	263	0	109	204	619	190	275	131	80	2303
1902	283	33	300	44	13	108	503	45	159	201	164	443	2296
1903	50	258	244	151	95	171	224	216	430	313	220	503	2875
1904	795	242	222	228	196	63	297	137	42	191	81	116	2610
1905	266	211	166	239	155	209	128	68	52	418	38	201	2151
1906	90	50	562	154	131	46	24	410	196	209	192	172	2236
1907	216	68	141	207	73	320	0	44	57	42	220	282	1670
1908	223	387	92	148	133	16	42	697	329	110	228	60	2465
1909	322	515	51	6	26	409	206	67	67	106	20	172	1967
1910	594	3	238	39	26	80	257	26	245	118	155	261	2042
1911	1123	268	447	0	273	168	146	103	211	63	62	306	3170
1912	135	168	436	13	92	172	883	14	65	62	139	180	2359
1913	184	40	335	160	1111	912	39	70	180	116	110	63	3320
1914	87	41	1100	183	68	18	256	15	222	111	140	520	2761

COUNTEGANY RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1915	153	5	10	49	25	309	91	93	518	16	23	428	1720
1916	295	401	149	170	3	105	112	111	464	1083	205	463	3561
1917	395	277	69	100	72	186	55	85	158	246	389	219	2251
1918	349	275	129	70	40	32	452	120	56	23	20	78	1644
1919	12	527	111	142	327	20	65	167	66	154	191	456	2238
1920	950	87	244	70	0	98	89	128	218	133	122	653	2792
1921	290	470	75	310	135	136	133	26	70	186	165	316	2312
1922	453	266	54	53	58	165	1579	137	376	50	2	90	3283
1923	190	3	79	14	16	118	149	44	566	291	212	499	2181
1924	338	383	157	47	75	20	50	128	168	55	401	590	2412
1925	366	352	76	30	1444	364	219	62		NO RECORDS			
1926-1959						NO RECORDS							
1960		NO RECORDS				76	691	47	345	158	127	458	
1961	462	141	1075	223	41	219	524	192	396	77	1040	426	4816
1962	322	346	35	29	200	0	150	145	667	198	162	838	3092
1963	394	193	199	630	504	185	267	169	131	186	196	470	3524
1964	16	107	235	588	70	122	123	488	111	330	132	194	2516

Appendix 5
Sheet 3

COUNTEGANY RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
	STATION NOW LOCATED AT GAERLOCH												
1965	NO	RECORDS		120	40	103	56	323	225	402	135	243	
1966	120	312	468	35	85	260	115	60	272	355	1160	348	3590
1967	402	58	84	35	88	233	99	710	639	290	123	31	2792

Appendix 6
Sheet 1

KRAWARREE RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1898	NO RECORDS		17	16	102	27	38	64	88	226	20	15	
1899	90	32	25	498	198	241	648	806	45	130	119	72	2904
1900	279	147	310	427	801	235	1197	22	225	40	460	105	4248
1901	87	31	25	498	202	45	117	661	210	391	121	21	2409
1902	308	0	263	30	0	0	335	139	20	160	141	735	2131
1903	35	39	54	111	23	150	90	165	515	85	110	440	1817
1904	238	14	120	10	5	20	290	7	10	90	29	14	847
1905	325	335	430	282	135	265	127	50	106	391	130	64	2640
1906	4	35	468	15	255	63	34	265	303	203	340	275	2260
1907	468	227	266	240	70	647	40	123	90	66	240	405	2882
1908	363	401	205	510	198	231	303	760	248	178	341	90	3828
1909	346	276	50	45	33	501	232	65	36	218	22	172	1996
1910	577	20	314	35	25	120	336	59	164	243	140	223	2256
1911	1299	212	399	19	275	64	137	115	290	234	155	195	3394
1912	96	897	220	71	73	272	989	29	218	69	107	180	3221
1913	114	22	351	228	672	1381	40	3	163	224	25	105	3328
1914	5	63	1339	340	17	36	218	12	217	200	155	559	3161
1915	122	61	0	140	23	218	88	47	619	5	0	416	1739

KRAWARREE RAINFALL STATISTICS
(Points)

Appendix 6
Sheet 2

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1916	278	NO RECORDS			72	80	191	136	706	1322	695	390	
1917	374	350	745	294	42	180	100	465	219	250	428	355	3802
1918	580	260	165	379	29	20	536	100	92	66	62	20	2309
1919	20	582	126	145	327	40	108	101	130	149	315	440	2483
1920	836	222	290	132	50	106	107	72	132	189	292	879	3307
1921	545	398	326	688	357	256	63	0	65	140	98	581	3517
1922	556	554	0	57	72	212	1901	93	545	110	10	85	4195
1923	119	17	192	105	48	277	140	110	600	265	151	397	2421
1924	224	280	90	170	0	127	152	91	125	135	705	445	2544
1925	251	367	150	10	2700	666	83	50	40	115	298	80	4810
1926	NO RECORDS									59	20	308	
1927	458	53	154	465	232	13	53	17	223	280	467	167	2582
1928	175	767	471	80	9	183	73	6	28	47	9	127	1975
1929	59	1330	216	372	104	15	26	550	276	256	446	227	3877
1930	1	76	191	106	366	260	128	59	42	357	4	320	1910
1931	37	10	177	231	377	225	85	25	204	241	287	127	2026
1932	0	97	515	243	152	21	144	240	262	117	213	160	2164
1933	431	0	84	289	82	146	310	33	245	214	624	369	2827

Appendix 6
Sheet 3

KRAWARREE RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1934	1228	938	150	316	178	627	1047	379	133	370	461	237	6064
1935	287	330	95	599	19	104	57	29	253	602	161	318	2854
1936	335	446	577	149	111	439	179	146	39	51	40	373	2885
1937	359	81	670	95	55	165	64	250	178	374	216	351	2858
1938	298	43	100	108	196	93	87	883	140	319	258	17	2542
1939	331	111	552	484	31	87	3	404	28	189	206	103	2529
1940	176	68	0	575	102	58	14	40	497	18	126	429	2103
1941	671	395	185	53	145	39	10	71	209	137	140	100	2155
1942	107	122	563	33	267	158	117	51	62	456	581	167	2684
1943	288	120	157	188	898	30	28	205	208	377	474	438	3411
1944	125	60	178	148	1102	8	200	54	18	133	50	224	2300
1945	360	318	40	745	47	553	52	111	60	258	223	244	3011
1946	258	323	213	202	93	478	42	30	80	140	506	26	2391
1947	23	991	159	140	83	103	38	150	73	81	442	641	2924
1948	652	557	95	138	836	616	7	21	64	303	130	287	3706
1949	227	346	942	77	383	684	69	23	282	283	279	46	3641
1950	372	543	1300	413	360	462	334	83	120	606	264	179	5036
1951	667	909	100	46	139	874	55	355	375	338	83	143	4084

Appendix 6
Sheet 4

KRAWARREE RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar,	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1952	269	116	441	597	194	1255	205	408	33	556	523	511	5108
1953	350	336	89	58	858	4	15	130	171	165	56	142	2374
1954	239	674	3	57	0	111	64	67	80	203	316	106	1920
1955	177	576	397	638	534	51	38	95	54	308	142	562	3572
1956	767	714	925	383	895	1088	400	48	67	350	28	43	5708
1957	11	171	192	18	0	275	718	321	61	48	140	352	2307
1958	460	296	147	120	37	482	159	194	168	111	159	397	2730
1959	352	369	574	271	13	613	592	77	186	1684	608	167	5506
1960	223	78	459	78	197	72	961	72	440	245	219	917	3961
1961	181	346	849	138	31	212	657	332	423	444	1529	628	5770
1962	537	689	131	42	115	0	148	230	853	147	115	797	3804
1963	372	285	456	556	613	301	270	201	250	141	247	483	4175
1964	34	48	424	707	159	152	121	495	182	339	238	206	3105
1965	49	60	15	101	25	134	53	74	252	553	87	542	1945
1966	126	362	268	16	61	305	NO RECORDS						
1967	NO RECORDS												

Appendix 7
Sheet 1

NAROOMA POST OFFICE RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1910	1365	140	510	0	48	150	513	0	132	174	156	300	3488
1911	2430	110	615	55	375	141	197	360	229	104	200	294	5110
1912	90	192	903	70	330	355	752	21	0	0	220	110	3043
1913	0	40	439	505	1165	1230	132	0	201	336	45	68	4161
1914	95	56	1170	670	95	55	568	0	180	177	213	420	3699
1915	405	12	104	296	53	48	30	53	365	92	33	268	1759
1916	399	390	298	260	33	61	160	138	761	706	468	466	4140
1917	295	218	206	587	282	200	18	85	170	108	530	143	2842
1918	621	272	74	240	72	44	419	94	61	35	128	45	2105
1919	50	1203	178	132	482	23	41	180	NO RECORDS		269	520	
1920	991	82	347	105	170	76	202	128	130	NO RECORDS			
1921-1925	NO RECORDS												
1926	268	36	393	490	350	211	260	99	325	187	18	294	2931
1927	358	65	264	758	369	49	130	24	321	328	385	100	3151
1928	464	547	810	202	253	637	86	54	37	46	62	58	3256
1929	130	1299	128	470	125	42	79	401	110	230	502	347	3863
1930	88	70	193	203	715	602	210	94	79	376	136	296	3062
1931	107	97	352	515	427	182	271	18	193	239	271	196	2868

Appendix 7
Sheet 2

NAROOMA POST OFFICE RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1932	25	156	370	200	365	43	388	287	330	295	308	355	3122
1933	500	42	311	247	330	238	426	128	133	236	415	295	3301
1934	1741	645	195	930	484	760	881	433	188	213	363	132	6965
1935	302	526	121	643	92	305	101	29	198	536	320	407	3580
1936	380	313	807	219	155	234	261	153	100	112	118	845	3697
1937	473	232	876	53	42	737	66	347	192	305	97	386	3806
1938	475	356	212	84	152	153	157	405	140	437	314	33	2918
1939	367	82	751	791	128	204	125	474	164	255	229	129	3699
1940	176	79	51	752	254	37	136	36	248	117	98	505	2489
1941	421	346	330	321	100	70	33	228	259	136	150	146	2540
1942	74	230	722	102	244	109	93	30	93	283	740	132	2852
1943	237	92	61	107	645	120	5	424	155	588	329	400	3163
1944	152	13	63	445	559	33	116	209	24	112	56	81	1863
1945	465	254	108	732	108	259	91	25	88	190	115	208	2643
1946	280	324	80	176	91	517	0	58	176	168	441	151	2462
1947	43	323	50	563	18	258	0	330	60	67	355	800	2867
1948	690	205	35	152	434	452	7	0	33	310	156	238	2712
1949	189	241	391	110	327	905	159	112	473	195	390	152	3644

NAROOMA POST OFFICE RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1950	583	782	1137	827	626	824	533	191	256	503	201	232	6695
1951	376	865	54	41	56	1087	123	425	1041	343	92	37	4540
1952	104	237	612	1314	269	1078	253	361	56	622	462	455	5823
1953	184	126	93	49	1469	31	19	212	111	285	98	64	2741
1954	279	728	33	34	65	152	46	59	20	224	247	131	2018
1955	260	926	272	75	595	152	82	35	150	268	152	447	3414
1956	128	1169	1028	424	795	1090	394	47	187	316	164	161	5903
1957	138	600	202	30	5	311	519	596	64	144	151	177	2937
1958	687	494	248	42	28	270	88	133	170	160	73	206	2599
1959	171	256	1109	143	17	585	336	114	171	1168	533	274	4877
1960	287	88	699	35	302	149	421	135	876	251	193	822	4258
1961	345	285					NO RECORDS						
1962				NO RECORDS					602	201	363	754	
1963	288	204	412	561	1207	923	518	367	229	50	359	837	5955
1964	32	105	95	966	233	467	36	486	77	332	259	242	3330
1965	23	26	19	211	299	203	110	313	183	604	144	255	2390
1966	148	421	413	29	66	935	156	152	265	231	559	469	3844
1967	286	139	419	79	93	196	64	455	522	165	78	85	2581

NERRIGUNDAH RAINFALL STATISTICS
(Points)

Appendix 8
Sheet 1

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1900		NO RECORDS			1955	307	606	48	225	46	511	138	
1901	70	75	290	190	50	130	142	1109	271	312	168	25	2832
1902	292	43	280	58	8	82	712	131	208	371	192	1147	3524
1903	66	129	143	96	207	350	383	284	380	228	168	679	3113
1904	395	458	230	468	189	27	411	102	26	187	70	101	2664
1905	272	199	212	360	128	127	21	49	55	337	44	316	2120
1906	169	124	1425	76	216	18	31	570	275	160	176	154	3394
1907	532	77	312	162	129	514	16	106	10	79	193	163	2293
1908	90	883	168	566	123	43	30	926	223	161	259	49	3521
1909	313	439	57	15	15	711	307	78	87	200	41	222	2485
1910	977	16	357	28	18	106	328	19	148	212	202	304	2715
1911	2027	178	531	10	312	129	125	246	184	105	117	276	4240
1912	89	321	653	80	222	324	1062	28	29	59	281	167	3315
1913	87	23	628	445	1020	1310	103	21	252	409	85	80	4463
1914	159	116	1842	878	110	31	602	32	688	218	502	514	5692
1915	234	96	66	286	31	339	59	128	566	63	35	320	2223
1916	172	405	423	253	31	53	132	101	862	1700	390	613	5135
1917	534	283	184	331	436	160	32	54	280	176	907	263	3640

Appendix 8
Sheet 2

NERRIGUNDAH RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1918	951	247	137	129	29	27	896	63	237	65	212	36	3029
1919	18	1346	115	106	580	20	61	86	205	238	888	750	4413
1920	1209	171	192	171	103	46	231	123	144	124	160	839	3513
1921	333	896	158	515	352				NO RECORDS				
1922-1961						NO RECORDS							
1962		NO RECORDS				0	128	239	1210	225	408	768	
1963	322	259	500	950	995	N.R.	463		NO RECORDS				
1964						NO RECORDS							
1965						NO RECORDS							
1966			374	37	67	556	184	146	214	322	1430		
1967						NO RECORDS							

Appendix 9
Sheet 1

TILBA TILBA RAINFALL STATISTICS

(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1916	NO RECORDS						147	159	903	664	428	672	
1917	457	191	283	479	375	258	34	63	142	139	825	259	3505
1918	923	399	72	405	32	45	554	113	79	31	252	64	2969
1919	41	1746	176	162	507	23	66	154	197	157	582	711	4522
1920	902	136	317	109	178	75	161	188	180	126	78	785	3235
1921	219	825	240	372	442	308	124	57	53	318	180	697	3835
1922	806	504	49	107	220	316	1241	343	974	358	51	139	5108
1923	120	145	16	183	18	101	145	42	357	230	219	428	2004
1924	290	314	336	470	88	206	350	78	172	88	408	928	3728
1925	420	247	322	103	2220	324	95	118	24	139	44	61	4117
1926	231	14	437	469	263	283	131	120	419	247	4	395	3013
1927	313	69	198	824	385	138	88	12	330	360	395	61	3173
1928	316	610	1094	121	101	511	87	29	23	62	37	105	3096
1929	82	1682	212	707	138	12	63	475	124	216	332	419	4462
1930	137	101	339	116	842	514	237	85	156	524	150	426	3627
1931	114	169	399	710	631	158	242	12	253	258	365	230	3541
1932	50	278	331	189	460	42	466	340	270	506	405	467	3804
1933	603	21	504	309	262	357	365	138	222	301	479	542	4103

Appendix 9
Sheet 2

TILBA TILBA RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1934	2048	928	197	1520	235	845	841	829	161	252	369	162	8387
1935	362	549	113	807	78	273	68	30	208	392	501	462	3843
1936	358	332	1352	255	131	268	345	191	94	160	182	774	4442
1937	635	172	777	74	32	762	60	373	166	301	145	510	4007
1938	451	470	267	111	158	248	105	437	164	434	274	22	3141
1939	495	144	743	777	101	172	31	513	80	173	363	101	3693
1940	177	72	48	676	197	28	73	36	272	83	211	610	2483
1941	578	266	509	366	62	99	25	133	206	170	207	139	2760
1942	38	120	844	50	206	99	127	12	78	483	1141	127	3325
1943	257	120	77	122	597	90	6	451	192	649	364	376	3301
1944	134	29	212	443	903	11	163	210	27	163	53	89	2437
1945	757	241	107	857	154	281	108	35	90	247	175	212	3264
1946	267	379	200	257	195	667	0	58	148	158	680	53	3062
1947	32	488	82	761	34	280	8	381	56	82	469	876	3549
1948	832	218	59	191	578	312	17	0	40	374	192	317	3130
1949	250	397	618	114	406	1179	104	61	209	208	591	119	4256
1950	670	1555	1347	836	532	663	432	371	261	604	235	160	7666
1951	234	78	29	58	104	1142	60	479	1068	448	145	72	3917

Appendix 9
Sheet 3

TILBA TILBA RAINFALL STATISTICS
(Points)

Year	Jan.	Feb.	Mr.	Apr.	May	June	July	Aug.	Sept.	Oct	Nov.	Dec.	Year
1952	105	177	749	1586	250	1317	223	578	29	870	800	530	7214
1953	286	140	137	47	1419	35	24	284	77	436	103	317	3305
1954	232	1011	9	34	0	238	66	79	50	228	356	131	2434
1955	305	724	325	141	645	124	74	7		NO	RECORDS		
1956	N.R.	1805	1310	344	813	1410	442	31	184	376	118	122	
1957	147	782	205	5	25	374	338	601	74	80	70	189	2890
1958	1000	749						NO RECORDS					
1959								NO RECORDS					
1960								NO RECORDS					
1961				NO	RECORDS			394	759	306	1171	653	
				STATION NOW LOCATED AT TILBA TILBA POST OFFICE									
1962		NO	RECORDS			150	452			NO	RECORDS		
1963		NO	RECORDS		1131	1082	1131	487	256	65	321	883	
1964	0	179	217	1104	118	351	0	462	18	169	209	177	3004
1965	66	53	25	165	120	103	60	308	159	625	133	309	2126
1966	80	272	511	0	72	925	65	87	220	60	540	313	3145
1967	227	134	209	120	50	320	75	562	389	162	140	42	2430

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistic	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
	Minimum	11	0	0	10	0	6	0	0	10	60	0	2	1895
	10%	42	22	39	40	31	22	32	19	35	90	51	26	2302
Bermagui South	30%	187	90	157	83	110	143	79	65	93	169	127	123	2734
(Period 38	50%	278	227	246	201	215	259	118	192	160	244	223	239	3464
years)	70%	355	417	508	418	416	419	298	358	194	319	306	366	4052
	90%	569	929	891	1006	1202	1075	530	492	608	630	778	713	6391
	Maximum	1645	1395	1286	1287	2244	1334	909	862	853	990	1033	832	7281
	Minimum	10	10	5	0	4	0	0	5	0	18	4	15	1950
	10%	65	61	51	33	36	19	14	20	30	65	32	73	2449
Bodalla	30%	196	133	137	90	84	62	56	51	101	145	126	137	2979
(Period 73	50%	303	215	257	209	186	167	139	76	178	198	211	247	3369
years)	70%	455	398	406	436	287	390	265	233	249	300	392	365	4139
	90%	878	743	951	798	848	703	702	457	520	585	579	705	5153
	Maximum	2168	2339	1932	1700	3058	2186	1108	1171	1799	1384	1251	1243	7330
	Minimum	57	3	22	8	2	15	0	11	27	48	56	16	2067
	10%	84	54	55	47	19	35	4	24	42	91	72	54	2373
Bodalla State	30%	189	191	83	72	64	123	42	54	77	174	129	110	3177
Forest	50%	313	309	229	140	156	348	107	191	168	214	201	241	3528
(Period 23	70%	471	454	640	428	448	528	176	346	204	453	412	370	3991
years)	90%	718	1114	1095	1161	889	1380	748	535	60[illegible]	1113	773	728	7170
	Maximum	930	1242	1742	1756	1569	1496	1022	643	1082	1462	822	855	9113

STATISTICAL RAINFALL DATA
(Points)

Stations	Rainfall Statistics	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Cobargo (Period 57 Years)	Minimum	29	0	15	0	0	0	0	0	0	32	4	2	1821
	10%	41	56	32	25	16	24	9	10	24	66	55	58	2114
	30%	150	109	117	68	77	97	69	35	79	128	138	158	2671
	50%	279	245	195	163	147	210	107	96	142	220	239	216	3231
	70%	434	374	420	358	233	454	281	215	233	335	353	403	3992
	90%	801	1153	964	823	957	781	733	500	688	484	580	759	5839
	Maximum	1923	2599	1505	1784	2212	1679	1687	705	961	1391	1692	901	8550
Countegany (Period 31 Years)	Minimum	12	3	10	0	0	0	0	14	42	16	2	60	1644
	10%	57	8	40	10	5	18	40	26	56	27	21	68	1769
	30%	151	68	103	48	41	91	97	69	116	94	117	150	2246
	50%	266	211	186	148	75	136	149	120	180	154	159	261	2465
	70%	342	305	244	213	143	185	261	168	231	204	200	448	2945
	90%	755	506	539	500	469	369	670	479	507	327	370	576	3554
	Maximum	1123	1200	1100	630	1385	912	1579	697	667	1083	1040	838	4816
Krawarree (Period 65 Years)	Minimum	0	0	0	10	0	0	3	0	10	5	0	14	847
	10%	22	21	25	32	11	18	27	19	35	60	27	45	1963
	30%	124	74	130	92	46	84	64	51	79	137	121	139	2388
	50%	279	260	192	148	115	165	117	93	168	203	161	227	2858
	70%	365	367	404	321	237	273	221	195	229	287	293	399	3528
	90%	658	735	700	584	815	655	681	477	463	449	513	600	4900
	Maximum	1299	1330	1339	745	2700	1381	1901	883	853	1684	1529	917	6064

STATISTICAL RAINFALL DATA
(Points)

Station	Rainfall Statistics	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Narooma Post Office (Period 47 years)	Minimum	0	12	19	0	5	31	0	0	0	0	18	33	1759
	10%	41	39	51	40	32	43	16	14	36	64	61	63	2333
	30%	144	100	113	108	97	144	87	53	104	163	139	144	2858
	50%	280	230	272	240	254	211	132	128	170	236	201	238	3163
	70%	403	337	482	511	367	461	267	303	200	314	325	328	3699
	90%	688	799	928	798	731	954	522	427	387	591	475	564	5839
	Maximum	2430	1299	1170	1314	1469	1230	881	596	1041	1168	740	845	6965
Nerrigundah (Period 20 years)	Minimum	18	16	57	10	8	18	16	19	10	59	35	25	2120
	10%	66	25	71	16	15	21	22	22	26	63	41	37	2230
	30%	111	102	173	85	37	44	60	57	145	135	130	157	2750
	50%	253	175	255	167	126	117	137	102	216	194	184	270	3355
	70%	491	310	403	317	213	275	366	130	274	235	245	256	3605
	90%	1186	840	1348	556	566	691	878	890	676	405	849	830	5068
	Maximum	2027	1346	1842	878	1020	1310	1062	1109	862	1700	907	1147	5692
Tilba Tilba (Period 39 years)	Minimum	32	14	9	5	0	1	0	0	23	31	4	22	2004
	10%	50	69	48	50	32	28	17	12	29	82	51	61	2483
	30%	177	144	137	116	104	101	66	61	79	160	175	131	3141
	50%	286	247	240	257	206	268	105	133	161	247	252	259	3541
	70%	457	470	399	479	406	324	223	343	208	360	395	462	3917
	90%	832	1011	844	836	842	845	466	513	357	524	680	774	5108
	Maximum	2048	1746	1352	1586	2220	1317	1241	829	1068	870	1141	928	8387

MINIMUM RAINFALL RECORDED IN PERIODS OF UP TO TWELVE MONTHS COMMENCING IN THE MONTH INDICATED
(Points)

Station	Number of Months	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bodalla	1	10	10	5	0	4	0	0	5	0	18	4	15
	2	99	42	16	35	54	14	45	62	67	47	36	60
	3	176	285	80	128	148	86	96	89	94	111	136	246
	4	399	348	309	183	244	266	168	137	139	177	274	330
	5	511	506	406	249	442	471	242	182	205	496	334	618
	6	760	589	472	450	542	537	287	248	557	556	660	636
	7	794	655	652	566	631	640	353	631	657	861	678	885
	8	860	806	752	636	920	861	825	936	1203	879	927	1046
	9	1061	906	859	975	995	1056	1342	1279	1370	1128	1088	1084
	10	1177	1042	1066	1141	1138	1501	1521	1465	1532	1289	1126	1341
	11	1247	1522	1287	1605	1604	1668	1661	1608	1557	1327	1434	1441
	12	1950	1815	1838	1996	1870	1760	1789	1633	1633	1654	1534	1726
Cobargo	1	29	0	15	0	0	0	0	0	0	32	4	2
	2	42	88	43	0	47	30	9	20	99	114	67	82
	3	148	122	56	146	186	80	73	122	143	147	133	234
	4	216	142	277	314	220	206	169	173	176	213	373	375
	5	236	350	358	359	385	331	249	206	242	493	411	409
	6	444	537	385	409	480	391	282	272	493	562	445	429
	7	604	580	435	661	699	450	348	513	754	596	465	637
	8	674	897	687	909	751	714	641	849	978	616	673	824
	9	1091	1059	1125	961	781	931	977	998	1091	824	860	867
	10	1535	1230	1248	991	998	1358	1126	1163	1299	1011	903	1224
	11	1676	1411	1278	1208	1425	1419	1291	1442	1486	1054	1423	1661
	12	1821	1441	1495	1635	1486	1611	1570	1515	1529	1538	1816	1750

TUROSS RIVER AT BELOWRA

LOCATION:	Latitude 36°08' Longitude 149°43'
PERIOD OF ESTABLISHMENT:	May 1954 to date.
COMPLETE YEARS OF COMPUTED RECORDS:	14
ZERO OF GAUGE:	R.L. 43.77 Assumed Datum.
CATCHMENT AREA:	205 square miles
CONTROL:	Rock and gravel.
EQUIPMENT:	Pressure Recorder installed February 1968. Staff gauge; Range 0 to 30 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 79 (b) Maximum observation in cusecs. : 2,060 (c) Minimum observation in cusecs : 3.7
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	28,100 cusecs
MEAN DAILY DISCHARGE FOR 14 YEARS:	230 cusecs
MEAN ANNUAL DISCHARGE FOR 14 YEARS:	168,000 acre feet
REMARKS:	Missing records derived by correlation with Tuross Vale, Yowrie and Downstream of Wadbilliga River Junction.

TUROSS RIVER AT BELOWRA

Month	Year 1954 Discharge for Month Max.	Min.	Mean	Discharge for Month Acre Feet	Month	Year 1955 Discharge for Month Max.	Min.	Mean	Discharge for Month Acre Feet
Jan.	..	..	..	..	Jan.	8	0.5	2.7	167
Feb.	..	..	..	..	Feb.	No Records			4,100*
Mar.	..	..	..	..	Mar.	450	75	192	11,890
Apr.	..	..	..	..	Apr.	12200	25	162	9,736
May	..	..	..	..	May	No Records			40,500*
June	94	15	26	1,540	June	No Records			11,300*
July	20	11	15	942	July	94	61	78	4,848
Aug.	11	8	10	604	Aug.	75	41	51	3,150
Sept.	8	6	7	444	Sept.	48	30	34	2,012
Oct.	136	6	25	1,536	Oct.	212	15	43	2,680
Nov.	242	11	64	3,828	Nov.	25	8	12	724
Dec.	11	2	7	416	Dec.	212	8	67	4,170
Total	..	..	..	..	Total	..	..	..	95,277*

Month	Year 1956 Discharge for Month Max.	Min.	Mean	Discharge for Month Acre Feet	Month	Year 1957 Discharge for Month Max.	Min.	Mean	Discharge for Month Acre Feet
Jan.	No Records			4,650*	Jan.	No Records			760*
Feb.	No Records			38,600*	Feb.	212	6	28	1,562
Mar.	7700	296	1862	115,420	Mar.	41	8	21	1,328
Apr.	1640	160	585	35,124	Apr.	8	6	7.6	460
May	No Records			50,000*	May	6	6	6	372
June	No Records			78,000*	June	242	6	33	1,952
July	3410	336	801	49,688	July	2980	25	185	11,442
Aug.	316	136	203	12,568	Aug.	2910	35	343	21,296
Sept.	160	75	103	6,174	Sept.	358	66	125	7,520
Oct.	614	66	163	10,110	Oct.	94	30	44	2,742
Nov.	66	35	48	2,908	Nov.	84	8	24	1,460
Dec.	48	15	34	2,126	Dec.	11	6	7	418
Total	..	..	..	405,368*	Total	..	..	..	51,312*

* Estimated

TUROSS RIVER AT BELOWRA

Year 1958

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	1050	8	59	3,634
Feb.	1310	66	236	13,232
Mar.	296	48	102	6,300
Apr.	48	25	30	1,798
May	25	11	21	1,294
June	No Records			6,000*
July	No Records			13,200*
Aug.	35	25	28	1,720
Sept.	No Records			3,800*
Oct.	39	9	19	1,196
Nov.	13	4	6	384
Dec.	81	9	19	1,208
Total	..	..	..	53,766*

Year 1959

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min	Mean	
Jan.	46	13	35	2,156
Feb.	101	27	42	2,378
Mar.	3410	81	371	23,008
Apr.	2840	81	399	23,946
May	81	39	55	3,388
June	5000	17	330	19,824
July	8660	146	720	44,660
Aug.	222	81	142	8,818
Sept.	1010	62	138	8,262
Oct.	13000	71	1726	107,022
Nov.	4800	358	888	53,300
Dec.	776	170	309	19,150
Total	..	..	..	315,912

Year 1960

Jan.	263	81	149	9,240
Feb.	112	62	73	4,248
Mar.	316	53	133	8,236
Apr.	112	53	76	4,530
May	112	22	44	2,734
June	81	33	39	2,332
July	14830	39	918	56,890
Aug.	248	81	141	8,750
Sept.	1640	80	323	19,360
Oct.	380	62	135	8,378
Nov.	No Records			6,000*
Dec.	No Records			33,300*
Total	..	..	..	163,998*

Year 1961

Jan.	1360	101	213	13,180
Feb.	158	46	80	4,486
Mar.	9570	158	753	46,694
Apr.	No Records			13,500*
May	123	81	108	6,666
June	1630	71	222	13,310
July	4600	114	534	33,136
Aug.	2420	124	320	19,812
Sept.	4900	212	820	49,204
Oct.	926	136	231	14,326
Nov.	28100	124	2021	121,274
Dec.	No Records			77,500*
Total	...	..	..	413,088*

* Estimated.

TUROSS RIVER AT BELOWRA

Year 1962					Year 1963				
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.	1310	225	415	25,760	Jan.	156	118	124	7,660
Feb.	3410	171	539	30,196	Feb.	167	109	124	6,958
Mar.	434	148	297	18,416	Mar.	167	109	132	8,188
Apr.	148	84	111	6,650	Apr.	15700	100	401	24,062
May	148	69	87	5,400	May	7940	480	1329	82,412
June	69	45	53	3,192	June	2490	178	558	33,468
July	267	40	62	3,866	July	1310	178	469	29,096
Aug.	267	35	73	4,524	Aug.	680	92	194	12,038
Sept.	9830	30	754	45,200	Sept.	590	92	195	11,674
Oct.	218	100	140	8,662	Oct.	1310	118	368	22,814
Nov.	No Records			9,010*	Nov.	275	92	127	7,648
Dec.	2840	156	496	30,736	Dec.	2840	100	732	45,372
Total	..	..	..	191,612*	Total	..	..	..	291,390

Year 1964					Year 1965				
Jan.	186	70	101	6,230	Jan.	32	17	23	1,440
Feb.	84	37	57	3,290	Feb.	18	10	15	820
Mar.	740	34	80	4,986	Mar.	10	9	9	550
Apr.	7000	32	584	35,030	Apr.	21	8	12	742
May	400	85	149	9,268	May	12	10	11	688
June	1600	74	299	17,948	June	24	10	11	680
July	118	70	96	5,920	July	25	12	14	894
Aug.	5200	49	388	24,000	Aug.	178	12	46	2,820
Sept.	661	100	223	13,400	Sept.	127	14	36	2,180
Oct.	212	63	96	5,980	Oct.	420	12	52	3,240
Nov.	236	73	131	7,880	Nov.	56	14	28	1,690
Dec.	141	29	67	4,190	Dec.	800	17	85	5,330
Total	..	..	..	138,122	Total	..	..	..	21,074

* Estimated

TUROSS RIVER AT BELOWRA

Year 1966

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	15	8	11	672
Feb.	77	8	19	1,120
Mar.	127	9	32	1,970
Apr.	21	12	15	918
May	12	10	12	726
June	420	10	100	5,980
July	92	18	33	2,050
Aug.	25	17	22	1,380
Sept.	400	24	69	4,160
Oct.	319	24	91	5,640
Nov.	14500	37	993	59,600
Dec.	846	118	193	12,000
Total	..	..	..	96,216

Year 1967

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	303	59	101	6,250
Feb.	275	40	91	5,070
Mar.	73	40	54	3,360
Apr.	40	25	33	1,980
May	30	18	22	1,380
June	73	21	48	2,860
July	43	40	41	2,550
Aug.	No Records			30,000*
Sept.	No Records			36,000*
Oct.	212	100	116	7,200
Nov.	108	35	86	5,170
Dec.	28	18	22	1,380
Total	..	..	..	103,200*

Year 1968

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	70	17	24	1,490
Feb.	19	7	12	722
Mar.	18	7	9	548
Apr.	9	5	6	364
May	330	5	35	2,160
June	15	13	13	792
July	17	12	13	806
Aug.	13	6	8	490
Sept.	6	2	4	222
Oct.	3	1	2.5	153
Nov.	45	0.5	7	397
Dec.	224	0.5	25	1,530
Total	..	..	..	9,674

* Estimated.

TUROSS RIVER AT TUROSS VALE

LOCATION:	Latitude 36°15' Longitude 149°31'
PERIOD OF ESTABLISHMENT:	June 1948 to September 1961.
COMPLETE YEARS OF COMPUTED RECORDS:	12
ZERO OF GAUGE:	R.L.87.64 Assumed Datum.
CATCHMENT AREA:	60 square miles
CONTROL:	Rock Bar
EQUIPMENT:	Automatic Recorder (Pressure Type) installed August 1954. Staff gauge, range 0 to 20 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 43
	(b) Maximum observation in cusecs : 522
	(c) Minimum observation in cusecs : 1.2
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	4,800 cusecs.
MEAN DAILY DISCHARGE FOR 12 YEARS:	66 cusecs.
MEAN ANNUAL DISCHARGE FOR 12 YEARS:	48,200 acre feet.

TUROSS RIVER AT TUROSS VALE

Month	Year 1948 Discharge in Cusecs Max.	Min.	Mean	Discharge for Month Acre Feet	Month	Year 1949 Discharge in Cusecs Max.	Min.	Mean	Discharge for Month Acre Feet
Jan.	..	..	..	..	Jan.	95	4.9	15	944
Feb.	..	..	..	..	Feb.	13	1.1	5	282
Mar.	..	..	..	..	Mar.	445	4.9	99	6,116
Apr.	..	..	..	..	Apr.	6.7	2.2	5.5	332
May	..	..	..	..	May	255	6.7	60	3,704
June	..	..	..	..	June	982	65	150	9,012
July	21	11	14	889	July	65	16	34	2,115
Aug.	11	4.9	7.7	477	Aug.	29	7.6	14	880
Sept.	21	4	6.8	410	Sept.	26	8.6	16	981
Oct.	61	4.9	13	784	Oct.	21	10	13	833
Nov.	13	2.2	6.6	395	Nov.	95	2.7	18	1,104
Dec.	69	0.2	5.7	354	Dec.	21	5.8	11	663
Total	..	..	..	..	Total	..	..	..	26,966

	Year 1950					Year 1951			
Jan.	94	2.2	10	628	Jan.	46	11	23	1,407
Feb.	550	2.2	122	6,827	Feb.	2690	2.2	401	22,442
Mar.	1640	2.2	185	11,468	Mar.	573	21	237	14,714
Apr.	2300	2.2	253	15,195	Apr.	26	2.2	14	860
May	337	2.2	46	2,827	May	26	0.4	4.9	302
June	2120	3.3	443	26,566	June	337	2.2	164	9,811
July	387	4.9	62	3,876	July	255	16	99	6,135
Aug.	95	46	60	3,726	Aug.	255	47	120	7,418
Sept.	16	2.2	6.3	376	Sept.	908	16	148	8,885
Oct.	2000	3.3	288	17,886	Oct.	370	53	135	8,350
Nov.	94	4.9	33	1,972	Nov.	54	8.6	22	1,350
Dec.	39	11	21	1,319	Dec.	8.6	0.2	2.6	164
Total	..	..	..	92,666	Total	..	..	..	81,838

TUROSS RIVER AT TUROSS VALE

Month	Year 1952 Discharge in Cusecs Max.	Min.	Mean	Discharge for Month Acre Feet	Month	Year 1953 Discharge in Cusecs Max.	Min.	Mean	Discharge for Month Acre Feet
Jan.	2.2	0	0.4	25	Jan.	210	21	75	4,638
Feb.	16	0.1	4.5	259	Feb.	26	8.6	15	826
Mar.	6.7	2.2	3.1	190	Mar.	8.6	2.2	4.3	268
Apr.	2290	2.2	211	12,663	Apr.	6.7	2.2	4.5	272
May	144	61	97	6,006	May	337	4.9	76	4,709
June	4800	133	1329	79,738	June	95	16	59	3,682
July	337	103	210	13,050	July	16	11	13	818
Aug.	196	61	114	7,082	Aug.	39	3.3	19	1,153
Sept.	61	8.6	25	1,495	Sept.	39	2.2	13	766
Oct.	11	4	7.4	456	Oct.	8.6	5.8	6.9	429
Nov.	573	3.3	268	16,086	Nov.	32	6.7	10	625
Dec.	337	196	268	16,640	Dec.	6.7	2.7	3.6	221
Total	..	..	..	153,690	Total	..	..	..	18,407

	Year 1954					Year 1955			
Jan.	4.9	0.4	1.3	82	Jan.	No Records			10*
Feb.	1160	0.2	79	4,404	Feb.	No Records			830*
Mar.	No Records			690*	Mar.	No Records			1,200*
Apr.	2.2	1.1	1.9	114	Apr.	No Records			910*
May	2.2	0.4	1.7	106	May	2340	14.7	140	8,670
June	54	4.9	19.6	1,179	June	73	14.7	39	2,349
July	No Records			460*	July	35	12.1	16.8	1,044
Aug.	No Records			255*	Aug.	18.1	7.6	11.2	699
Sept.	No Records			200*	Sept.	14.7	4	8.8	525
Oct.	No Records			410*	Oct.	No Records			700*
Nov.	No Records			660*	Nov.	9.7	1.7	4.4	264
Dec.	No Records			40*	Dec.	99	1.7	12.4	770
Total	..	..	..	8,600*	Total	..	..	..	17,971*

* Estimated.

TUROSS RIVER AT TUROSS VALE

Month	Year 1956 Discharge in Cusecs Max.	Min.	Mean	Discharge for Month Acre Feet	Month	Year 1957 Discharge in Cusecs Max.	Min.	Mean	Discharge for Month Acre Feet
Jan.	118	5.8	15	954	Jan.	9.7	2.7	3.6	225
Feb.	1350	4	142	8,217	Feb.	7.6	1.7	3.5	194
Mar.	1680	65	216	13,362	Mar.	5.8	1.7	3	186
Apr.	No Records			3,660*	Apr.	4	1	2.3	139
May	2650	35	175	10,866	May	2.7	1	1.5	93
June	3160	35	284	17,060	June	128	1	7	420
July	771	57	123	7,618	July	1410	1.7	74	4,570
Aug.	81	18	47	2,900	Aug.	770	8	76	4,722
Sept.	57	12	24	1,452	Sept.	65	15	28	1,698
Oct.	277	15	44	2,719	Oct.	23	5.8	12	720
Nov.	18	5.8	14	832	Nov.	29	4	7.6	456
Dec.	43	4	8.6	533	Dec.	15	0.4	2.3	140
Total	..	..	..	70,173*	Total	..	..	..	13,563

	Year 1958					Year 1959			
Jan.	311	1.7	13	799	Jan.	78	2.7	14	850
Feb.	234	5.8	34	1,881	Feb.	46	3	7.4	416
Mar.	73	8.6	18	1,111	Mar.	640	8	51	3,171
Apr.	9.7	2.7	5.2	313	Apr.	950	8	69	4,114
May	8.6	1.7	4.2	258	May	11	4.5	7.2	445
June	1060	1	22	1,289	June	2040	2	82	4,899
July	771	9.7	44	2,751	July	3100	14	127	7,860
Aug.	50	7.6	11	664	Aug.	77	15	32	2,008
Sept.	43	5.8	13	775	Sept.	315	14	28	1,660
Oct.	15	4	7.9	492	Oct.	2860	20	260	16,118
Nov.	65	2.7	4.3	260	Nov.	385	47	99	5,916
Dec.	50	1	4.8	295	Dec.	203	20	47	2,910
Total	..	..	..	10,888*	Total	..	..	..	50,367

*Estimated

TUROSS RIVER AT TUROSS VALE

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	11	24	1,460	Jan.	345	12	47	2,882
Feb.	32	6	11	666	Feb.	56	6	11	592
Mar.	110	5.2	24	1,490	Mar.	2640	30	156	9,684
Apr.	18	2	6.9	417	Apr.	190	26	47	2,828
May	56	2	7	430	May	78	14	30	1,830
June	66	2	6.6	402	June	640	14	64	3,814
July	3890	8.2	21	13,190	July	1820	42	124	7,704
Aug.	46	17	57	3,536	Aug.	1450	34	95	5,862
Sept.	No Records			1,711*	Sept.	1650	59	183	10,994
Oct.	No Records			1,884*	Oct.				
Nov.	147	9	21	1,276	Nov.				
Dec.	1900	15	114	7,080	Dec.				
Total	..	..	..	33,542*	Total				

* Estimated

YOWRIE RIVER AT YOWRIE

LOCATION:	Latitude 36°18' Longitude 148°43'
PERIOD OF ESTABLISHMENT:	September 1958 to date
COMPLETE YEARS OF COMPUTED RECORDS:	10
ZERO OF GAUGE:	R.L. 70.79 Assumed Datum
CATCHMENT AREA:	51 Square Miles
CONTROL:	Gravel
EQUIPMENT:	Automatic Recorder (Pressure Type) installed January 1967; staff gauge, range 0 to 20 feet.
CURRENT METER OBSERVATIONS:	(a) Number obtained : 77
	(b) Maximum observation in cusecs : 305
	(c) Minimum observation in cusecs : 1.3
MAXIMUM ESTIMATED DISCHARGE DURING PERIOD OF RECORDS:	7,440 cusecs
MEAN DAILY DISCHARGE FOR 10 YEARS:	52 cusecs
MEAN ANNUAL DISCHARGE FOR 10 YEARS:	38,000 acre feet

YOWRIE RIVER AT YOWRIE

Year 1958

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	..	..	..	..
Feb.	..	..	..	..
Mar.	..	..	..	..
Apr.	..	..	..	..
May	..	..	..	..
June	..	..	..	..
July	..	..	..	..
Aug.	..	..	..	..
Sept.	5	3.7	4.5	267
Oct.	5	1.5	2.2	138
Nov.	4	0.7	1.5	91
Dec.	4	1.5	1.9	118
Total	..	..	..	..

Year 1959

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	14	1.5	2.8	176
Feb.	220	1.5	8.7	538
Mar.	1320	4	93	5,780
Apr.	220	1.5	54	3,360
May	13	4	7.2	448
June	1040	4	77	4,802
July	2780	13	150	9,311
Aug.	35	10	18	1,134
Sept.	23	6	10	594
Oct.	7400	6	432	26,764
Nov.	760	53	139	8,366
Dec.	75	23	48	3,006
Total	..	..	..	64,279

Year 1960

Jan.	44	14.5	24	1,496
Feb.	18	8.5	13	736
Mar.	111	8.5	25	1,566
Apr.	18	8.5	11	642
May	8.5	8.5	8.5	528
June	8.5	5	7	419
July	3300	6.5	326	20,188
Aug.	36	23	28	1,714
Sept.	503	23	103	6,174
Oct.	44	23	26	1,642
Nov.	23	17	21	1,259
Dec.	2650	23	196	12,200
Total	..	..	..	48,564

Year 1961

Jan.	101	25	34	2,120
Feb.	32	6	13	724
Mar.	3300	20	179	11,106
Apr.	44	30	31	1,884
May	20	12	13	808
June	500	12	53	3,160
July	2360	12	158	9,816
Aug.	320	12	50	3,120
Sept.	1500	44	361	21,686
Oct.	116	16	31	1,920
Nov.	6200	14	522	31,326
Dec.	4200	86	396	24,566
Total	..	..	..	112,236

YOWRIE RIVER AT YOWRIE

Month	Year 1962 Discharge in Cusecs Max.	Min.	Mean	Discharge for Month Acre Feet	Month	Year 1963 Discharge in Cusecs Max.	Min.	Mean	Discharge for Month Acre Feet
Jan.	440	40	116	7,198	Jan.	40	12	19	1,190
Feb.	1320	40	238	13,328	Feb.	40	9	20	1,130
Mar.	69	32	53	3,284	Mar.	600	9	81	5,000
Apr.	29	16	19	1,150	Apr.	4280	9	158	9,500
May	17	16	16	997	May	2530	79	233	14,500
June	16	12	14	830	June	400	42	98	5,900
July	25	12	13	794	July	170	31	74	4,570
Aug.	59	10	14	872	Aug.	70	18	27	1,680
Sept.	1980	6	155	9,314	Sept.	141	13	29	1,720
Oct.	25	12	18	1,120	Oct.	107	13	32	1,890
Nov.	12	3	6	358	Nov.	107	7	32	1,890
Dec.	171	10	37	2,270	Dec.	700	7	123	7,650
Total	..	..	..	41,515	Total	..	..	..	56,620

	Year 1964					Year 1965			
Jan.	38	13	21	1,320	Jan.	3.2	2	2.3	144
Feb.	46	13	15	880	Feb.	2.5	2.3	2.4	136
Mar.	70	9	17	1,040	Mar.	2.4	2.2	2.3	143
Apr.	3510	9	159	9,520	Apr.	4.2	2.2	3.1	189
May	37	19	25	1,530	May	7	3	3.9	242
June	186	19	41	2,460	June	5	3	3.6	216
July	23	12	16	982	July	4.2	3.5	3.5	220
Aug.	1100	10	77	4,760	Aug.	18	3.5	5.2	320
Sept.	70	6	27	1,590	Sept.	13	3.5	4.2	250
Oct.	18	6	10	618	Oct.	31	2	7	434
Nov.	27	9	15	916	Nov.	5	2	3.1	186
Dec.	9	4	6.5	404	Dec.	417	2	24	1,510
Total	..	..	..	26,020	Total	..	..	..	3,990

YOWRIE RIVER AT YOWRIE

Year 1966

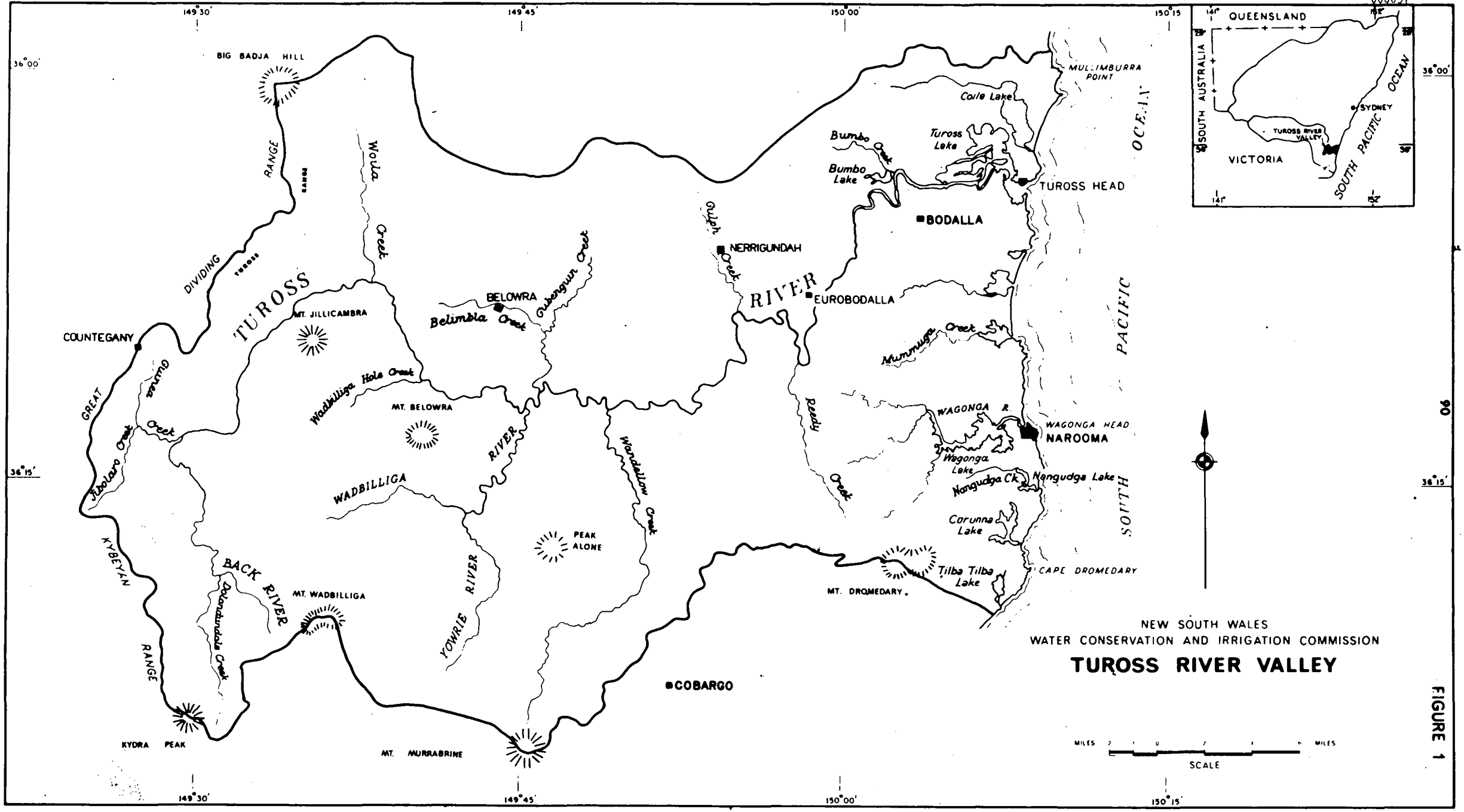
Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	2.5	2	2	125
Feb.	3.2	2	2.1	119
Mar.	9.5	2	3.5	220
Apr.	2.5	2	2	121
May	3	2	2.2	135
June	309	2	24	1,410
July	7	2	3.3	206
Aug.	38	2.5	3.7	230
Sept.	24	3.2	6.9	413
Oct.	24	3.2	4.6	284
Nov.	3510	3.6	183	11,000
Dec.	141	18	41	2,510
Total	..	..	..	16,773

Year 1967

Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	18	6	9	612
Feb.	13	3	5.5	312
Mar.	27	2.2	6.2	387
Apr.	4.3	2	3.4	206
May	6.7	0.5	1.8	115
June	11	2.1	4.8	285
July	4.3	2.3	3.4	208
Aug.	462	2.3	34	2,090
Sept.	644	7	58	3,510
Oct.	15	4.3	9	576
Nov.	5	2.1	3.3	200
Dec.	2.1	1.4	1.7	105
Total	..	..	..	8,606

Year 1968

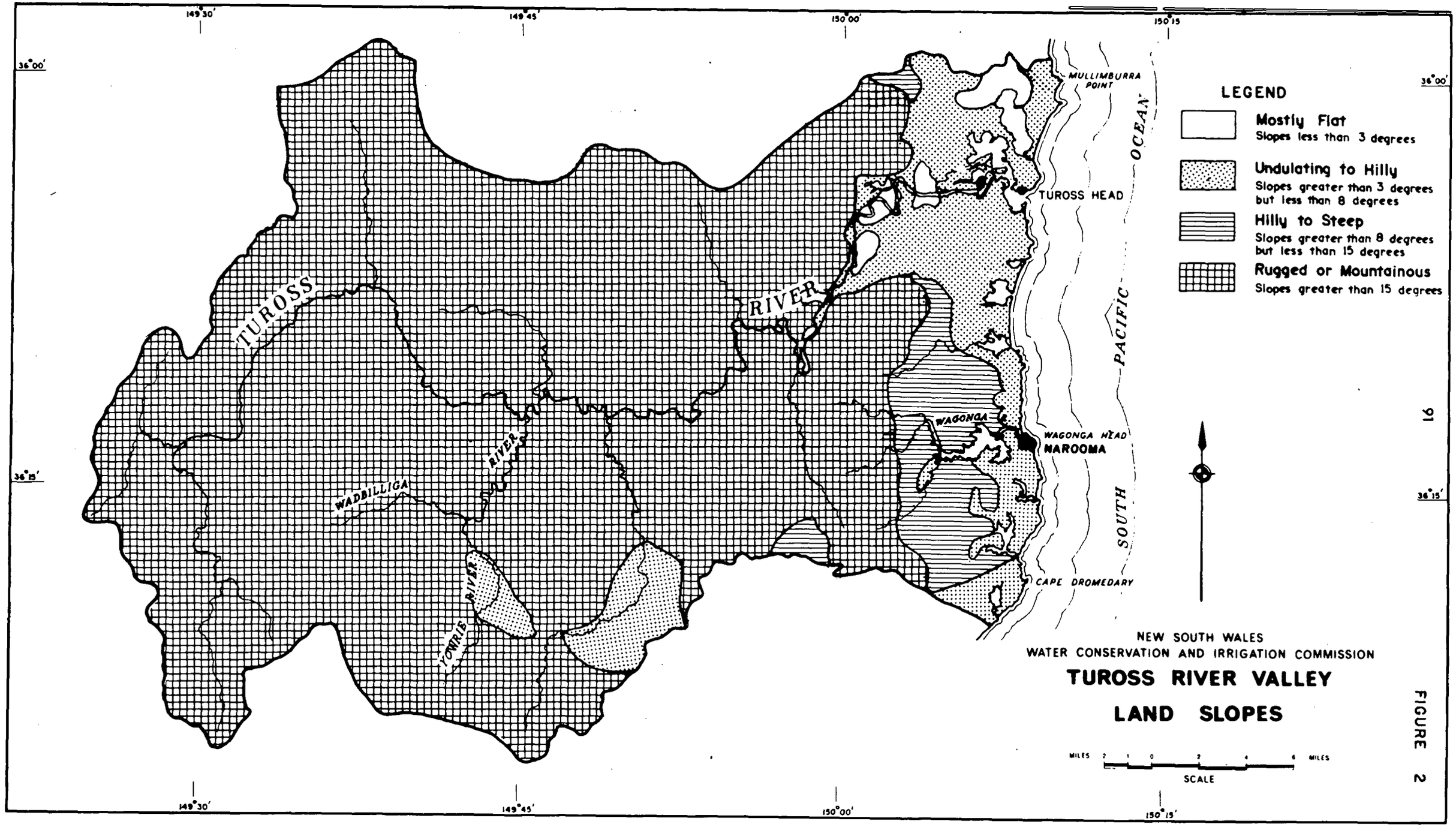
Month	Discharge in Cusecs			Discharge for Month Acre Feet
	Max.	Min.	Mean	
Jan.	37	0.6	2.6	159
Feb.	0.7	0.5	0.6	35
Mar.	0.7	0.6	0.6	39
Apr.	0.7	0.5	0.6	37
May	23	0.4	1.9	120
June	1.5	1.1	1.2	71
July	1.1	1.1	1.1	71
Aug.	1.1	0.6	0.9	55
Sept.	0.7	0.3	0.5	32
Oct.	0.3	0.2	0.3	15
Nov.	3	0.1	0.2	13
Dec.	66	0.1	4	275
Total	..	..	..	922

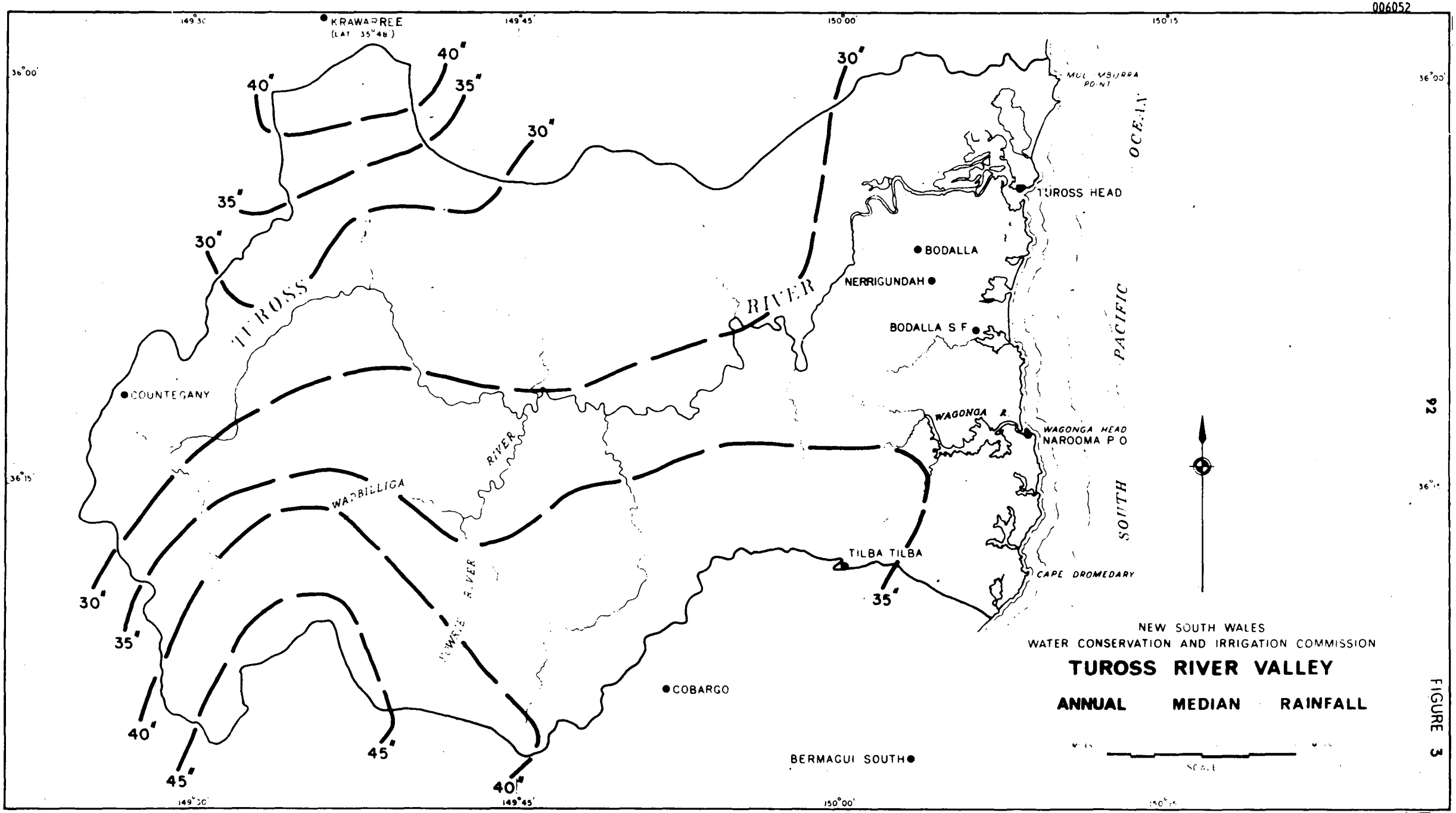


NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION

TUROSS RIVER VALLEY

FIGURE 1


149°30'
149°45'
150°00'
150°15'
36°00'
36°15'
MULLIMBURRA POINT
TUROSS HEAD
PACIFIC OCEAN
SOUTH
TUROSS RIVER
WADBILLIGA RIVER
YOWRIE RIVER
WAGONGA
WAGONGA HEAD
NAROOMA
CAPE DROMEDARY
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
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
TUROSS RIVER VALLEY
LAND SLOPES
MILES 2 1 0 2 4 6 MILES
SCALE
91
FIGURE 2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(LAT 35°48')
149°30'
149°45'
150°00'
150°15'
36°00'
36°15'
40"
35"
30"
45"
TUROSS RIVER
MUL MBURRA POINT
TUROSS HEAD
OCEAN
PACIFIC
SOUTH
BODALLA
NERRIGUNDAH
BODALLA S F
COUNTEGANY
WAGONGA R.
WAGONGA HEAD
NAROOMA P O
WADBILLIGA
RIVER
TILBA TILBA
CAPE DROMEDARY
COBARGO
BERMAGUI SOUTH
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
TUROSS RIVER VALLEY
ANNUAL MEDIAN RAINFALL
SCALE

92

FIGURE 3

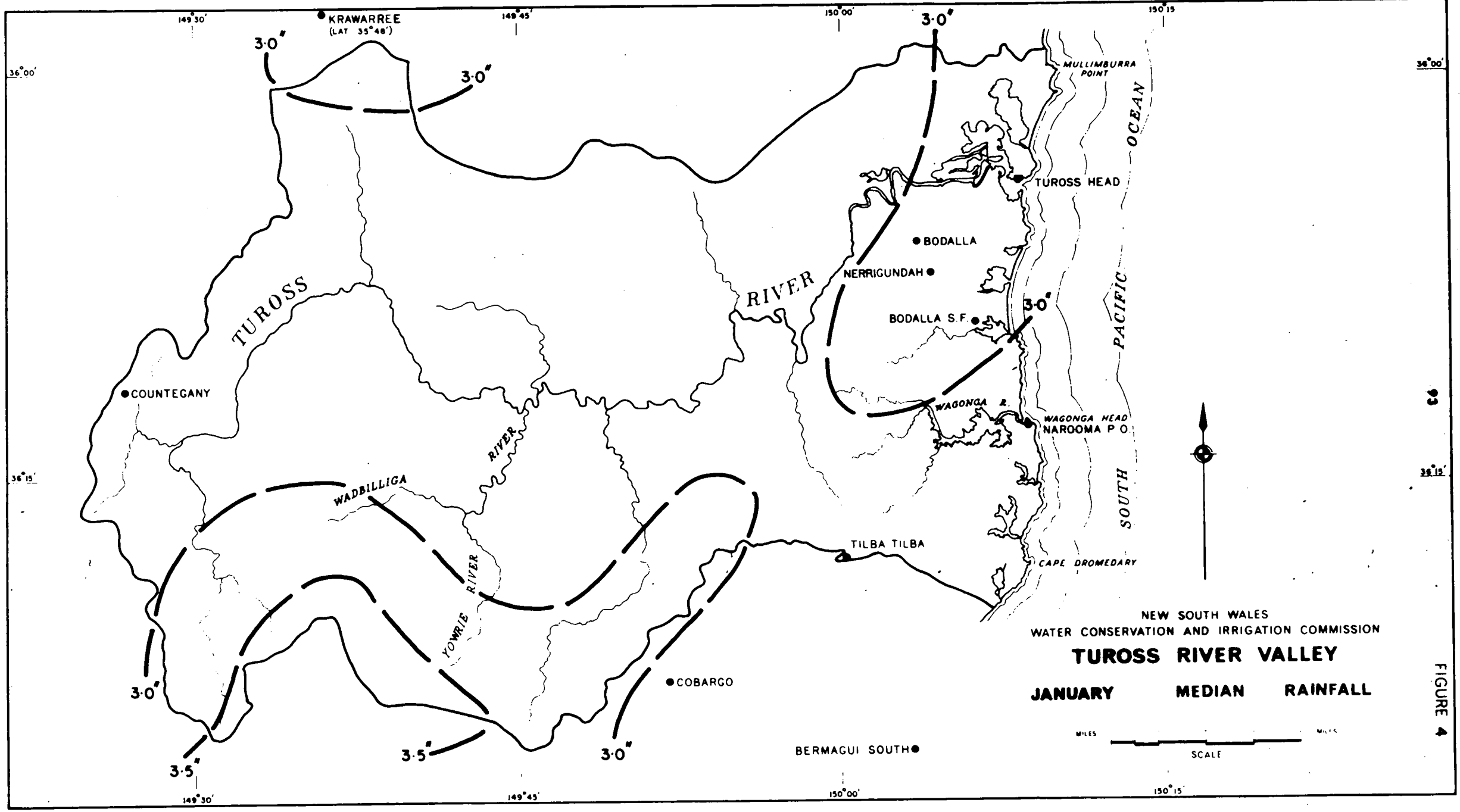
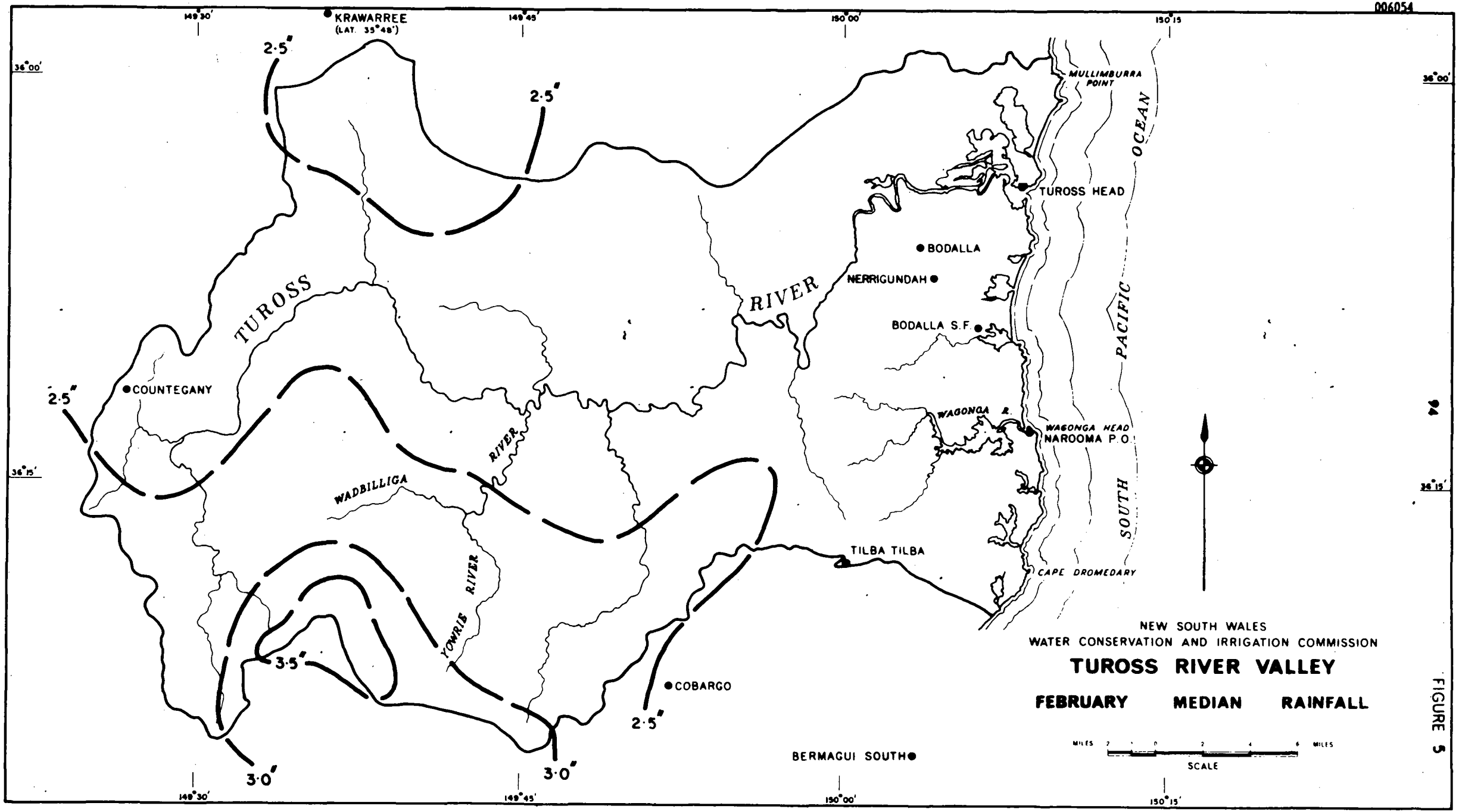


FIGURE 4

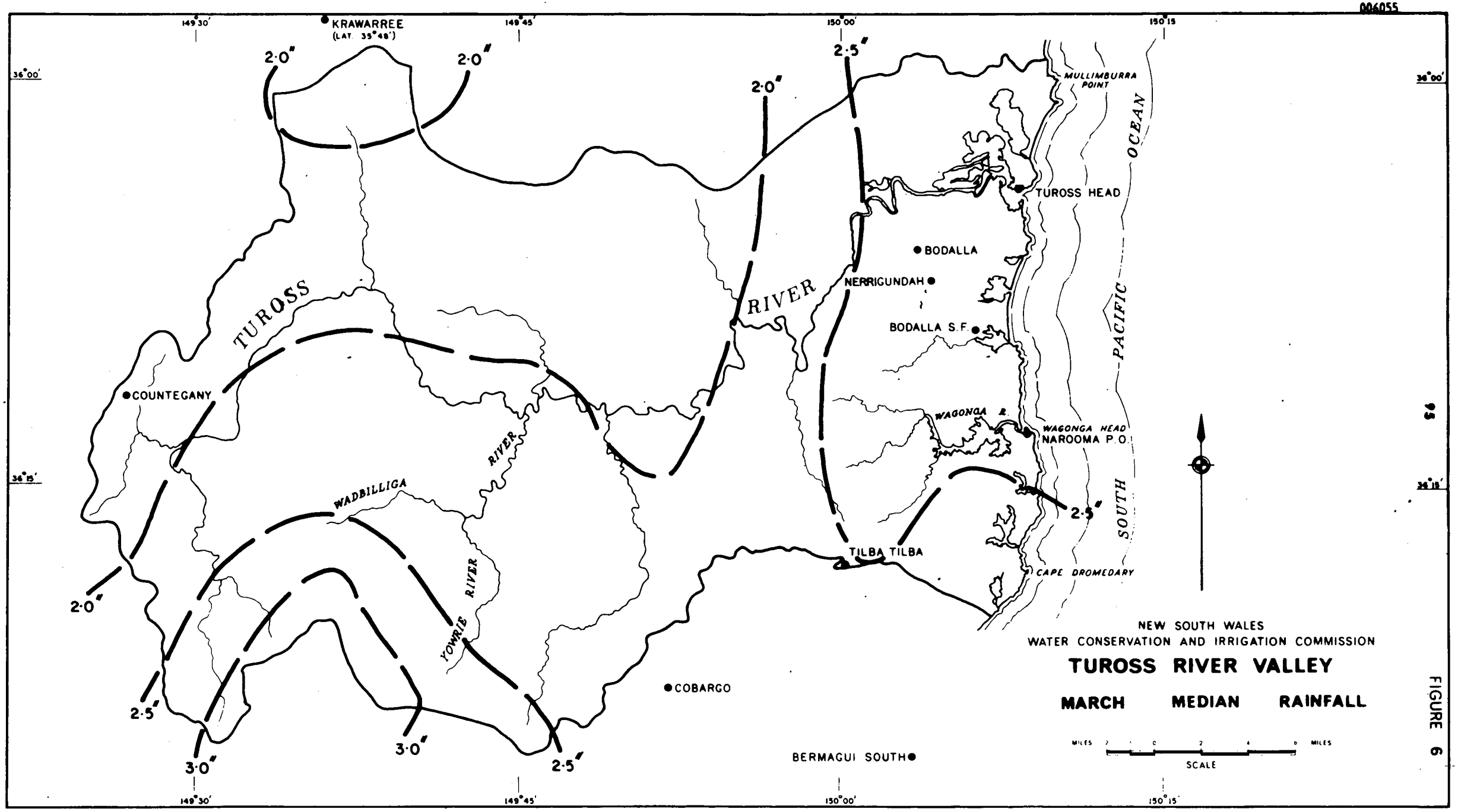


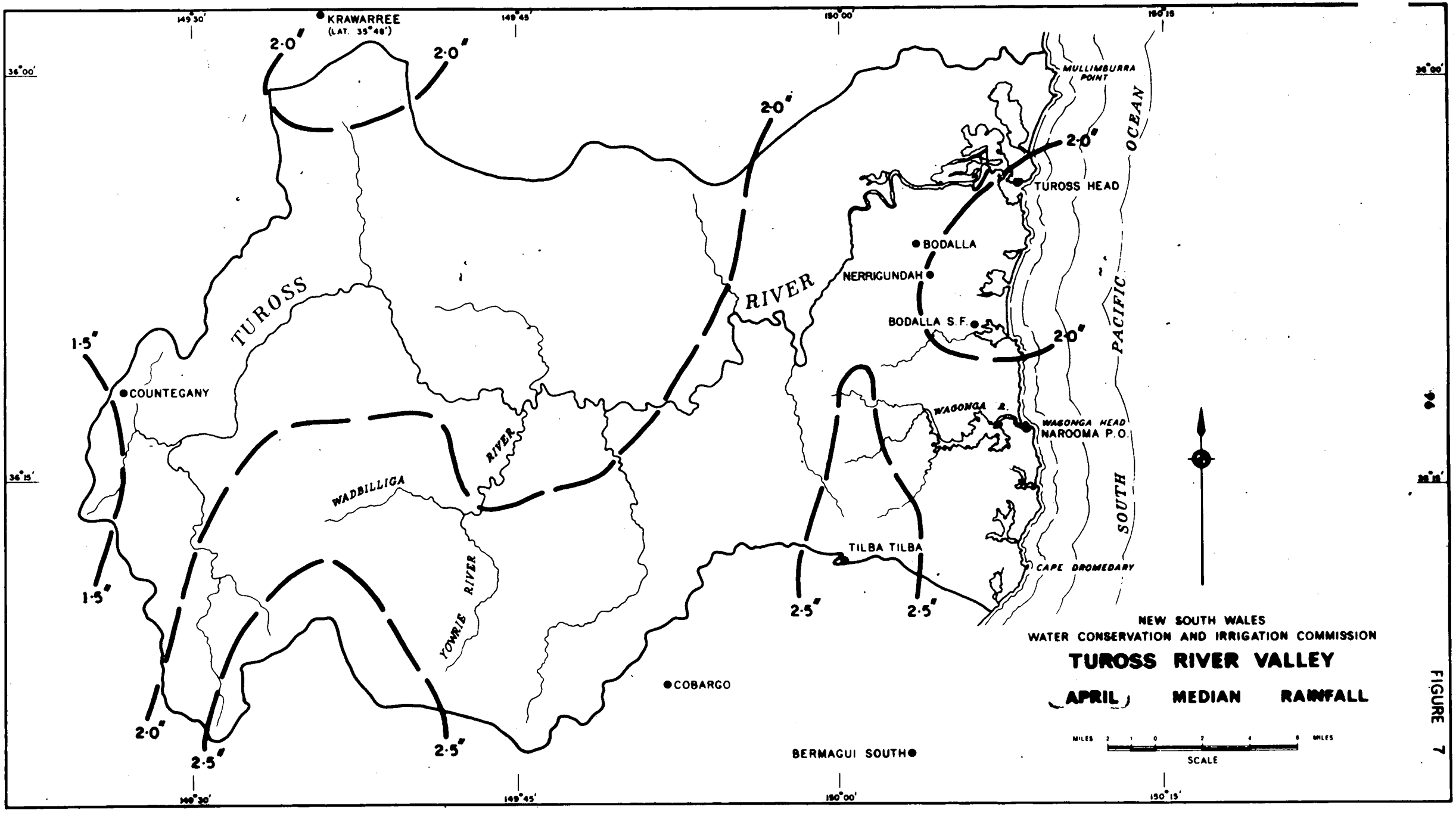
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION

TUROSS RIVER VALLEY

FEBRUARY MEDIAN RAINFALL

FIGURE 5


KRAWARREE
(LAT. 35°48')
149°30'
149°45'
150°00'
150°15'
36°00'
36°15'
2·0"
2·5"
3·0"
TUROSS
RIVER
WADBILLIGA
RIVER
YOWRIE
RIVER
COUNTEGANY
COBARGO
BERMAGUI SOUTH
BODALLA
NERRIGUNDAH
BODALLA S.F.
TILBA TILBA
TUROSS HEAD
MULLIMBURRA
POINT
PACIFIC
OCEAN
WAGONGA R.
WAGONGA HEAD
NAROOMA P.O.
SOUTH
CAPE DROMEDARY
MILES
SCALE
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
TUROSS RIVER VALLEY
MARCH MEDIAN RAINFALL
FIGURE 6


KRAWARREE
(LAT. 35°48')
149°30'
149°45'
150°00'
150°15'
36°00'
36°15'
2·0"
1·5"
2·5"
TUROSS
RIVER
WADBILLIGA
RIVER
YOWRIE
RIVER
COUNTEGANY
COBARGO
BERMAGUI SOUTH
BODALLA
NERRIGUNDAH
BODALLA S.F.
MULLIMBURRA
POINT
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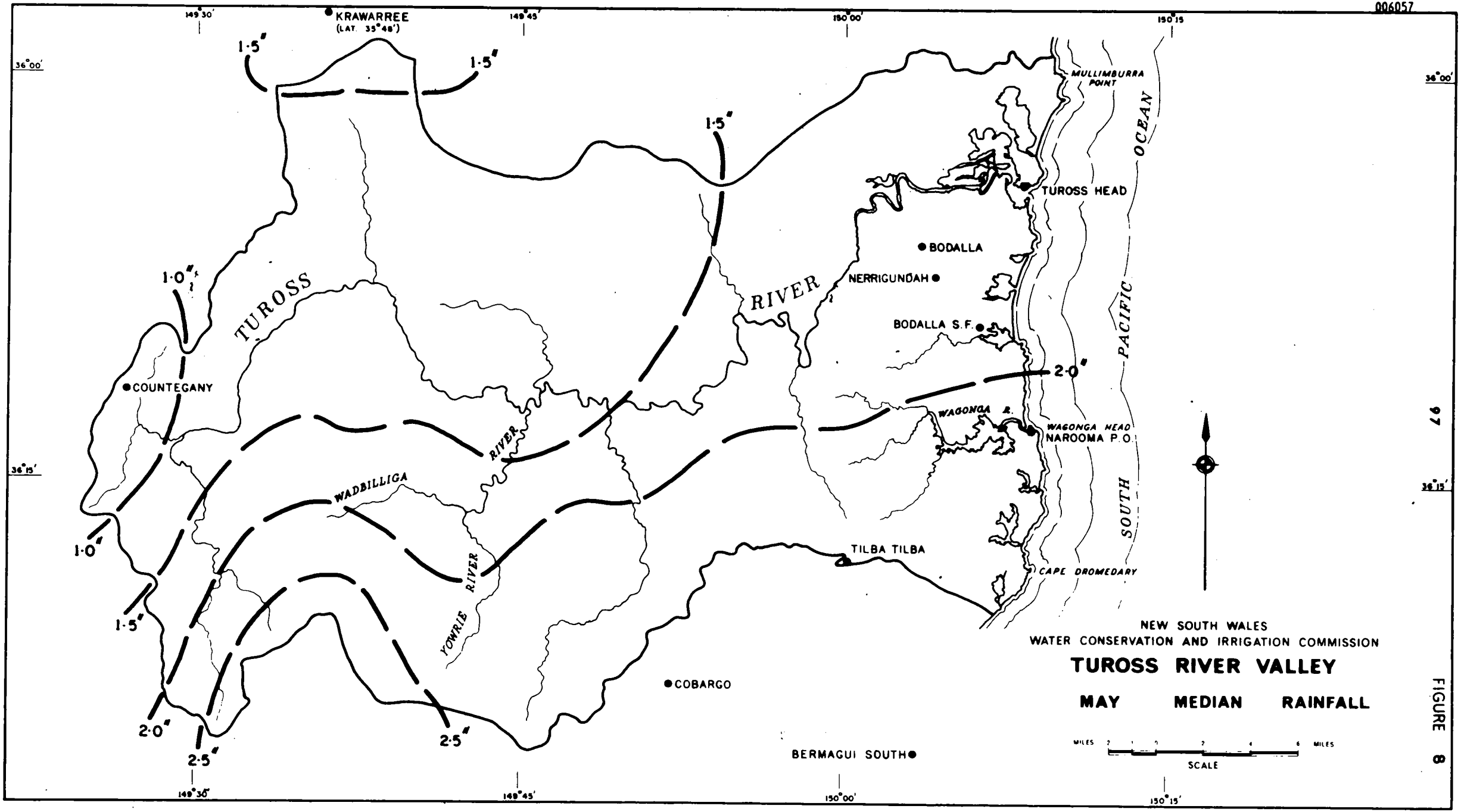
PACIFIC
OCEAN
WAGONGA R.
WAGONGA HEAD
NAROOMA P.O.
TILBA TILBA
CAPE DROMEDARY
SOUTH
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
TUROSS RIVER VALLEY
APRIL MEDIAN RAINFALL
MILES 2 1 0 2 4 6 MILES
SCALE
FIGURE 7


KRAWARREE
(LAT. 35°48')
149°30'
149°45'
150°00'
150°15'
36°00'
36°15'
1·5"
1·0"
2·0"
2·5"
TUROSS
RIVER
WADBILLIGA
RIVER
YOWRIE
RIVER
COUNTEGANY
BODALLA
NERRIGUNDAH
BODALLA S.F.
TUROSS HEAD
MULLIMBURRA
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SOUTH
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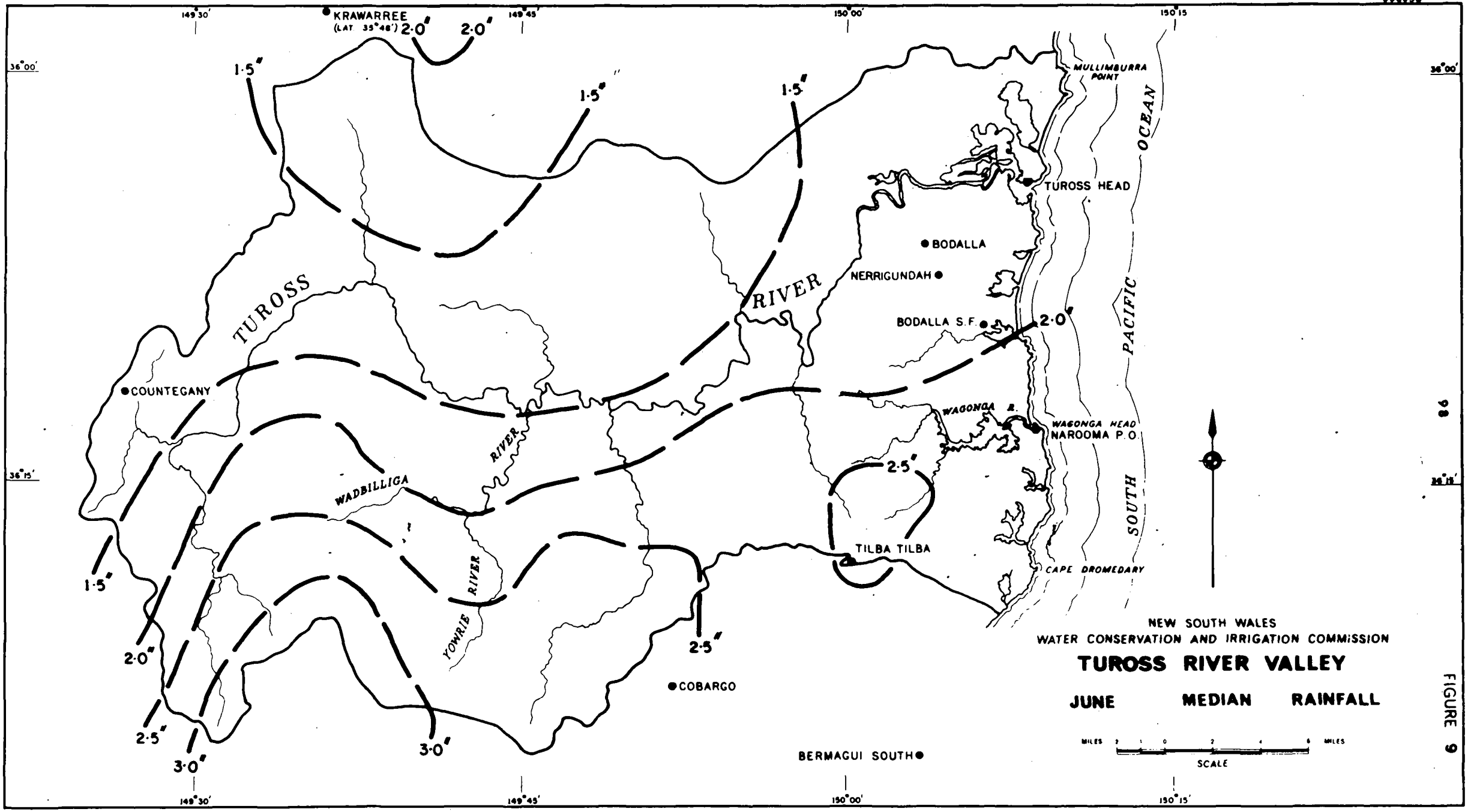
NAROOMA P.O.
TILBA TILBA
CAPE DROMEDARY
COBARGO
BERMAGUI SOUTH
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
TUROSS RIVER VALLEY
MAY MEDIAN RAINFALL
MILES 2 1 0 2 4 6 MILES
SCALE
FIGURE 8



NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION

TUROSS RIVER VALLEY

JUNE MEDIAN RAINFALL

FIGURE 9

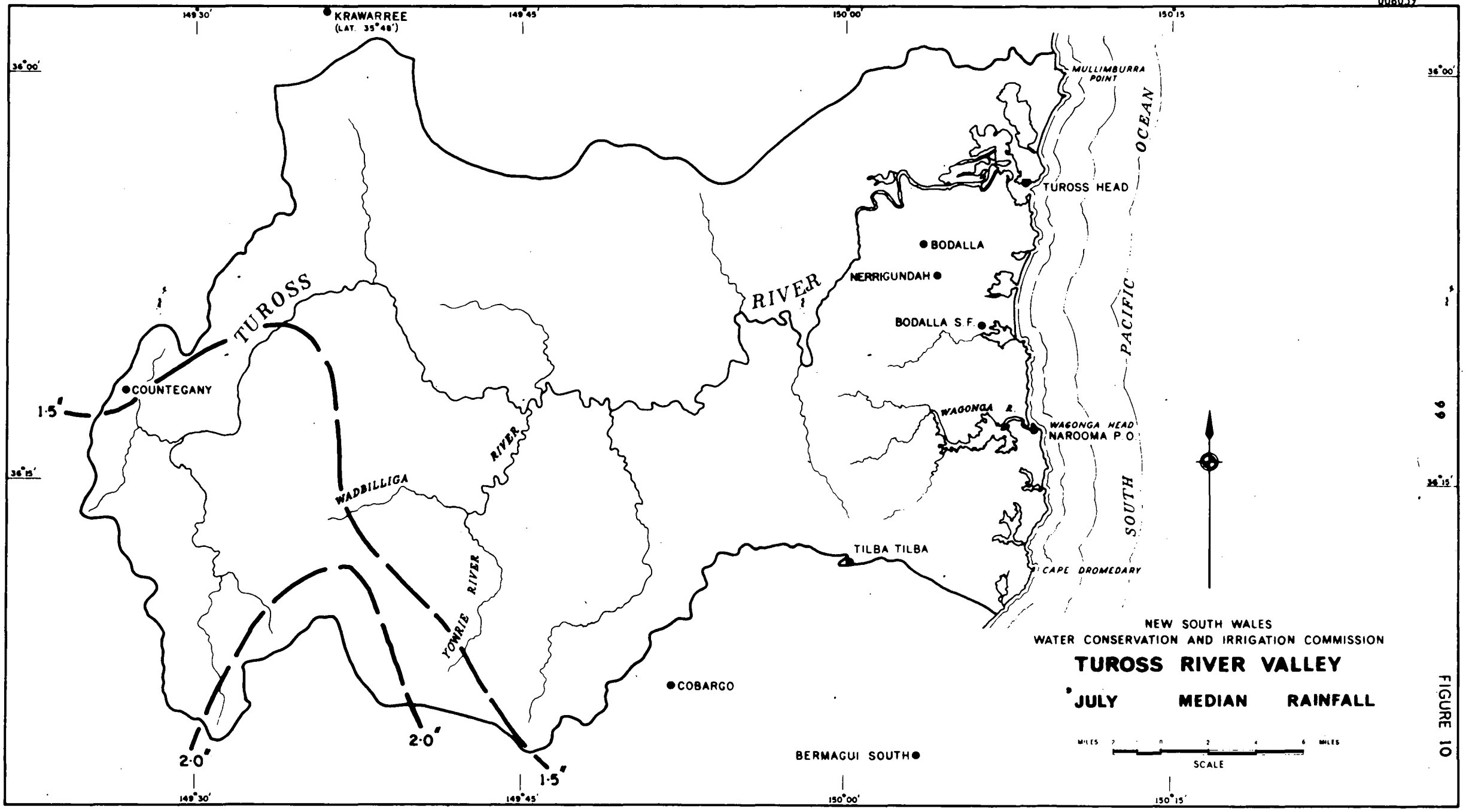
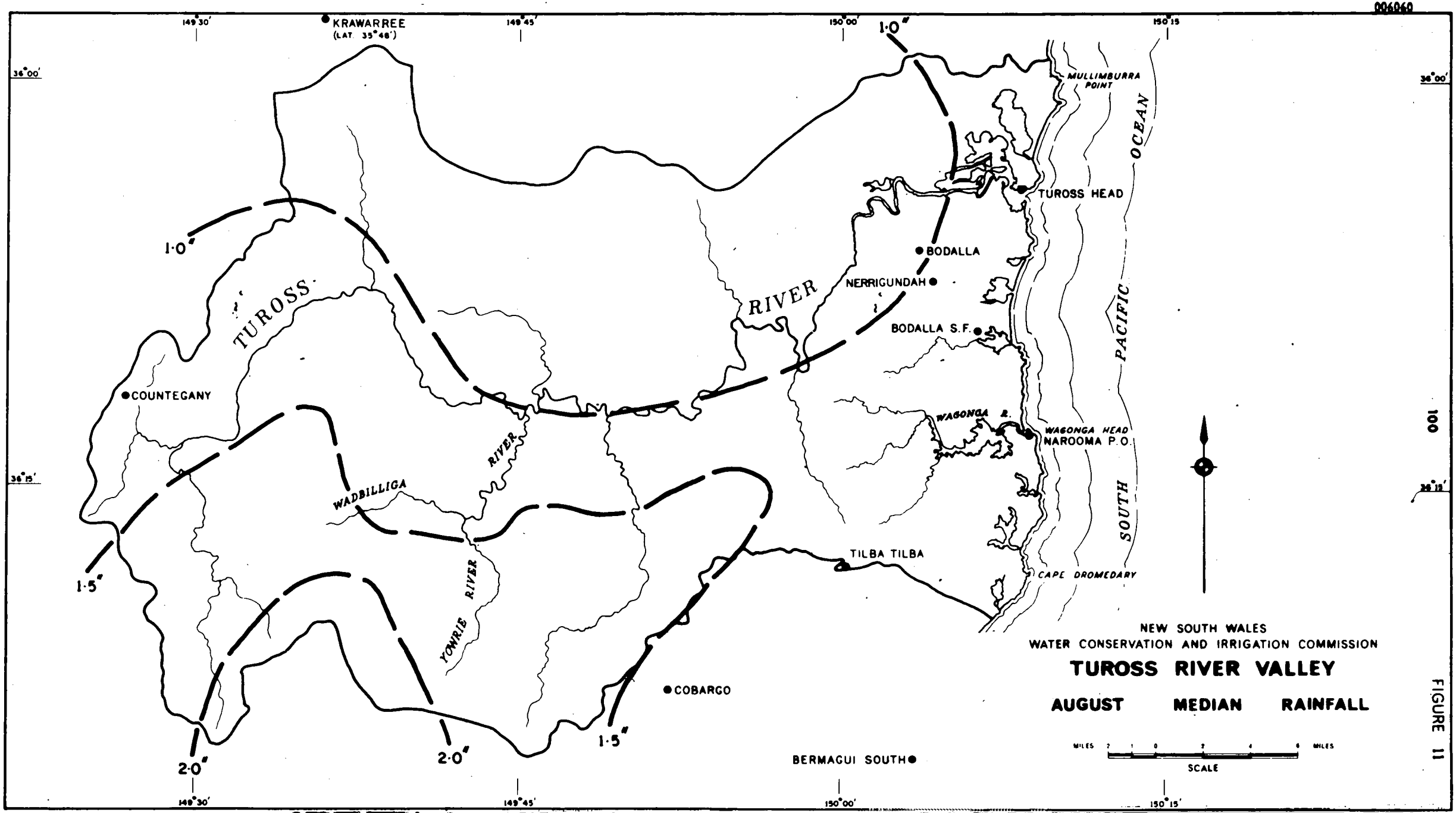
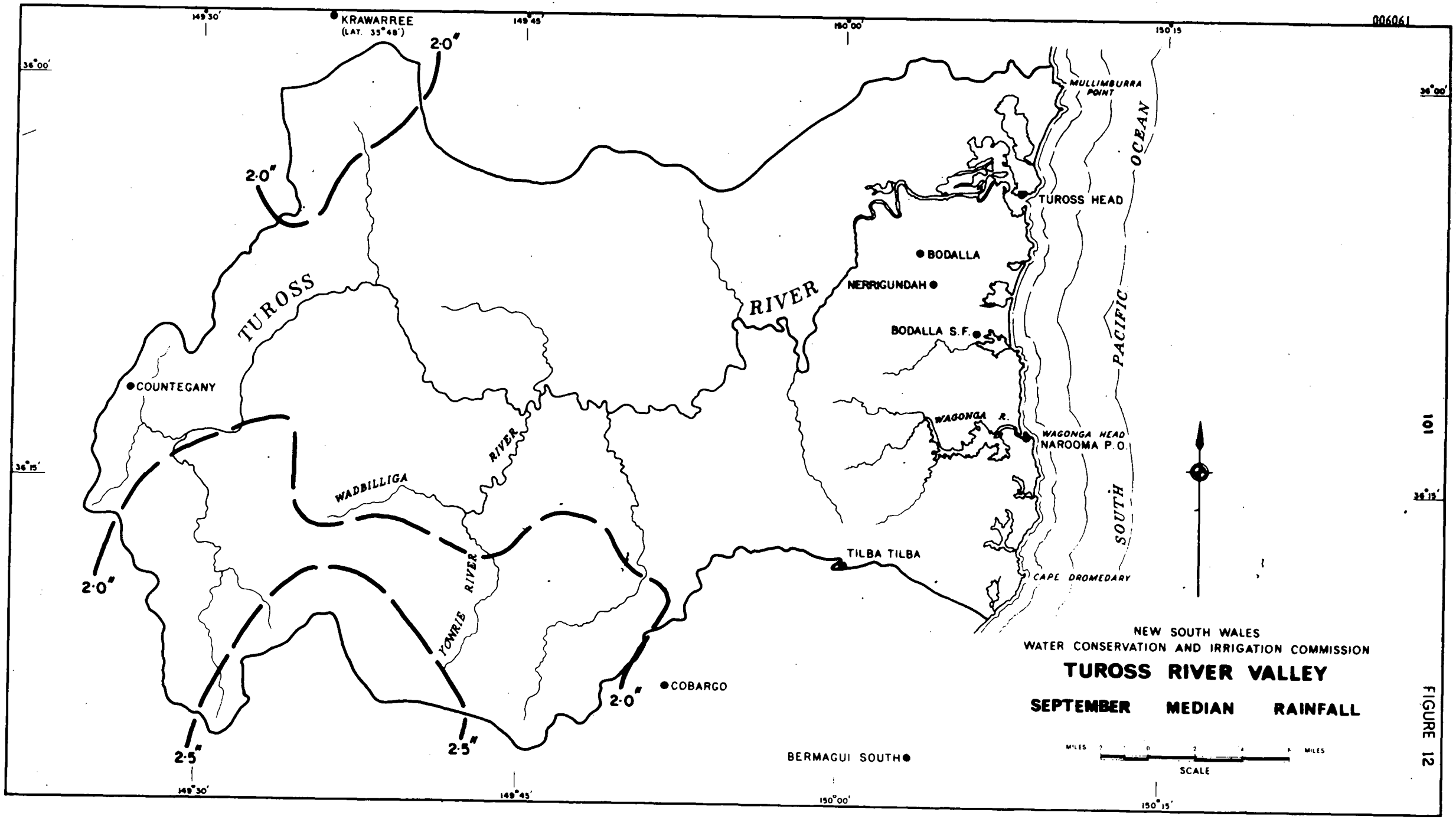

149°30'
KRAWARREE
(LAT. 35°48')
149°45'
150°00'
150°15'
36°00'
36°15'
TUROSS
RIVER
MULLIMBURRA POINT
TUROSS HEAD
PACIFIC OCEAN
SOUTH
BODALLA
NERRIGUNDAH
BODALLA S.F.
COUNTEGANY
1·5"
WADBILLIGA
RIVER
YOWRIE RIVER
WAGONGA R.
WAGONGA HEAD
NAROOMA P.O
TILBA TILBA
CAPE DROMEDARY
COBARGO
2·0"
2·0"
1·5"
BERMAGUI SOUTH
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
TUROSS RIVER VALLEY
JULY MEDIAN RAINFALL
MILES 2 0 2 4 6 MILES
SCALE

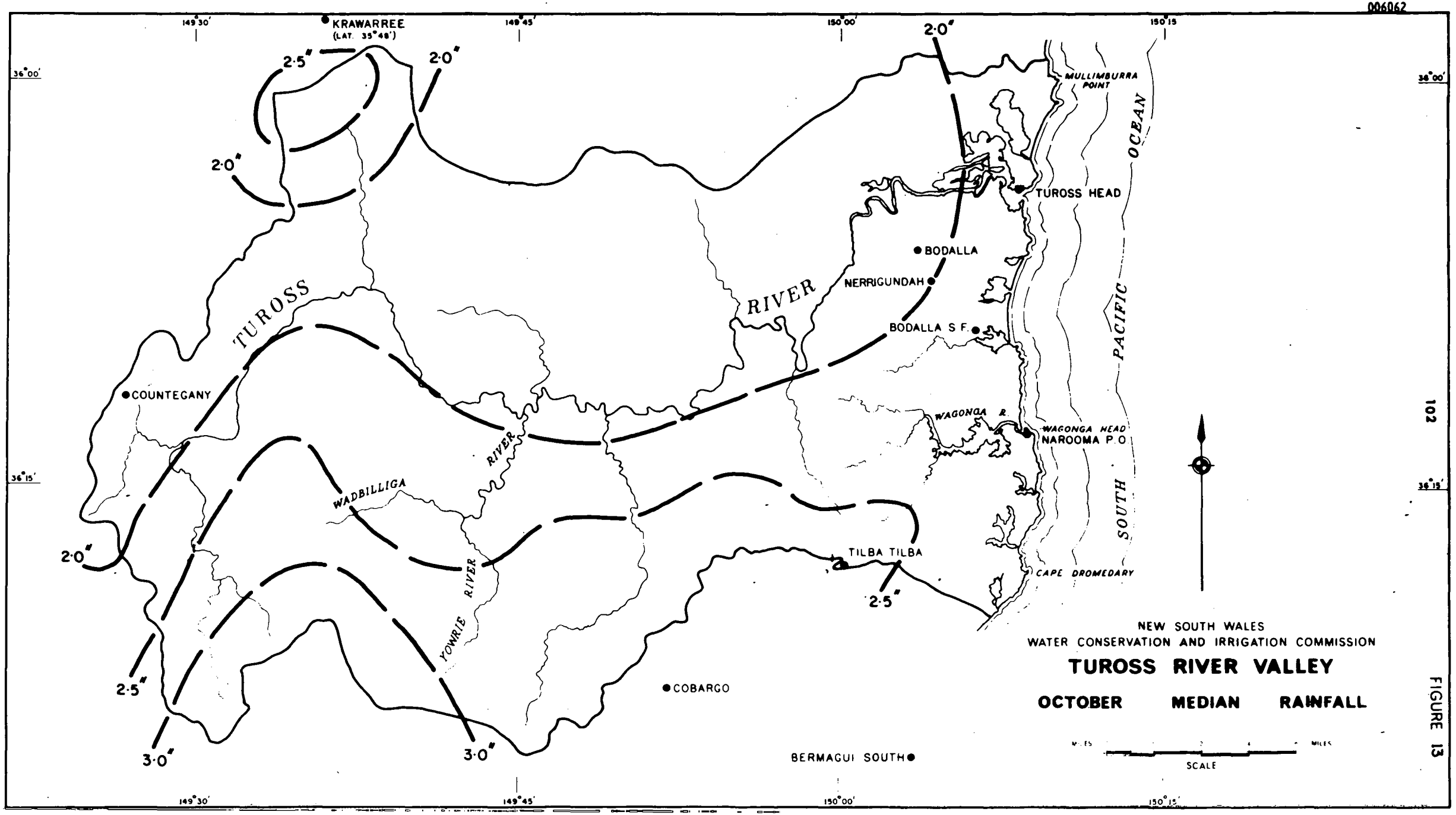
FIGURE 10


KRAWARREE
(LAT. 35°48')
149°30'
149°45'
150°00'
150°15'
36°00'
36°15'
1·0"
1·5"
2·0"
TUROSS
RIVER
MULLIMBURRA POINT
TUROSS HEAD
BODALLA
NERRIGUNDAH
BODALLA S.F.
COUNTEGANY
WADBILLIGA
RIVER
YOWRIE RIVER
WAGONGA R.
WAGONGA HEAD
NAROOMA P.O.
TILBA TILBA
CAPE DROMEDARY
COBARGO
BERMAGUI SOUTH
PACIFIC OCEAN
SOUTH
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
TUROSS RIVER VALLEY
AUGUST MEDIAN RAINFALL
MILES 2 1 0 2 4 6 MILES
SCALE
100
FIGURE 11



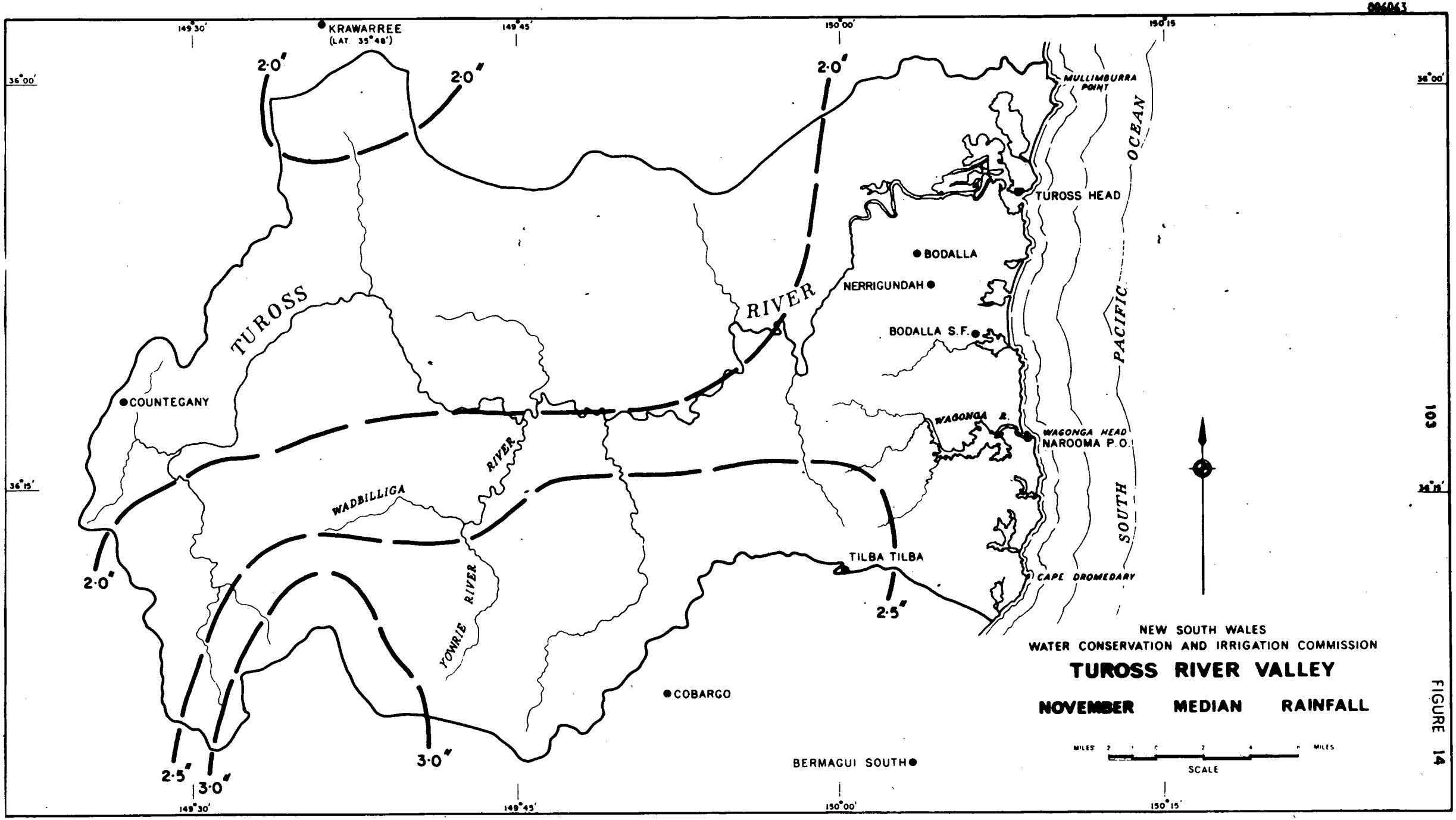
101

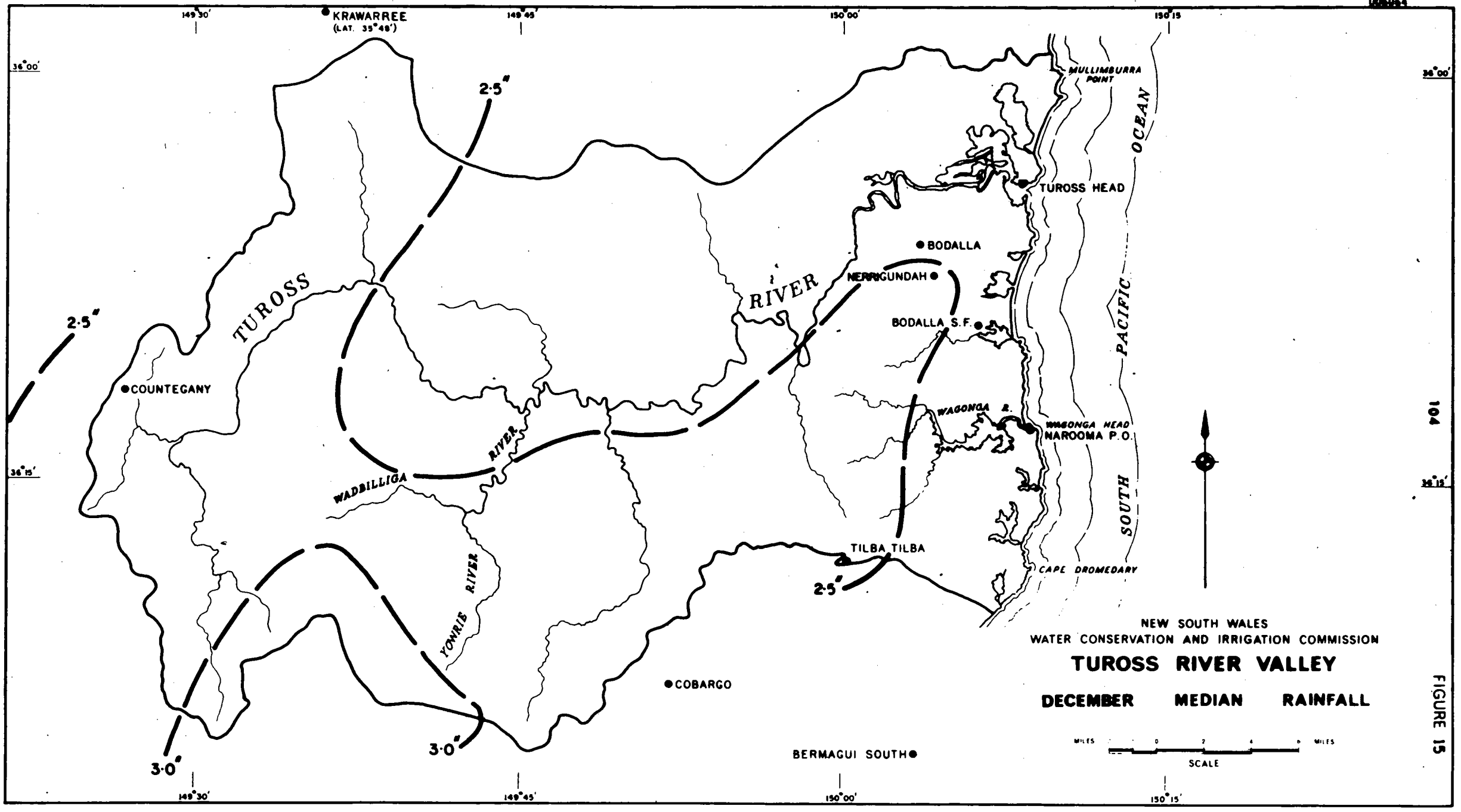
FIGURE 12



102

FIGURE 13


KRAWARREE
(LAT. 35°48')
149°30'
149°45'
150°00'
150°15'
36°00'
36°15'
2·0"
2·5"
3·0"
TUROSS
RIVER
MULLIMBURRA POINT
TUROSS HEAD
OCEAN
PACIFIC
SOUTH
BODALLA
NERRIGUNDAH
BODALLA S.F.
COUNTEGANY
WADBILLIGA
RIVER
YOWRIE RIVER
WAGONGA R.
WAGONGA HEAD
NAROOMA P.O.
TILBA TILBA
CAPE DROMEDARY
COBARGO
BERMAGUI SOUTH
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
TUROSS RIVER VALLEY
NOVEMBER MEDIAN RAINFALL
MILES 2 1 0 2 4 6 MILES
SCALE
103
FIGURE 14


KRAWARREE
(LAT. 35°48')
149°30'
149°45'
150°00'
150°15'
36°00'
36°15'
2·5"
3·0"
TUROSS
RIVER
MULLIMBURRA POINT
TUROSS HEAD
BODALLA
NERRIGUNDAH
BODALLA S.F.
COUNTEGANY
WADBILLIGA
RIVER
WAGONGA R.
WAGONGA HEAD
NAROOMA P.O.
TILBA TILBA
CAPE DROMEDARY
YOWRIE RIVER
COBARGO
BERMAGUI SOUTH
PACIFIC OCEAN
SOUTH
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
TUROSS RIVER VALLEY
DECEMBER MEDIAN RAINFALL
MILES 0 2 4 6 MILES
SCALE
104
FIGURE 15

NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION

TUROSS RIVER VALLEY GEOLOGICAL FORMATIONS

SCALE

Miles 2 1 0 2 4 6 Miles

105

FIGURE 18

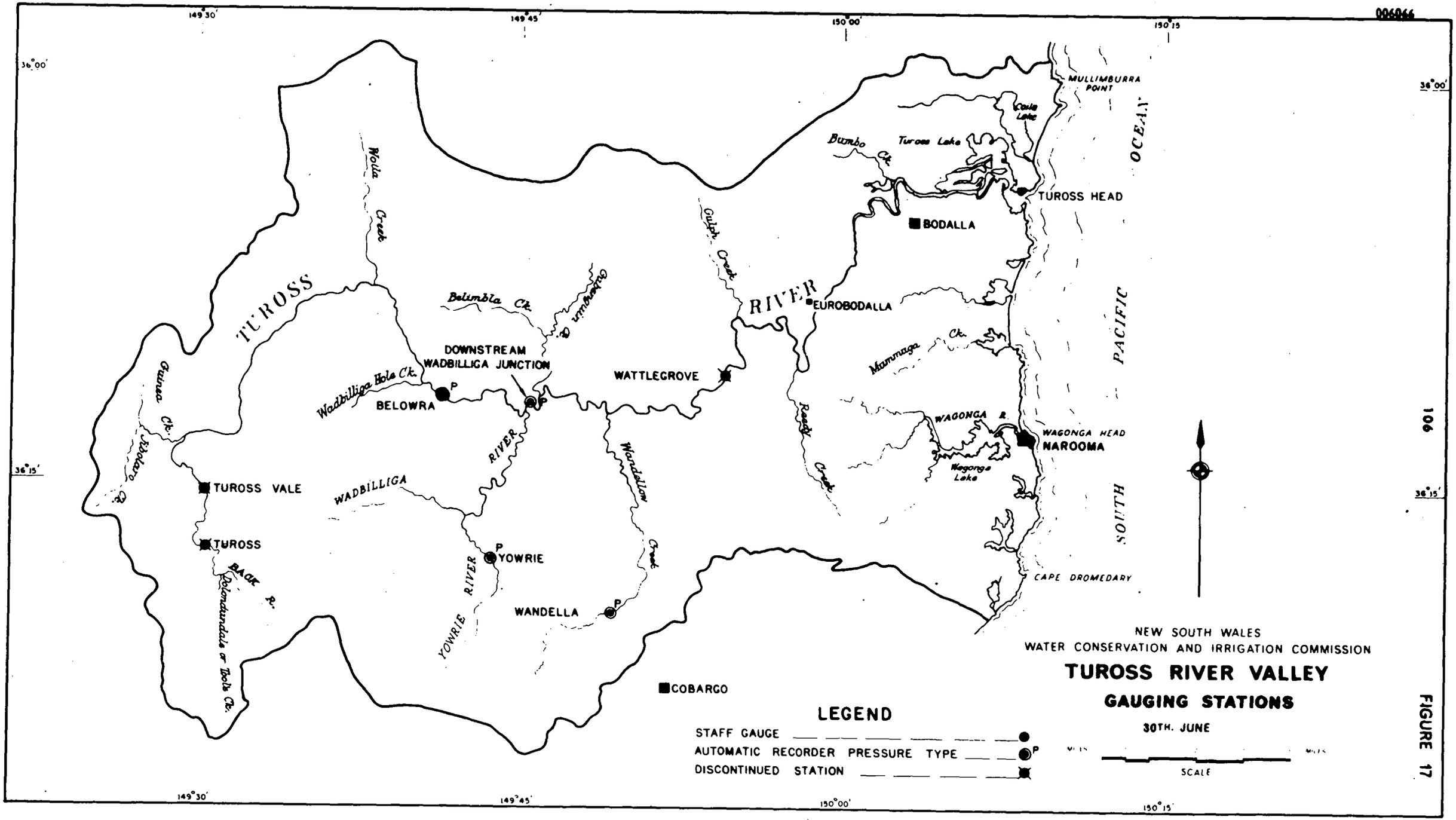
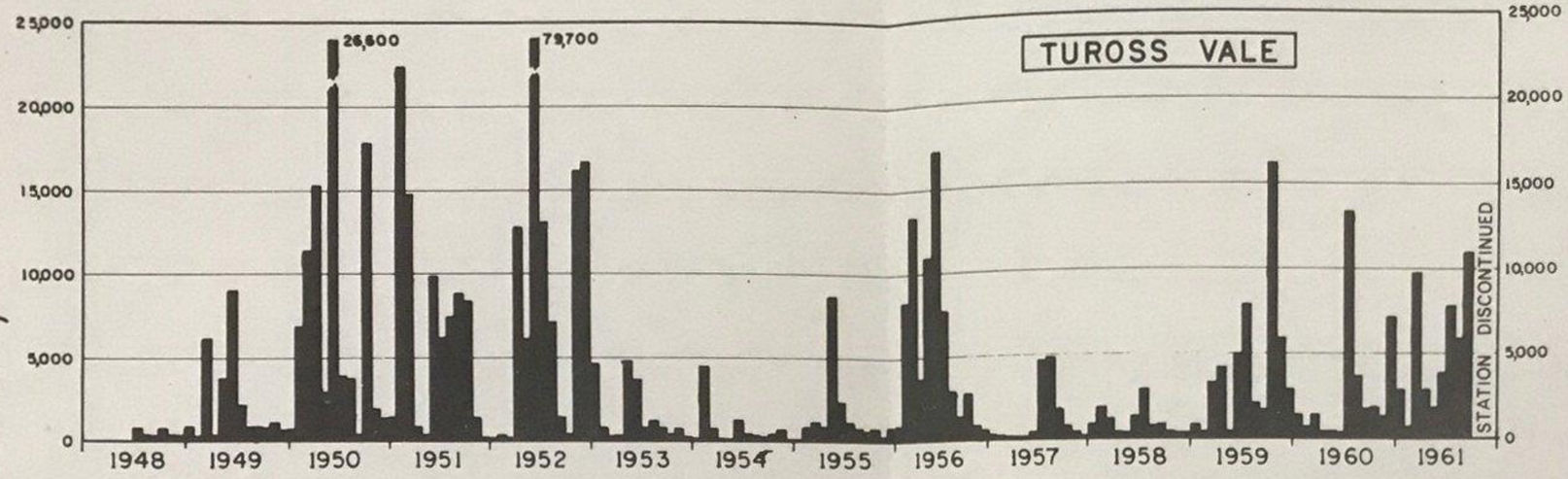
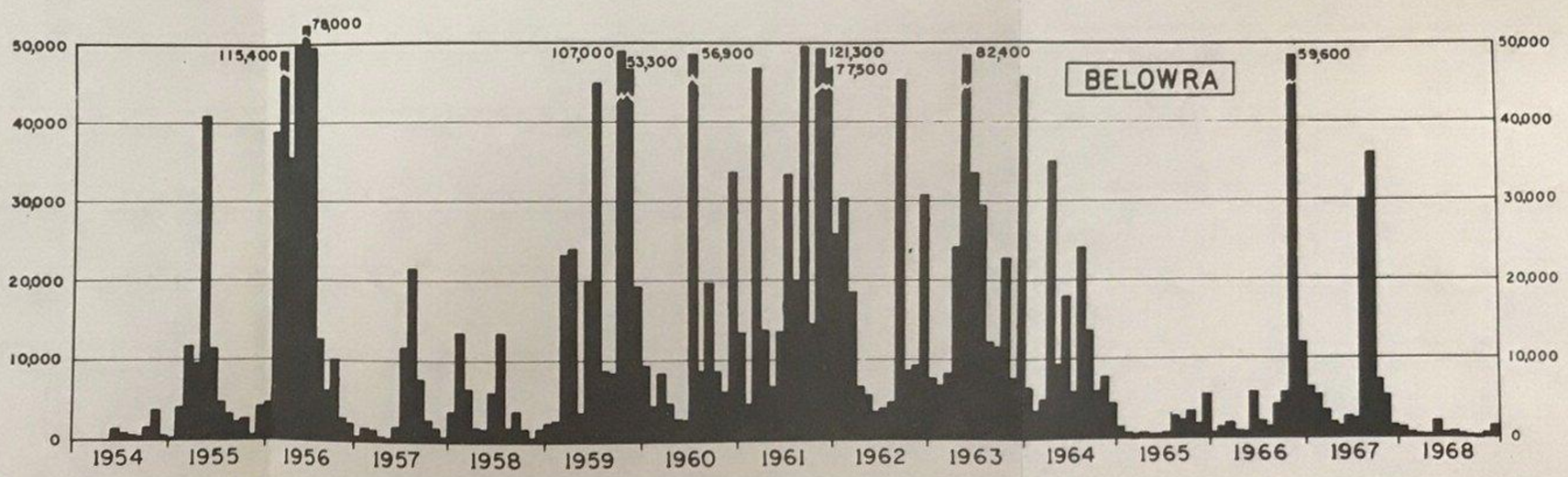
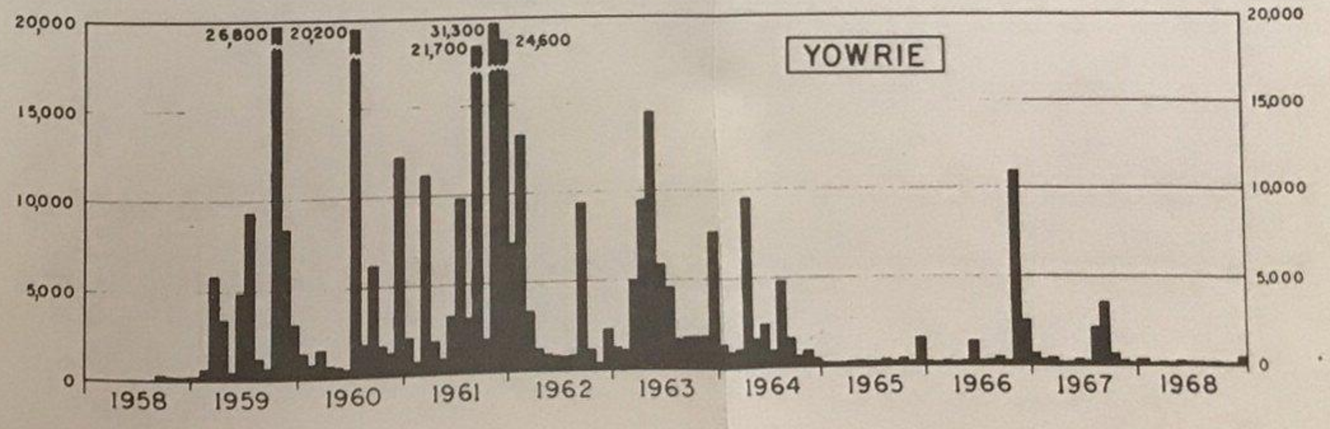

149°30'
149°45'
150°00'
150°15'
36°00'
36°15'
TUROSS
RIVER
Wolla Creek
Belimbla Ck.
Gilpin Creek
Wadbilliga Hole Ck.
DOWNSTREAM
WADBILLIGA JUNCTION
BELOWRA
WATTLEGROVE
Guinea Ck.
Tuross R.
TUROSS VALE
WADBILLIGA
RIVER
Wandellow Creek
TUROSS
Black R.
Coolumdundale or Tooth Ck.
YOWRIE
YOWRIE RIVER
WANDELLA
COBARGO
Bumbo Ck.
Tuross Lake
Coila Lake
MULLIMBURRA POINT
TUROSS HEAD
BODALLA
EUROBODALLA
Mummaga Ck.
Reedy Creek
WAGONGA R.
Wagonga Lake
WAGONGA HEAD
NAROOMA
CAPE DROMEDARY
PACIFIC OCEAN
SOUTH
LEGEND
STAFF GAUGE
AUTOMATIC RECORDER PRESSURE TYPE
DISCONTINUED STATION
MILES
SCALE
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
TUROSS RIVER VALLEY
GAUGING STATIONS
30TH. JUNE
106
FIGURE 17

FIGURE 18







MONTHLY DISCHARGE (ACRE FEET)

MONTHLY DISCHARGE (ACRE FEET)

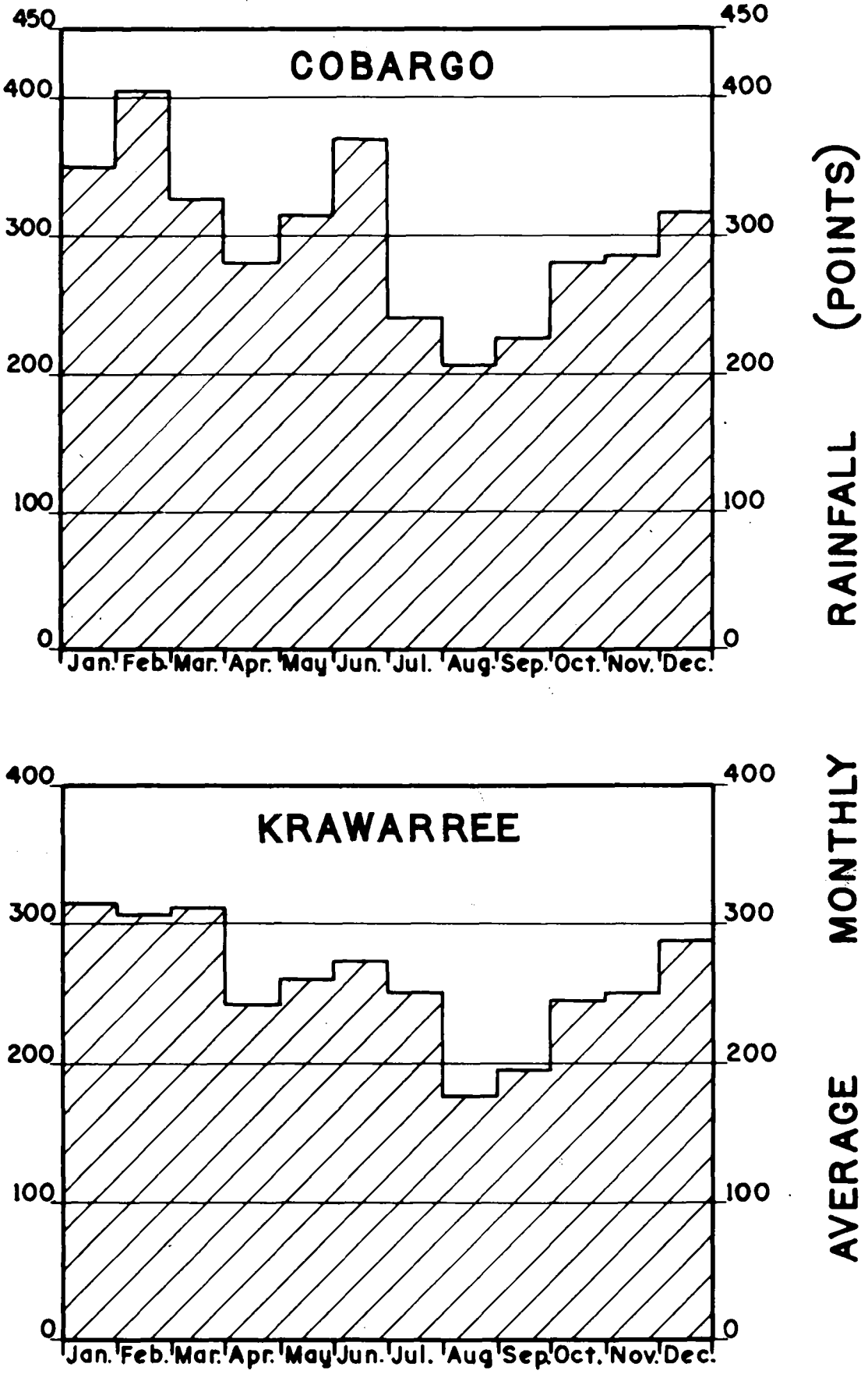
HYDROGRAPHS OF MONTHLY DISCHARGES

TUROSS RIVER AT TUROSS VALE

TUROSS RIVER AT BELOWRA

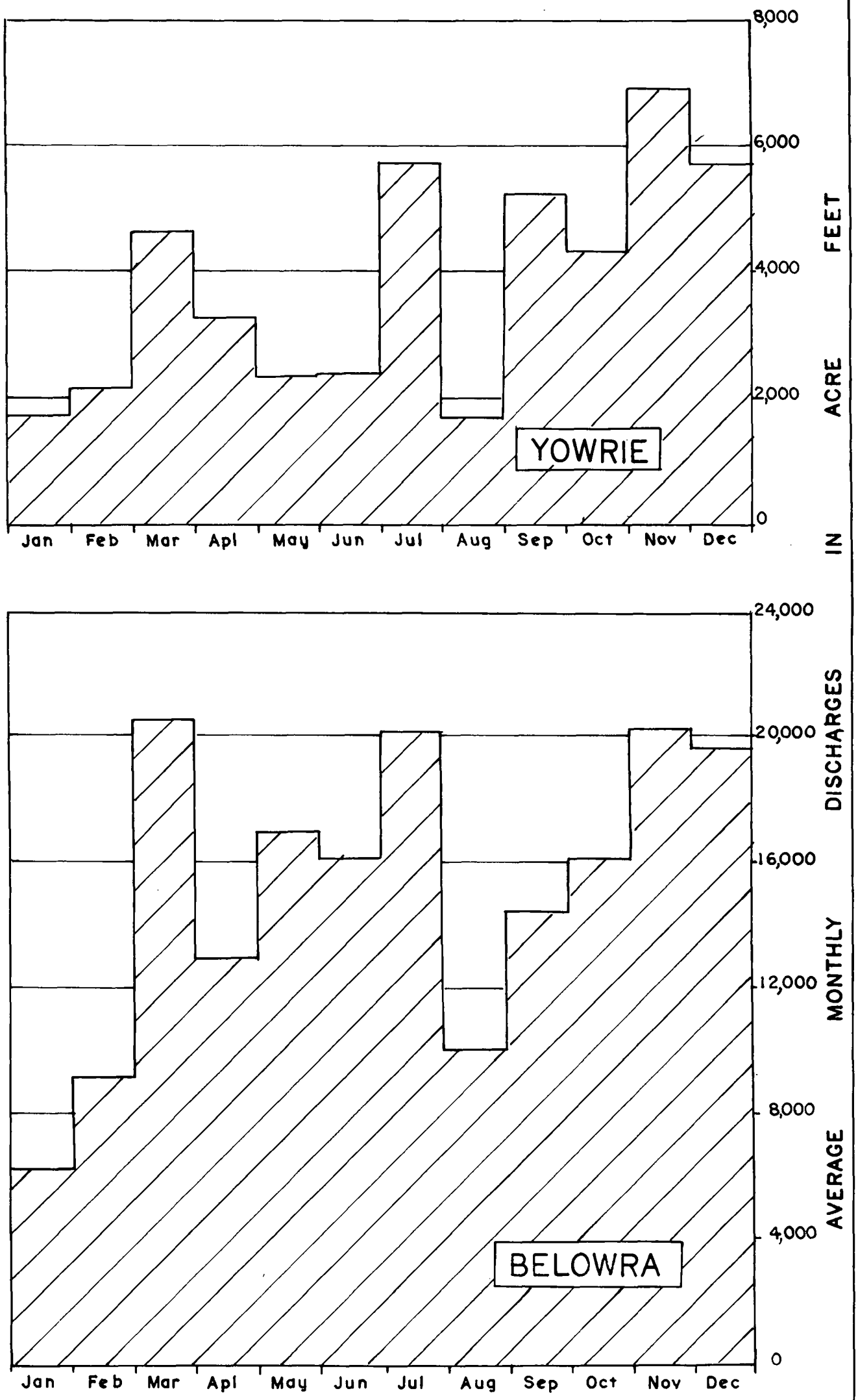
YOWRIE RIVER AT YOWRIE

FIGURE 19



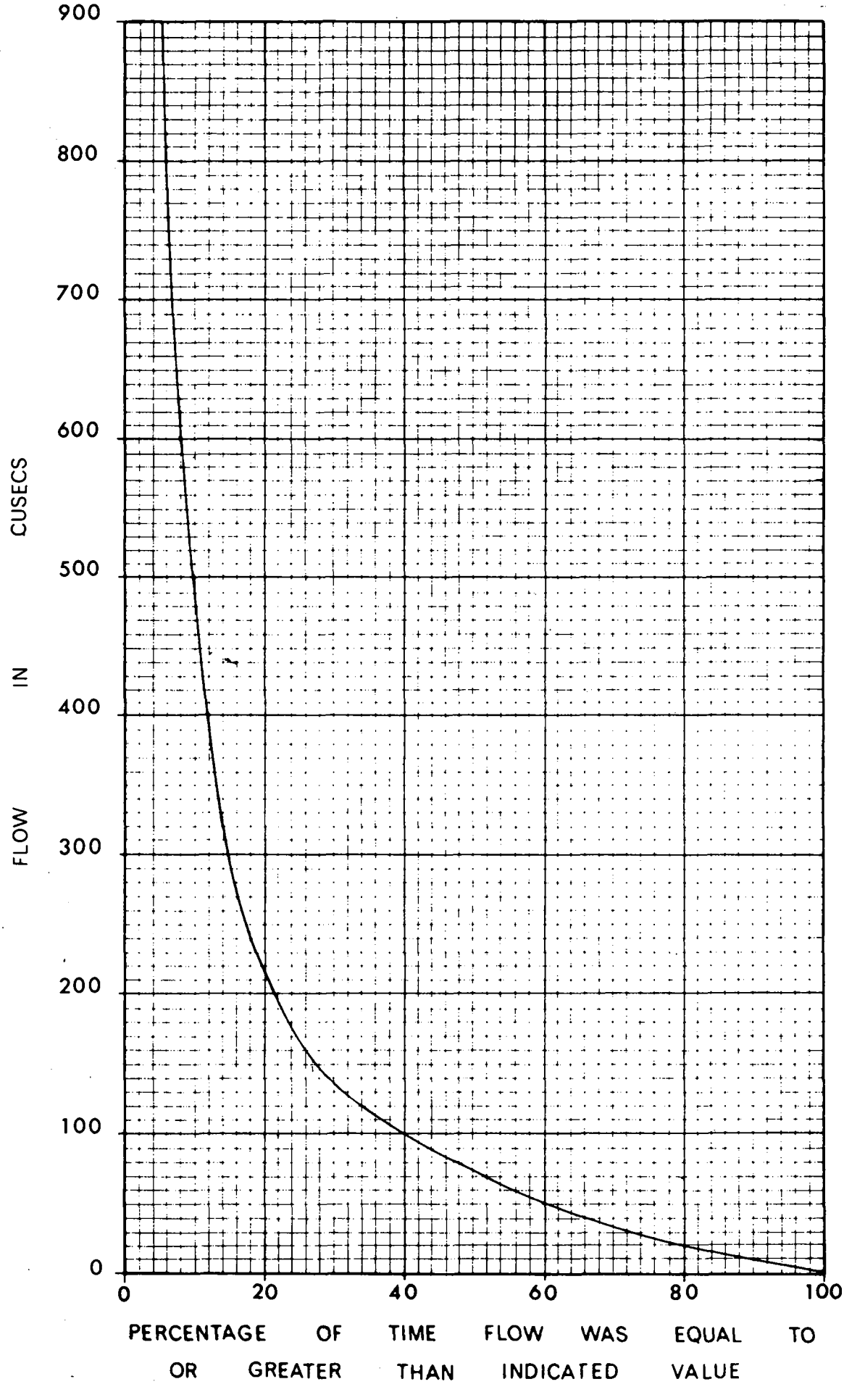
DISTRIBUTION OF AVERAGE MONTHLY RAINFALLS AT COBARGO AND KRAWARREE

FIGURE 20



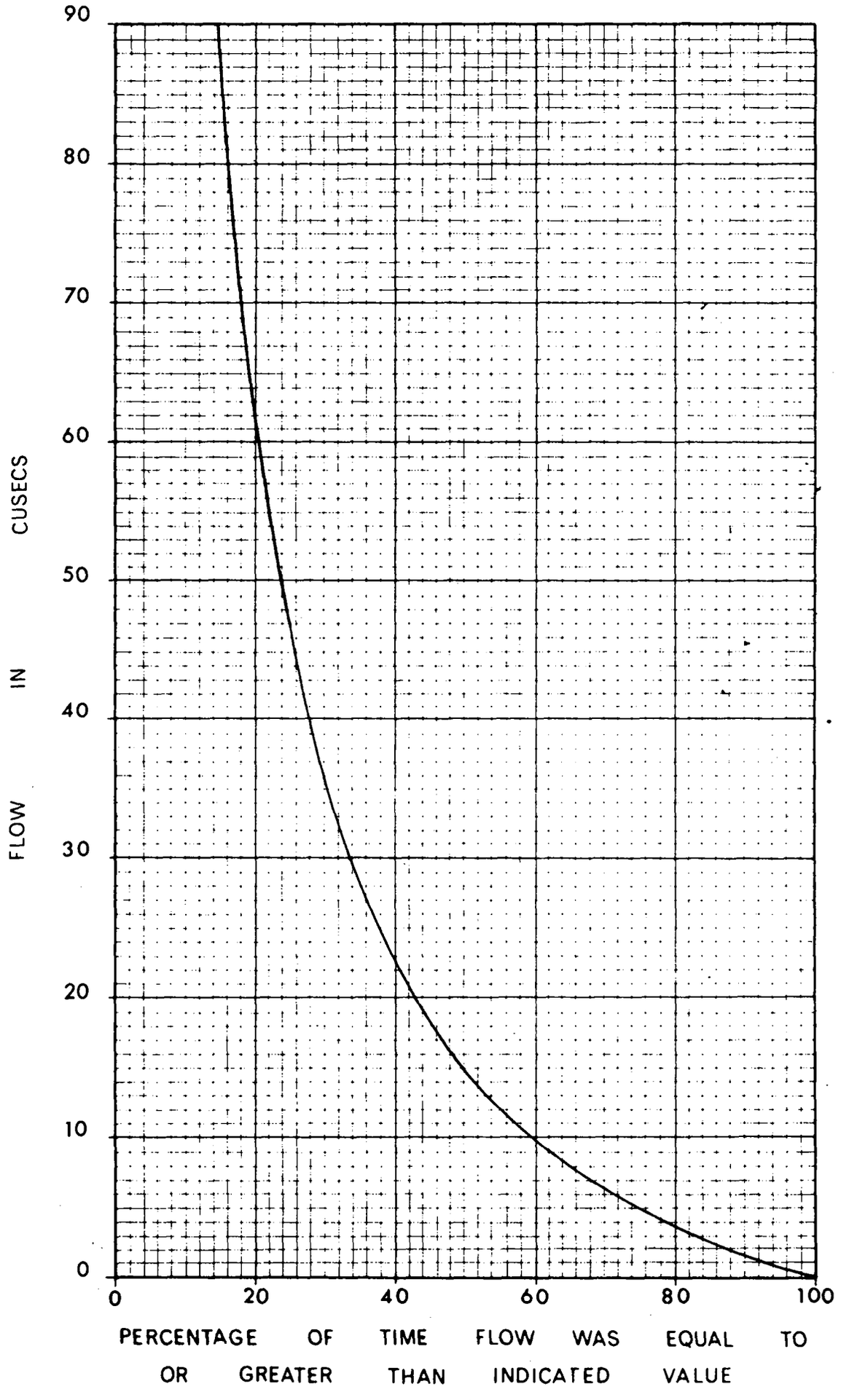
AVERAGE MONTHLY DISCHARGES FOR YOWRIE AND BELOWRA

FIGURE 21



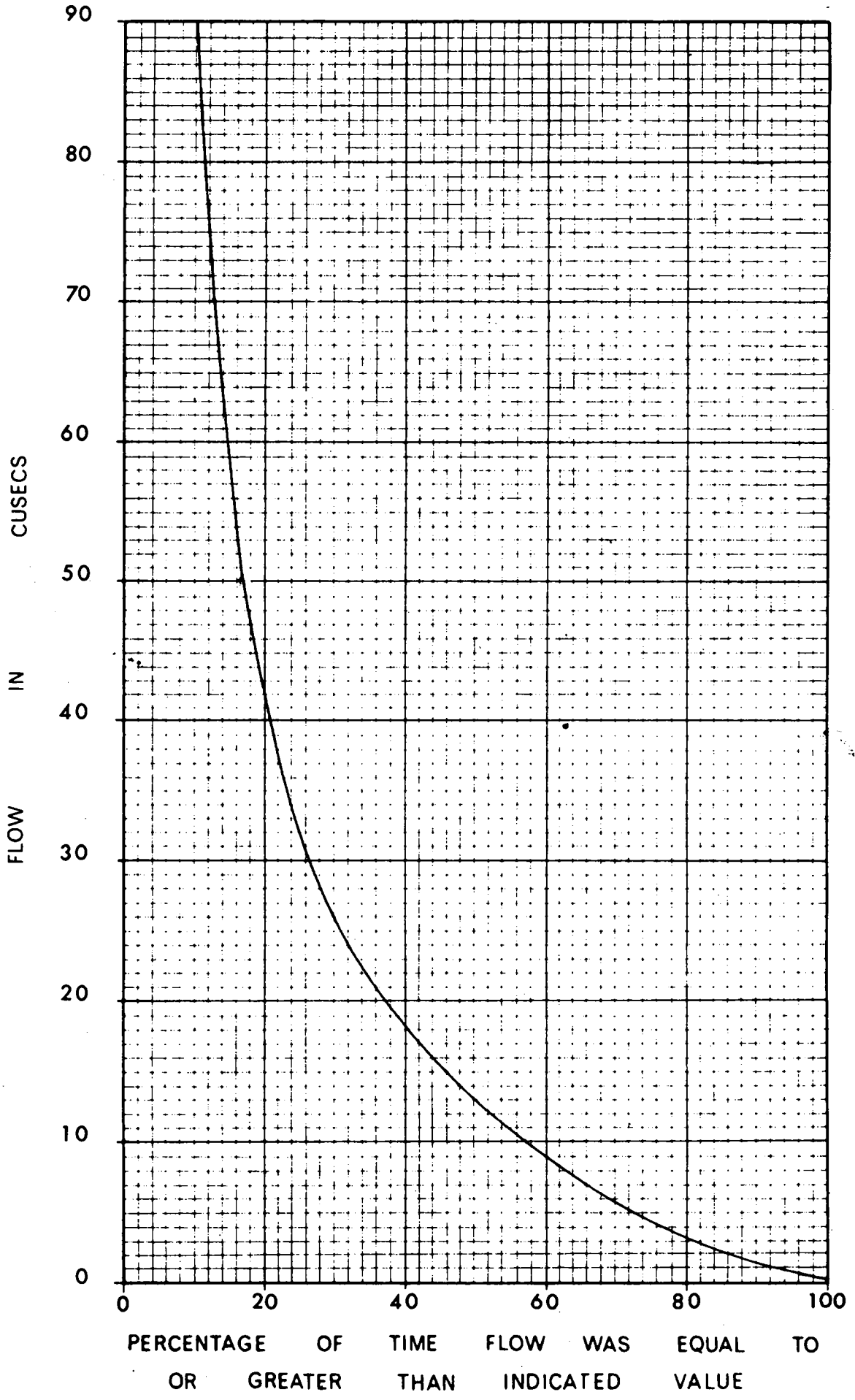
FLOW DURATION CURVE FOR TUROSS RIVER AT BELOWRA

FIGURE 22



FLOW DURATION CURVE FOR TUROSS RIVER AT TUROSS VALE

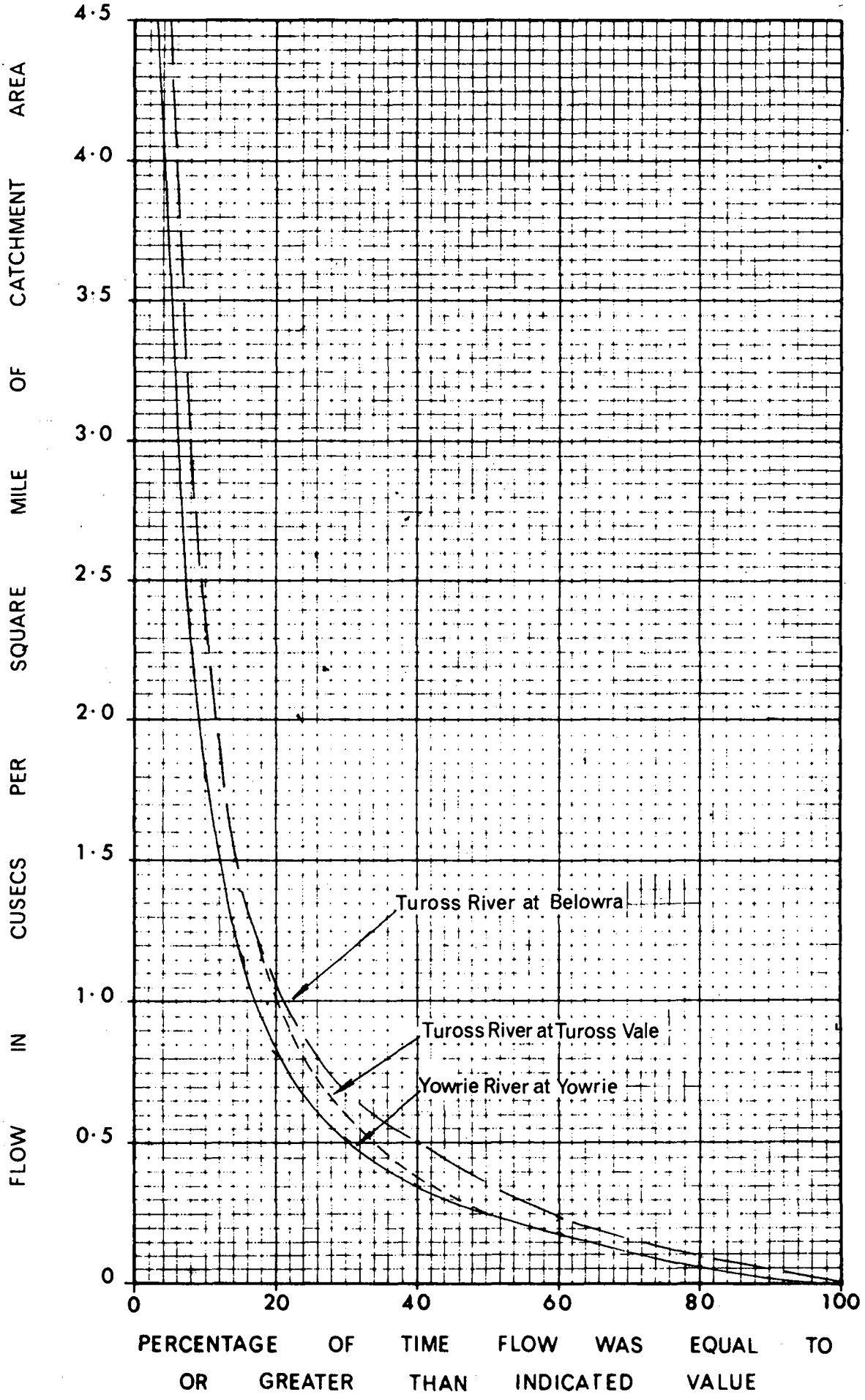
FIGURE 23



FLOW DURATION CURVE FOR YOWRIE RIVER AT YOWRIE

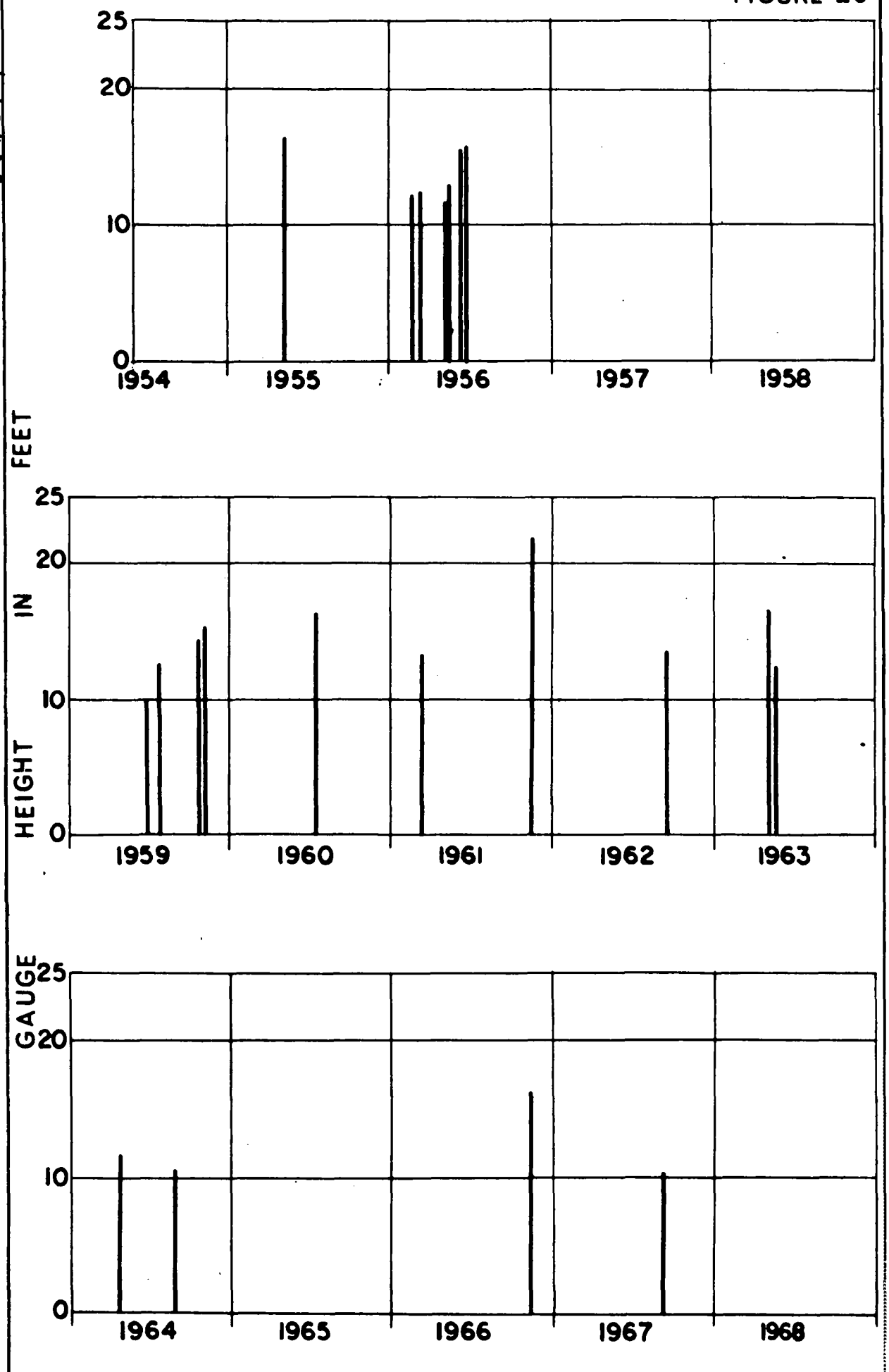
FIGURE 24

006073



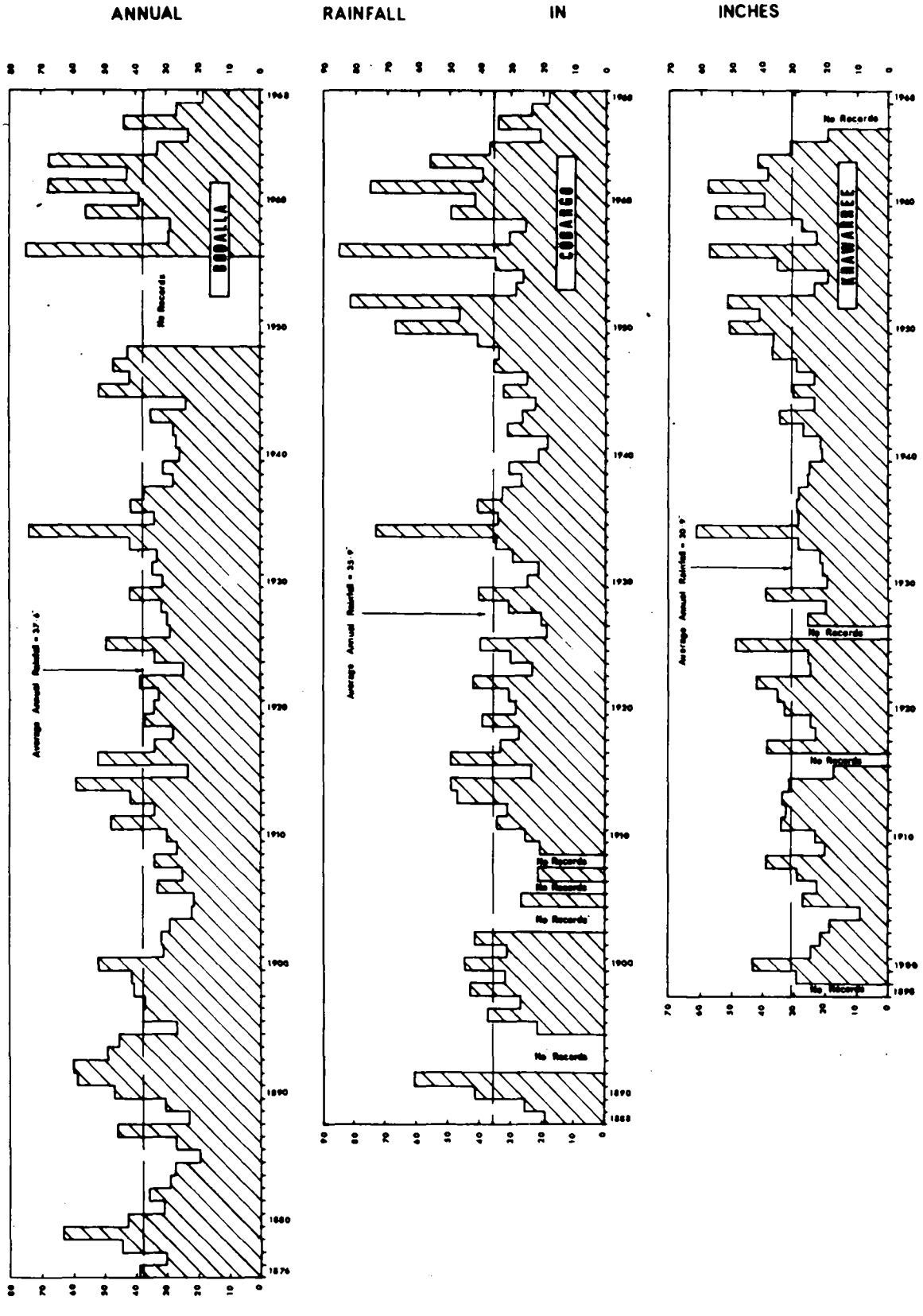
FLOW DURATION CURVES FOR TUROSS VALLEY STREAMS

FIGURE 25



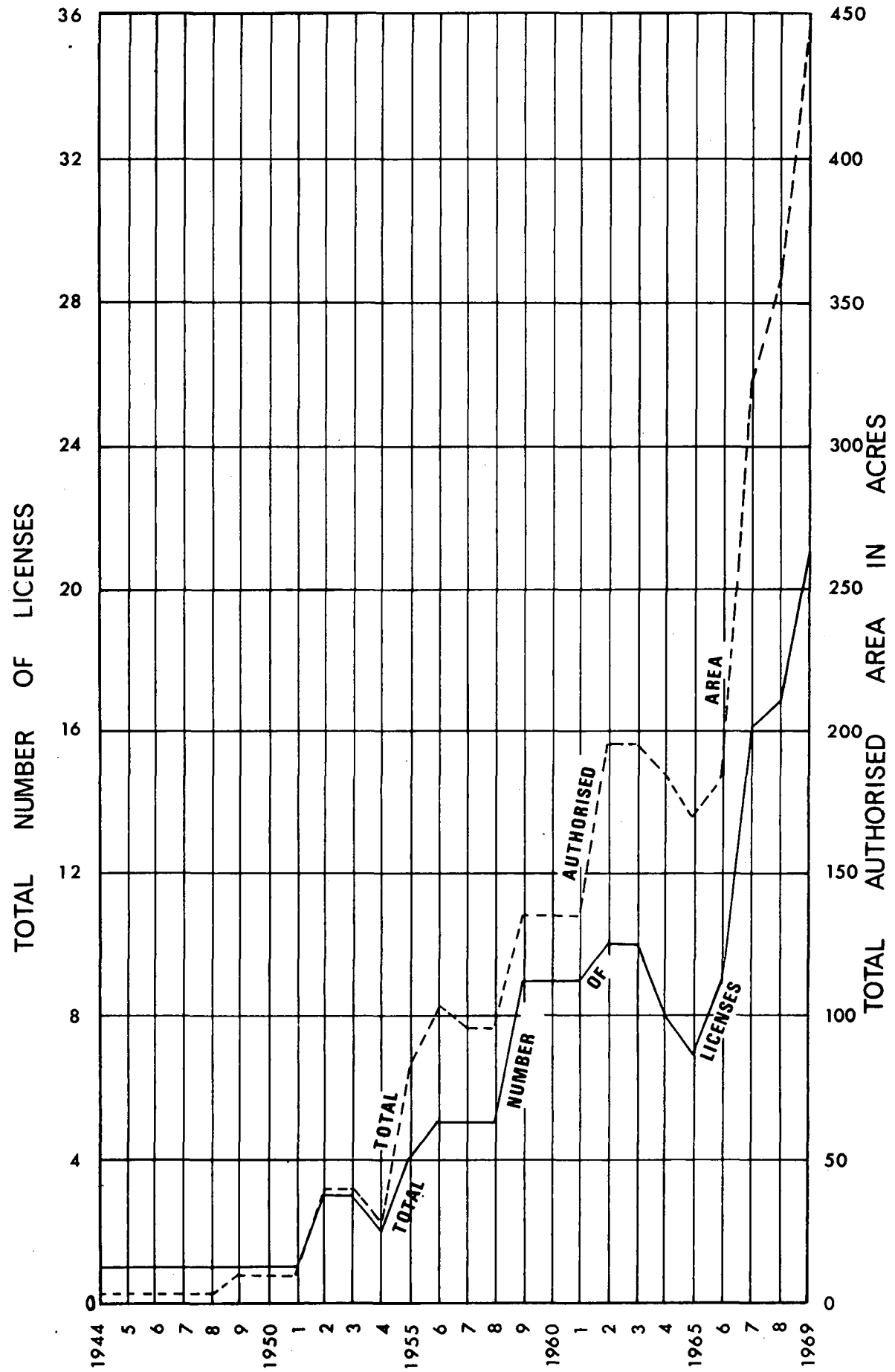
FLOOD PEAKS EXCEEDING 10 FEET
TUROSS RIVER AT BELOWRA

FIGURE 28

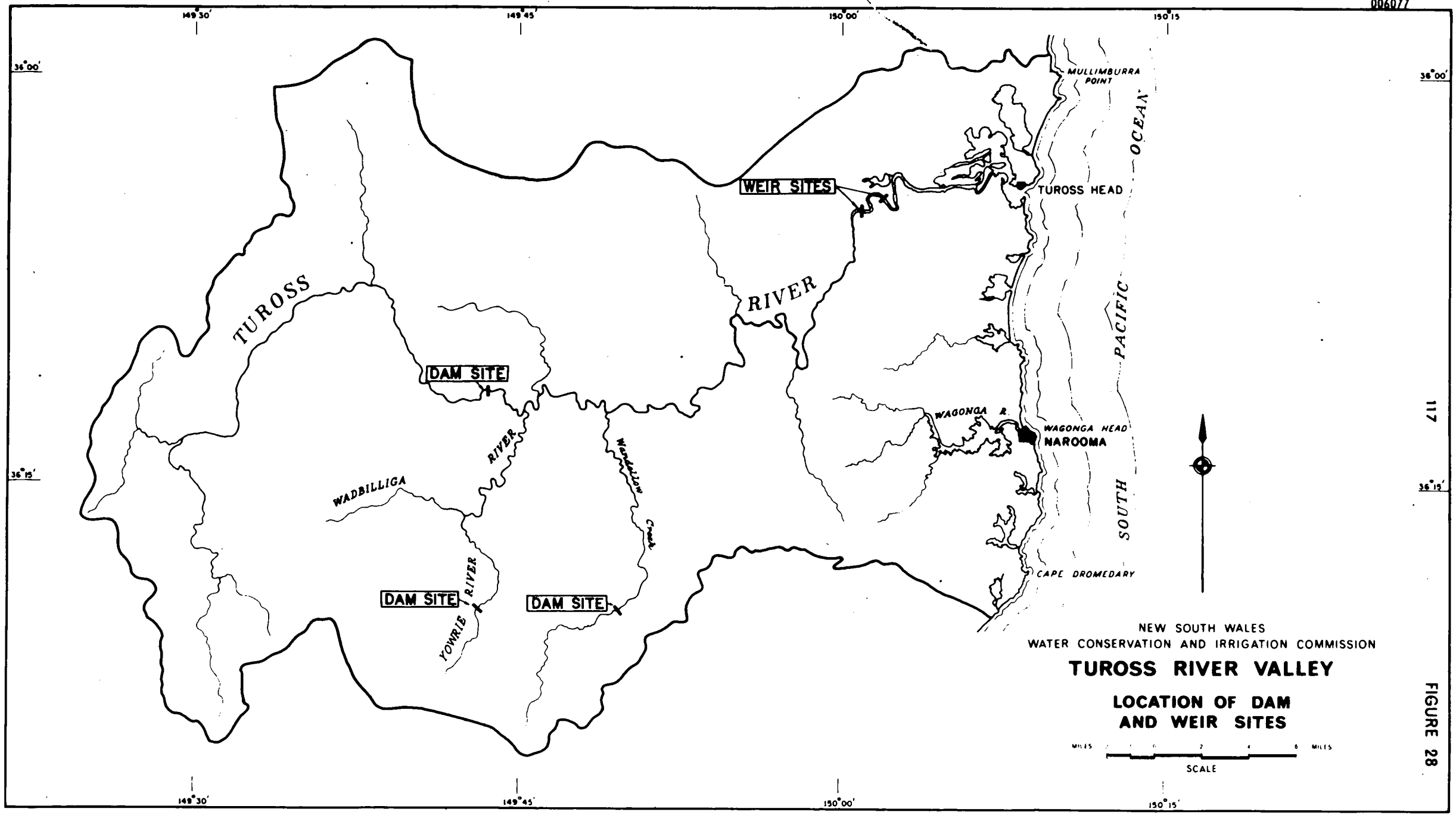


ANNUAL RAINFALLS AT BODALLA, COBARGO AND KRAWARREE

FIGURE 27



TUROSS RIVER VALLEY
AREA AUTHORISED FOR IRRIGATION AND
TOTAL NUMBER OF LICENSES AT
30th JUNE FOR EACH YEAR INDICATED


149°30'
149°45'
150°00'
150°15'
36°00'
36°15'
TUROSS
RIVER
WEIR SITES
DAM SITE
DAM SITE
DAM SITE
WADBILLIGA
RIVER
YOWRIE
RIVER
Wandellow Creek
MULLIMBURRA POINT
TUROSS HEAD
PACIFIC OCEAN
SOUTH
WAGONGA R.
WAGONGA HEAD
NAROOMA
CAPE DROMEDARY
MILES
SCALE
NEW SOUTH WALES
WATER CONSERVATION AND IRRIGATION COMMISSION
TUROSS RIVER VALLEY
LOCATION OF DAM AND WEIR SITES
117
FIGURE 28