The World Bank
The United Nations Development Programme

Consulting Services
for

Sub Saharan Africa Hydrological Assessment (SADCC Countries)

Country Report : Zimbabwe

January 1990

Draft

Sir M MacDonald & Partners Limited
Demeter House, Station Road, Cambridge, U.K.
in association with
Hidroprojecto Consultores de Hidraulica e Salubridade, S.A.
Lisboa, Portugal.

CONTENTS

CONTENTS (cont)

CONTENTS (cont)

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

GENERAL BACKGROUND

1.1 Geography and Climate

Zimbabwe is a land-locked country, covering an area of some 390 750 km^2. It borders on to Zambia, Mozambique, South Africa, Botswana and Namibia. Zimbabwe is divided for administrative purposes into eight provinces; Mashonaland West, Mashonaland Central, Mashonaland East, Manicaland, Midlands, Matabeleland North, Matabeleland South and Masvingo, as shown in Figure 1.1.

Zimbabwe is dominated by the 'high veld' that runs from south-west to north-east across the centre of the country with an altitude of between 1 200 m and 1 500 m. On each side of this high plateau lies the 'middle veld', with an altitude between 600 m and 1 200 m, which slopes northward to the Zambezi and southward to the Limpopo. Beyond this, mostly to the south, lies the 'low veld'. The low veld consists of the Zambezi valley and the Limpopo and Sabi basins and has an altitude of below 600 m. Important physical features are lake Kariba on the Zambezi, one of the largest man-made lakes in the world; Victoria Falls on the Zambezi River which is a major tourist attraction and the Great Dyke, an igneous intrusion, more than 480 km long and 10 km wide and running approximately north-south through the central portion of the country.

Large areas of Zimbabwe have been cleared for cultivation; natural vegetation is, however, still evident in many parts of the country. Woodland savannah mainly covers the central high veld and the areas bordering the Zambezi River. Patchy areas of grassland occur within the woodland. Tree savannah occurs in the southern low veld and in Matabeleland North.

The country experiences three distinct seasons each year: a cool, dry period in the winter months of April to August, warming through a hot but still dry period lasting until early November when clouds and rain arrive for the warm but wet period of November to March. Temperatures are partly controlled by altitude, with the high veld experiencing some frosts in June or July in most years, and temperatures rising to the low 30s around October. In the low veld regions, temperatures rarely fall below 2°C in the winter, but can rise to over 40°C in the summer. Mean annual temperatures vary from 18°C in the high veld to 23°C in the lowland areas.

Rainfall occurs mostly through convectional storms, with perhaps 90% of total falls occurring in this way. Consequently rainfall intensities within the country are frequently high. The distribution of rainfall over the country is uneven with by far the highest falls recorded in the eastern highlands, which receives a considerable amount of orographic rainfall caused by moist air moving in across the Mozambiquan coast, and being lifted to altitudes in excess of 1 800 m. These air currents also cause the drizzle and light rain which occurs quite frequently in the eastern highlands, and is locally referred to as 'guti' weather.

The distribution of mean annual rainfall is shown in Figure 1.2. Highest rainfall totals occur very locally in the highlands, with one or two stations recording means of over 2 000 mm a year. Lowest falls are less than 400 mm a year along the southern border of the country, with average rainfall being 675 mm a year. The government has a cloud-seeding programme to increase rainfall in the drier regions and drier years. This programme is believed to be effective, but this has yet to be fully established.

1.2 Population

Zimbabwe's population in 1987 was estimated by the Central Office of Statistics to be around 8.64 million, with an annual growth rate of some 2.7%. The total fertility rate (the average number of live births to a woman during her reproductive years) was 5.6 children according to the 1982 census. The crude birth rate in 1982 was some 39.5 per 1 000 population and the crude death rate in 1982 was 10.8 per 1 000 population with a life expectancy of 56 years. The child population (below 15 years) was estimated at 47% of the total population.

At the time of the 1982 census, 26% of the population lived in urban areas, with some 55% of the urban population living in the cities of Harare and Bulawayo.

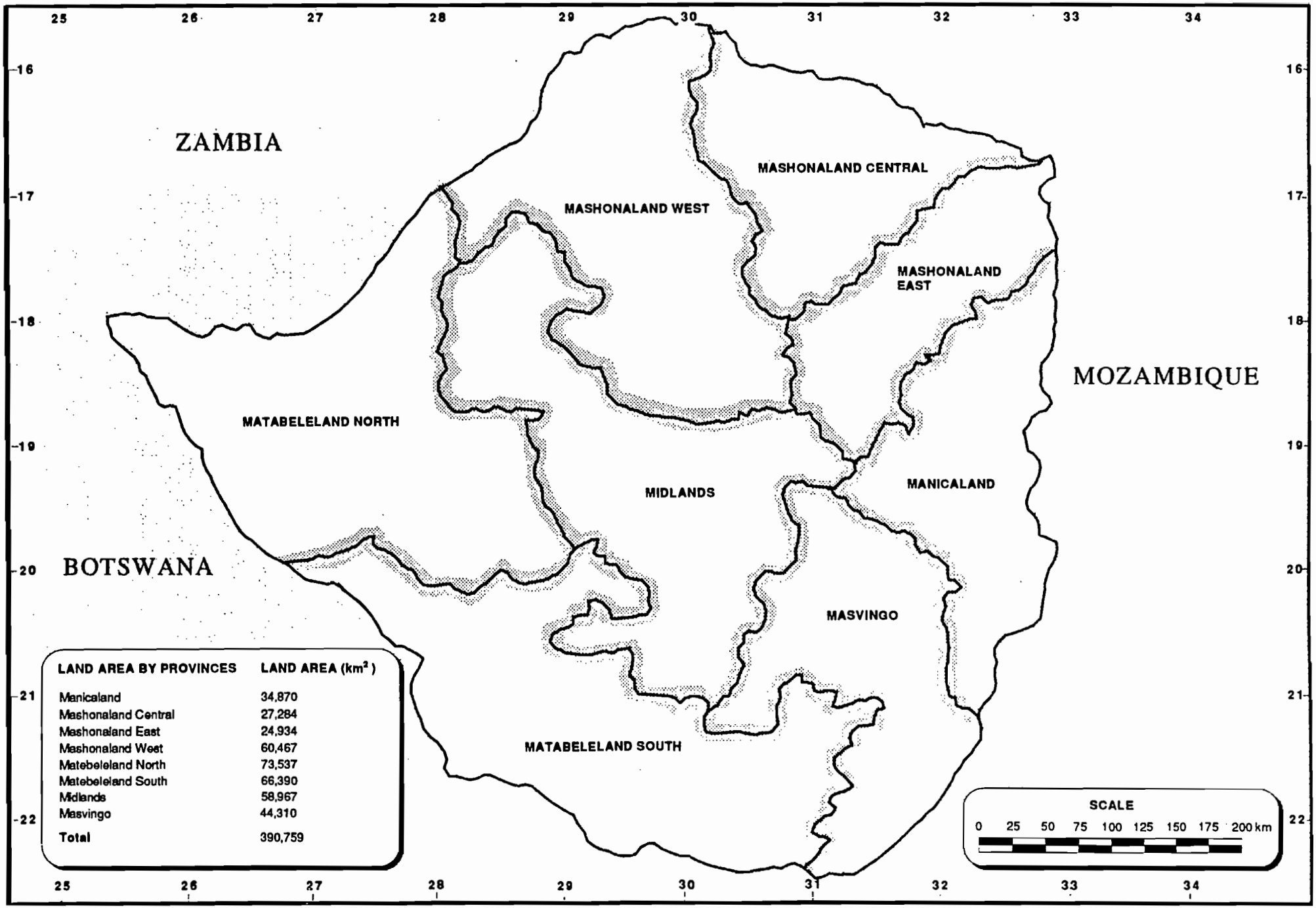
In the rural areas, population densities vary in part according to land use. Table 1.1 shows the breakdown into official land categories, with 'commercial' land being predominantly owned by under 5 000 large-scale farmers of European origin, 'small-scale commercial' land being largely made up of the old 'tribal' lands and accommodating around 800 000 small-scale African farmers and their dependants. The 'resettlement' land comprises commercial land purchased by the Government for resettling African farmers. Table 1.1 shows that rural population densities are greatest in the communal lands.

Zimbabwe's population growth rate in the 1960s and 1970s was very high, and is now placing considerable strains on the economy, particularly with the nation's burgeoning unemployment problem. Life expectancy remains high for the region, and the recent child-spacing programme has been successful in reducing birth rates.

1.3 Health

Spending on health in the community is high at over 5% of GNP, but dominated by urban requirements and hospitals, with 15% of government expenditure in this sector going to preventative services.

The incidence of water-related diseases in the country is relatively low, with diarrhoeal diseases accounting for about 15% of child morbidity in 1979 (World Bank, 1983) and much less than this for adults. A much more significant problem is rural malnutrition and the incidence of calorie-protein deficiency, affecting 20% of under fives, according to the World Bank (1983). Goitre, pellagra and



LAND AREA BY PROVINCES	LAND AREA (km^2)
Manicaland	34,870
Mashonaland Central	27,284
Mashonaland East	24,934
Mashonaland West	60,467
Matebeleland North	73,537
Matebeleland South	66,390
Midlands	58,967
Masvingo	44,310
Total	390,759

Figure 1.1 The Provinces of Zimbabwe

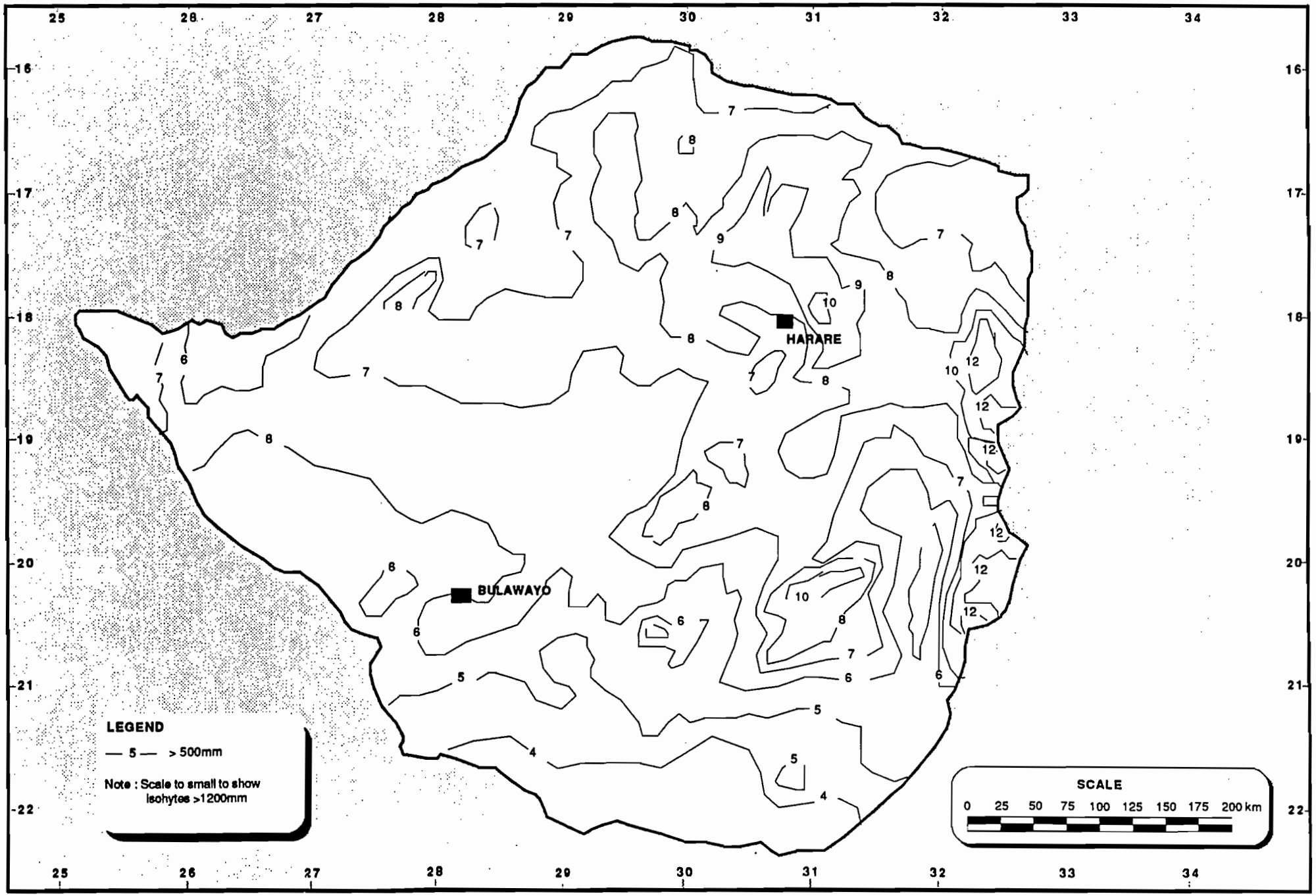


Figure 1.2
Mean Annual Rainfall

TABLE 1.1

National Distribution of Land and Rural Population[1]

Land category	Total area (km^2)	Per cent of total area	Per cent of agricultural land	Per cent of rural population
National Parks	47 000	12.1		
State Forests	9 200	2.4		
Urban and State Land	2 200	0.5		
Sub-total	58 400	15.0		
Agricultural Land				
Commercial	128 200	32.8	38.6	29
Small-scale Commercial	14 200	3.6	4.3	0.7
Communal	163 500	41.8	49.2	69
Resettlement	26 400	6.8	7.9	0.5
TOTAL	390 700			

Note: (1) Developed from Zimbabwe Land Subsector Study, World Bank, 1986

vitamin A deficiency are also fairly common. The principal cause of this has been a lack of purchasing power, rather than a national food shortage, especially amongst the labour force on the commercial farms.

1.4 Employment and Education

The demographic problems of the country have led recently to potentially serious unemployment problems and high expenditure on education. A recent World Bank Report (World Bank 1987) identified a shift in employment patterns from agriculture towards other employment areas such as manufacturing over the last decade or so (Table 1.2), with the latest census in 1982 showing the unemployment rates given in Table 1.3. These rates are believed to have worsened over the intervening seven years to the present day.

A further significant change that has occurred in recent years has been the erosion of government salaries both in real terms and relative to the private sector, to the position where, for professional grades, salaries have half their value of a decade ago. Table 1.4 illustrates this change.

The Government of Zimbabwe, however, continues to place a high priority on education, awarding it the largest vote appropriation of all ministries including defence and accounts for 9% of GDP. The education system within the country is well-established and effective, capable of producing a much larger skilled output than the economy can absorb.

1.5 The Economy

In recent years, the expansion of the national economy has just about kept abreast of increasing population, and is now the strongest economy in the SADCC region. The economy is broadly based, with the major contributions identified in Table 1.5. Tobacco is the most important export crop providing, in 1987, some 20% of total export earnings. Mineral exports account for 31% of the total.

In recent times the economy has been passing through a transitional phase of relatively low growth, declining fixed investment and a stagnant formal employment sector. Problems have been an acute shortage of foreign exchange, a large budget deficit of 10% of GDP and the consequent channelling of private savings into the public debt. The country has faced a period of large loan repayments as well as the debt servicing requirements equivalent to 60% of export earnings, but these will reduce in the near future. The Government is presently in the process of trying to encourage foreign investment to bring about the higher levels of growth needed for fuller employment and improved per capita income.

The Government of Zimbabwe's development priorities are set out in the First Five Year National Development Plan 1986 to 1990. The key general objectives which are relevant to the water sector include:

TABLE 1.2

Employment by Sector

Employment sector		Percentage of employment in 1969	1982
Formal wage:			
	Commercial agriculture	16.1	12.4
	Non-agriculture	27.8	34.8
	Small-scale farms	0.7	0.7
	Sub-total	44.6	47.2
Communal farmers		53.4	46.9
Informal sector		2.1	5.9
Total number (thousands)		1 604.7	2 215.9

Source: 'A Strategy for Sustained Growth', World Bank, 1987

TABLE 1.3

Unemployment Rates in August 1982

	Age	All	Uneducated education	Primary education	Secondary
Males	15 to 19	12.9	23.4	12.9	9.5
	20 to 24	15.9	18.4	17.5	10.7
Sub-total		10.9	11.6	11.7	7.0
Females	15 to 19	17.0	22.7	16.9	13.2
	20 to 24	15.8	13.7	17.0	13.4
Sub-total		10.7	8.8	11.6	10.5
TOTAL		268 100	54 640	183 340	30 120

Source: World Bank, 1987

TABLE 1.4

Monthly Wages and Rates of Change

Class	Private sector Monthly salary (Z$) 1982	1985	% change	Public sector Monthly salary (Z$) 1982	1985	% change
Unskilled	129	175	10.7	119	181	15.0
Copy typist	385	533	11.5	280	361	8.8
Clerk	266	493	22.8	217	309	12.5
Technician (3 years' experience)	841	1 606	24.1	450	537	6.1
Graduate	582	837	12.9	536	640	6.1

Source: World Bank, 1987

TABLE 1.5

Contribution to Gross Domestic Product, 1988

Sector	Contribution (per cent)
Agriculture	15
Manufacturing	25
Finance and insurance	6
Distribution and hotels	13
Public administration	8
Transport	5
Education	9
Mining	6
Others	13

Source: Southern Africa Economist: Vol 2, Nr 3: 1989

- land reform and efficient utilisation of land;
- raising standards of living
- enlargement of employment;
- balance between environment and development;
- provision of irrigation schemes for communal areas;
- development of irrigation to improve the economic base in rural areas;
- conservation of natural resources;
- co-operation with SADCC countries on all environmental issues;
- balanced development through regional development;
- minimisation of the rate of rural-to-urban migration;
- increase in agricultural output;
- self-sufficiency in major foodstuffs including wheat;
- self-sufficiency in energy supply;
- improvement and increasing water supplies to rural areas and growth points.

In addition to these general objectives a large number of specific development projects are listed. Although the number and scale of these projects will probably prove to be somewhat optimistic they give a good indication of development opportunities and are therefore listed in Table 1.6.

1.6 Previous Studies

The most significant hydrological study in Zimbabwe was the National Master Plan for Rural Water Supply and Sanitation (NMPRWSS), carried out by Interconsult under funding by NORAD, reported to the Ministry of Energy and Water Resources and Development (MEWRD) in December 1985.

The report comprised the following volumes:

Volume 1	Executive Summary
Volume 2.1	Hydrology
Volume 2.2	Hydrogeology
Annex I	Memoirs to Hydrogeological Map
Annex II	Boreholes and Dug Wells Report
Volume 2.3	Water Quality
Volume 3	Rural Water Supply Programme
Volume 3.1	Population Development
Volume 3.2	Soil and Water Conservation
Volume 3.3	Inventory of Existing Water Supply Situation
Volume 3.4	Water Tariff Study
Volume 4.1	Outline of a Health Profile
Volume 4.2	Social Studies
Volume 4.3	Health Education

TABLE 1.6

Summary of Water Sector Developments Listed in First Five-Year National Development Plan 1986-1990

Province	Project	Project Type	Development
Manicaland	Bonde	Irrigation	600 ha new irrigation
Manicaland	Buhera District Rural Dev.	Int. Rural Dev	Various, including water supply works
Manicaland	Chisambanje	Irrigation	Extension of existing area by 4000 ha
Manicaland	Chitowe	Dam	Dam for water supply and irrigation
Manicaland	Deure Block C	Irrigation	Improvements to existing area
Manicaland	Honde/Pungwe Valley	Int. Rural Dev.	Various, including small scale irrigation
Manicaland	Middle Sabi IIIB	Irrigation	Extension of existing area by 960 ha
Manicaland	Musikavanhu	Irrigation	400 ha irrigated from groundwater
Manicaland	Nyamaropa	Irrigation	Improvement of existing area of 197 ha
Manicaland	Nyanyadzi/Nenhowe	Irrigation	Extension of existing area by 150 ha
Manicaland	Osborne	Dam	Dam for irrigation water
Manicaland	Tawona	Irrigation	Extension of existing area by 72 ha
Mashonaland Central	Bindura	Dam	Dam for water supply and irrigation
Mashonaland Central	Chimanda	Dam	Dam for water supply and irrigation
Mashonaland Central	Concession	Dam	Dam for water supply and irrigation
Mashonaland Central	Dande	Dam	Dam for irrigation water
Mashonaland Central	Jumbo	Dam	Dam for water supply and irrigation
Mashonaland Central	Lionshead	Dam	Dam for water supply and irrigation
Mashonaland Central	Mwenje	Dam	Dam for irrigation water
Mashonaland Central	Silverstroom	Dam	Dam for water supply and irrigation
Mashonaland East	Longlands	Dam	Dam for water supply
Mashonaland East	Mahusekwa	Dam	Dam for water supply
Mashonaland East	Mudzi	Dam	Dam for water supply
Mashonaland East	Rufaro	Dam	Dam for water supply
Mashonaland East	Wedza	Dam	Dam for water supply
Mashonaland West	Claw Gates	Dam	Increasing dam yield for water supply
Mashonaland West	Doreen's Pride	Mixed Agricult.	Various, including livestock and irrigation
Mashonaland West	Kanyati/Gatshe	Resource manag.	Various, including small scale irrigation
Mashonaland West	Kariba South	Hydro-power	Rehabilitation of power station
Mashonaland West	Kariba South Extension	Hydro-power	2 additional 150 MW sets
Mashonaland West	Mazikadei	Dam	Dam for irrigation water
Mashonaland West	Mhondoro	Dam	Dam for water supply
Mashonaland West	Ngezi	Dam	Dam for water supply and irrigation
Masvingo	Manyuchi	Dam	Dam for irrigation water
Masvingo	Mbindangombe	Dam	Dam for water supply
Masvingo	Mkasine Ranch	Irrigation	Dam for irrigated stockfeed
Masvingo	Mushwe/Mashava	Dam	Dam for water supply
Masvingo	Neshuro	Dam	Dam for water supply
Masvingo	Province Irrigation Programme	Irrigation	Fifteen low cost irrigation schemes
Masvingo	Roswa	Dam	Dam for water supply
Masvingo	Sikato State Farm	Irrigation	Extension of existing area by 1 300 ha
Matebeleland North	Kalope	Dam	Dam for water supply
Matabeleland North	Lugwala	Dam	Dam for water supply and irrigation
Matebeleland North	Silalabuhwa	Dam	Rehabilitation of dam for irrigation water
Matabeleland South	Hollin's Block	Dam	Dam for water supply and irrigation
Matabeleland South	Madabe Raising	Dam	Dam for water supply
Matebeleland South	Mangwe	Dam	Dam for water supply
Matabeleland South	Mayfair Gates	Dam	Increasing dam yield for water supply
Matabeleland South	Model D Pilot Project	Resettlement	Various, including water supply works
Matabeleland South	Mtshabezi	Dam	Dam for water supply
Matebeleland South	Mwanakaridza	Dam	Dam for water supply
Matebeleland South	Shashani	Dam	Dam for water supply and irrigation

TABLE 1.6 (cont)

Province	Project	Project Type	Development
Matebeleland South	Shobi	Dam	Dam for water supply
Matebeleland South	Sivule	Dam	Dam for water supply
Matebeleland South	Siwaze	Dam	Dam for water supply and irrigation
Matebeleland South	Small Scale Irrigation	Irrigation	Rehabilitation of 6 small schemes
Midlands	Biri	Dam	Dam for water supply and irrigation
Midlands	Hama	Dam	Dam for water supply and irrigation
Midlands	Hozori	Dam	Dam for water supply and irrigation
Midlands	Insukamini	Dam	Dam for water supply and irrigation
Midlands	Lower Damba	Dam	Dam for water supply and irrigation
Midlands	Modi Matanga	Dam	Dam for water supply and irrigation
Midlands	Mtanke	Dam	Dam for water supply and irrigation
Midlands	Murezu	Dam	Dam for water supply and irrigation
Midlands	Musipani	Dam	Dam for water supply and irrigation
Midlands	Petronella	State Farm	Various, including livestock and irrigation
Midlands	Province Irrigation Scheme	Irrigation	4 medium size dams and irigation infrastr.
Midlands	Sadza Raising	Dam	Dam for water supply and irrigation
Midlands	Sungai	Dam	Dam for water supply and irrigation
Midlands	Swenoro Raising	Dam	Dam for water supply and irrigation
Midlands	Yomba	State Farm	Various, including livestock and irrigation

Volume 4.4	Sanitation Technology
Volume 5	Operation and Maintenance
Volume 6	Management
Volume 7	Human Resources Development
Volume 8	Design Manual
Volume 8.1	Water Engineering Design

Obviously, the report covered a much larger area than hydrology, but it provides crucial background and reference material for any examination of the climate, surface water resources or groundwater resources of the country.

Within Zimbabwe, a lot of primary data analysis has been developed and published as technical papers by officers of the Department of Meteorological Services and MEWRD, and the libraries of both these departments will provide access to copies of these papers. For a general reference the most important of these documents might be considered to be:

- Climate Handbook of Zimbabwe, Department of Meteorological Services, 1981;
- Hydrology in Zimbabwe - the past and the future, by P Wurzel, published in the Proceedings of the Rome Symposium of the IAHS, Publication Nr 164, 1987;

Each of these documents makes extensive reference to earlier research and publications produced by members of the departments.

CHAPTER 2

WATER RESOURCE DEVELOPMENT

2.1 Surface Water Resources

2.1.1 Introduction

Total surface runoff in Zimbabwe has been estimated to average 50 mm a year, although this varies widely throughout the country and from year to year. The principal runoff - generating areas are those receiving in excess of 800 mm of rainfall a year on average, which are shown in Figure 2.1. Flow variability presents a major problem for potential water users, with many streams flowing only in the wet season, and computed coefficients of variation of total annual runoff recorded at the gauging stations ranging between 0.60 and 1.60. Perennial streams stem largely from the higher rainfall areas indicated in Figure 2.1.

The National Master Plan for Rural Water Supply and Sanitation (NMPRWSS) sub-divided the catchments of Zimbabwe into four classes; shown in Table 2.1.

TABLE 2.1

Classification of Country by Mean Annual Runoff

Class	Mean annual runoff range	Typical co-eff. variation annual runoff	% country in class	Comments
1	≤ 20 mm	> 1.2	34	Years without runoff may occur
2	21 - 40 mm	> 1.2	21	Years without runoff may occur
3	41 - 99 mm	1.0 - 1.3	26	Wide variation in annual runoff
4	≥ 100 mm	0.6 - 1.0	19	Some perennial rivers

The surface water resources available to Zimbabwe, however, also include those in the border rivers of the Limpopo and Zambezi. While the resources of the Limpopo are small, those of the Zambezi are enormous in comparison: the flow at Victoria Falls is double the total runoff generated within the whole of Zimbabwe.

2.1.2 The Zambezi River

The Zambezi River represents by far the largest water resource for Zimbabwe, and is currently used to generate hydropower at Victoria Falls (108 MW) and Kariba dam (1 266 MW). Figure 2.2 shows the catchment areas of the River Zambezi to Lake Kariba and Lake Cabora Bassa. The catchment area above Lake Kariba is approximately 663 800 km^2 and is divided into the upper catchment of 507 200 km^2 above Victoria Falls and the lower catchment of 156 6000 km^2 which lies between the falls and Kariba. With the construction of Kariba dam between 1954 and 1961; the Central African Power Corporation (CAPCO) was established with one of its functions to collect, accumulate and process hydrological data. In October 1987 the functions of the Corporation relating to generation and transmission of electricity in Zambia and Zimbabwe passed to ZESCO (Zambia Electricity Supply Corporation) and ZESA (Zimbabwe Electricity Supply Authority). The remaining functions of CAPCO were transferred to the newly formed Zambezi River Authority.

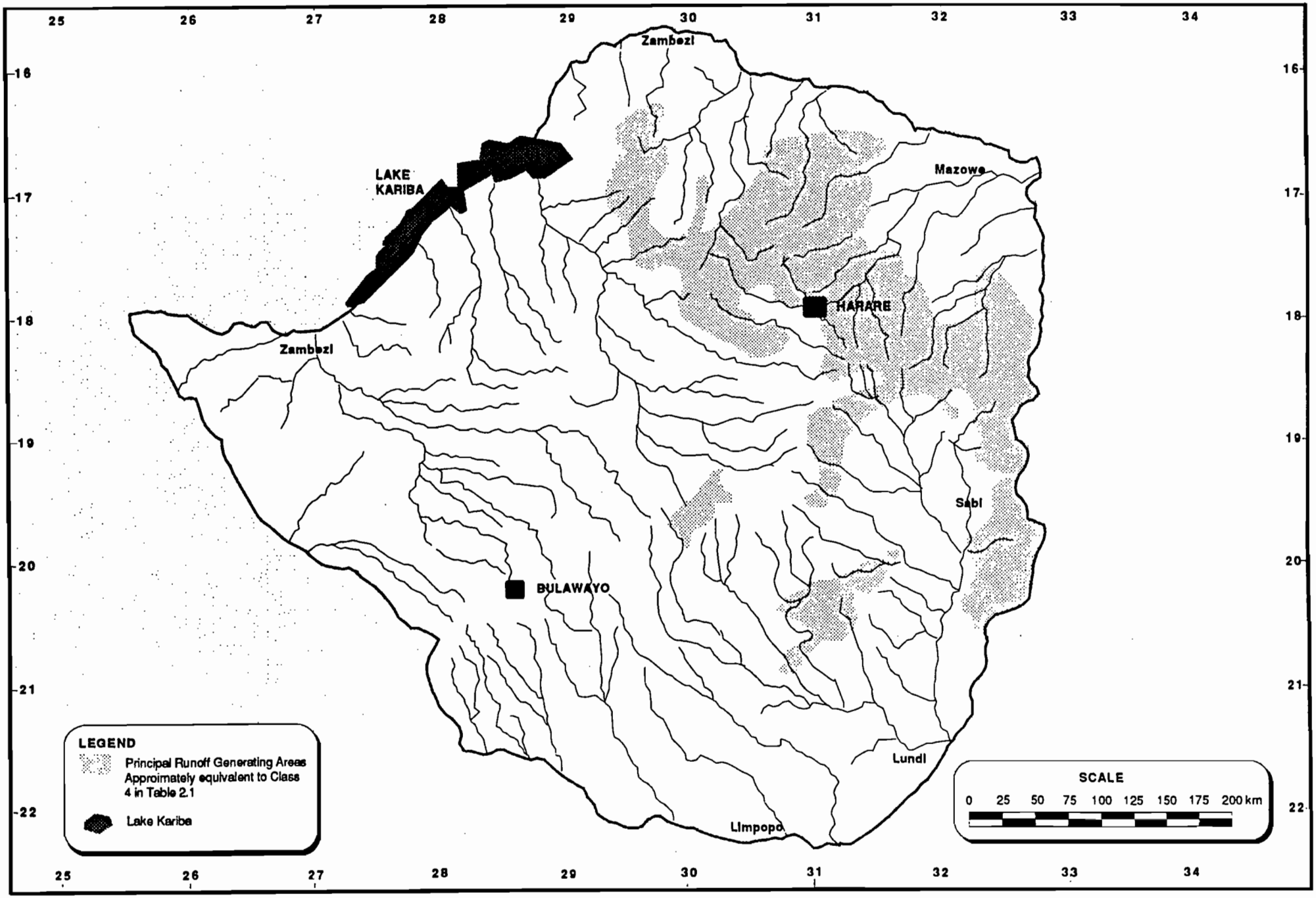
Excellent hydrological records have been collected and processed by CAPCO and water balances of Lake Kariba have been estimated since 1981. All data is computerised and available and kept up-to-date.

The river forms the international boundary with Zambia, and it has been agreed that power generation in the river will be equally shared - both at the Kariba development and any new dam on the river. Abstraction of water from the Zambezi for purposes such as irrigation within Zimbabwe has been shown to be hopelessly uneconomic, mostly because of the considerable pumping needed to lift the water up to the irrigable land.

The quantity of water available in the Zambezi for power generation at Kariba and the proposed Batoka Gorge development has been the subject of considerable speculation in recent years, arising because of apparent large shifts in the pattern of runoff in the catchment above the principal gauging station at Victoria Falls.

Discharge measurements made at Victoria Falls have been few and far between, mostly because of practical difficulties in making these measurements. Those taken to date are listed in Table 2.2. In view of the significance of this gauging station, it is recommended that further discharge measurements are taken, possibly using the recently developed 'moving-boat' technique. In order to carry out this work additional gauging equipment would have to be provided to either the Zambezi River Authority or to the hydrology branch of the Ministry of Energy, Water Resources and Development (MEWRD).

The observation of water levels above Victoria Falls began in the early years of the twentieth century when a gauge post station was established by the then Rhodesia Railways in September 1906 on the Zambian bank of the Zambezi River at a point 2 km upstream of the Victoria Falls. Readings were initially taken weekly but from 1910 to 1920 they were taken on the last day of the month.



Principal Runoff Generating Areas

Figure 2.1

Figure 2.2
Zambezi Catchment Areas to
Lakes Kariba and Cabora Bassa

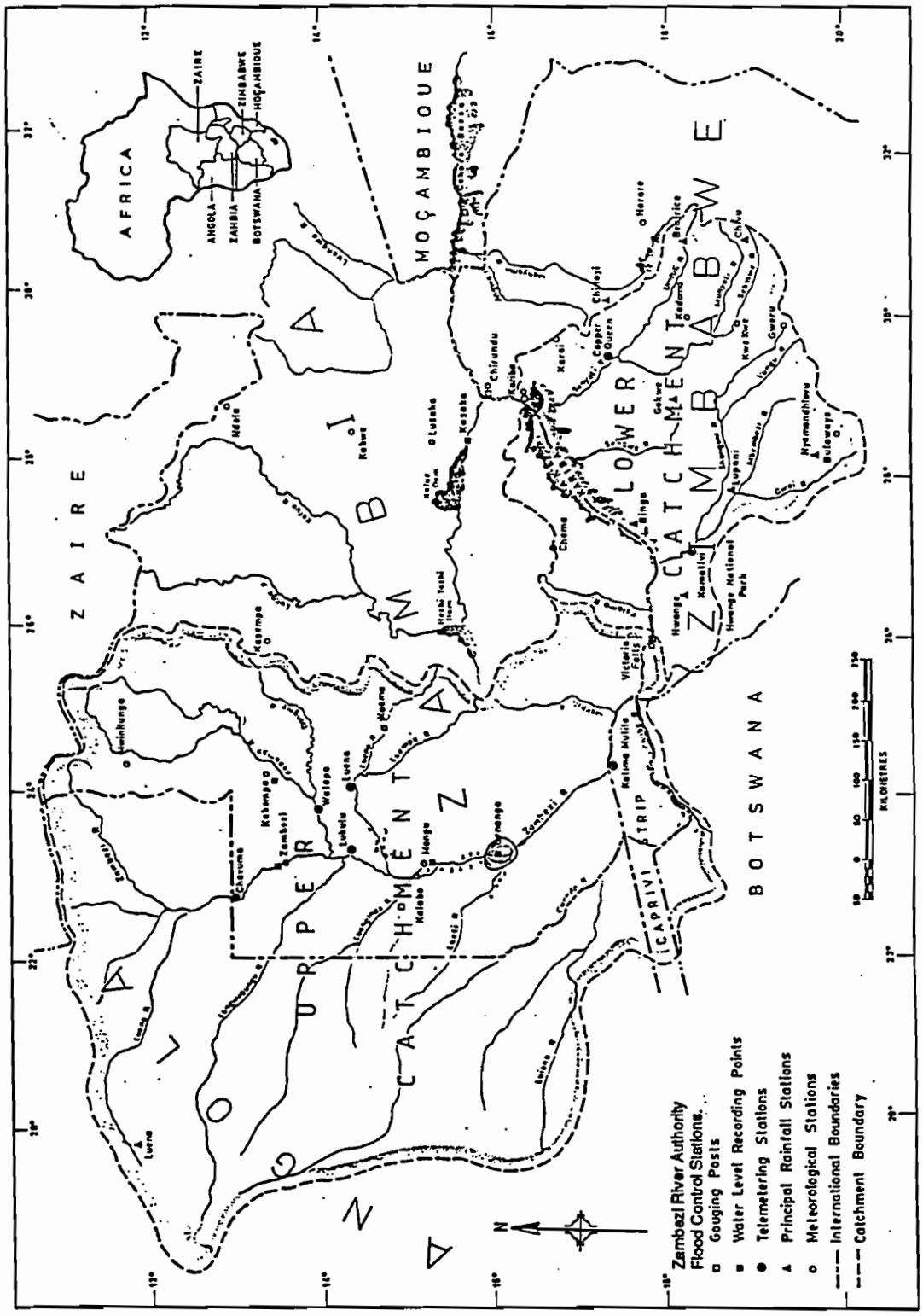


TABLE 2.2

Zambezi : Victoria Falls Current Meter Gaugings

Date yr/month/day	GP ft	Flow cusecs	GP m	Flow m^3/s	Remarks
200411	8.67	140 000	2.643	3 966	*
460906	1.40	10 450	.427	296	at Long Island
460906	1.40	9 940	.427	282	above Canary Island
460906	1.40	10 667	.427	302	above Kandahar
461208	1.25	9 810	.381	278	Kandahar & Long Islands
470711	4.52	45 200	1.378	1 281	Kazangula
470317	5.31	56 600	1.618	1 603	Livingstone Boat Club
470318	5.37	62 200	1.637	1 762	above Canary Island
470507	9.78	142 000	2.981	4 023	
480304	5.60	56 300	1.707	1 595	Kazengula
480318	11.94	192 000	3.639	5 439	Kazengula
480402	11.70	184 000	3.566	5213	Kazengula
480407	11.72	195 000	3.572	5 524	Kazengula
480415	11.30	173 000	3.444	4 901	Kazengula
480604	7.52	85 700	2.292	2 428	
480609	7.15	80 300	2.179	2 275	
480614	6.78	68 600	2.067	1 943	
491116	.73	7 852	.223	222	.5 mile u/s BOAC landing strip
541020	1.20	10 800	.366	306	
561019	1.84	12 200	.561	346	Katambora
561130	2.02	15 500	.616	439	Katambora
570329	13.63	269 000	4.154	7 621	Katambora
580128	5.27	61 600	1.606	1 745	Katambora
580210	9.15	128 000	2.789	3 626	Katambora
580410	12.10	207 000	3.688	5 864	Katambora
580421	10.30	153 000	3.139	4 334	Katambora
580603	6.14	74 500	1.871	2 111	Katambora
580616	5.24	61 300	1.597	1737	Katambora
580702	4.20	38 000	1.280	1077	Katambora
590414	9.56	150 000	2.914	4 250	Katambora
590513	6.95	89 500	2.118	2 536	Katambora
590625	4.44	44 900	1.353	1 272	Katambora
590630	4.05	37 300	1.234	1 057	Katambora
590721	2.81	22 600	.856	640	Katambora
590826	2.00	18 300	.610	518	Katambora
591105	.95	9 000	.290	255	Katambora
600422	10.37	172 000	3.161	4 873	Katambora
610414	11.60	196 000	3.536	5 553	Katambora
610426	12.08	223 000	3.682	6 318	Katambora
631126	2.33	20 800	.710	589	Katambora
640323	6.90	88 200	2.103	2 499	Katambora

Notes: * quoted by Ahronowitz - engineer in MEWRD
Z/LV/Flow/Corres/40 dated 10.5.73
GP - Gauge post reading at Livingstone Pump House

Subsequently it was thought that this station may be insensitive because of the very wide cross-section of river at this site and on 30/10/24 the irrigation branch of the then Southern Rhodesia Department of Agriculture established another gauge called the 'Zambezi : Livingstone Pump Station' ZGP1 (grid ref LL 773 224) at the Livingstone Boat Club and Municipality Pumping Station at a point 5.5 km upstream of the falls on the Zambian bank. Readings have been taken daily since the establishment of the station.

During the UDI years two further gauge post stations were established on the Zimbabwe bank of the river - these were 'Zambezi : Victoria Falls Big Tree' Ref Nr ZGP25 (grid ref LL 774 194) on 25 November 1965 and 'Zambezi : Victoria Falls Pump Station' Ref Nr ZGP26 (grid ref LL 779 184) on 23 October 1967.

The current rating table for ZGP1 was prepared from the current meter gaugings listed in Table 2.2. The 1947/48 gaugings were carried out at Kazengula some 75 km upstream of the falls and the gaugings during the 1950s and 1960s at Katambora 55 km upstream. The rating tables for 'Big Tree' (772 504) and 'Victoria Falls Pump Station' (772 604) were prepared by correlation of the levels at these stations with the levels at ZGP1 during periods of overlap.

Over the years doubts have been expressed over the stability of the river cross-sections at the measuring points, thus:

Chief Hydrological Engineer to Director of Irrigation (Z/LV/1/9 of 4 March 1955) 'It is admitted in Mr Wallis' report of 23/6/47 that the river has silted across this section (ZGP1) above the falls and he states: 'If the above gaugings are plotted on the rating curve compiled by the Kalahari reconaissance and survey (1925) used at present it will be found that the measured flows are somewhat less than the rating curve gives. This may be due to changes in the river conditions below the gauge post site over the long period; it is known that the channels on either side at Long Island have silted up considerably due to weed growth, Canary Island having increased in size during the last 17 years to such an extent that only half that water way that existed in 1931 is available now'.

Chief Hydrological Engineer to Livingstone Municipality (Z/LV/Flow corres/12 of 13 August 1959) 'There was an obvious shift of the rating curve due to the high peak floods in 1957 and 1958 and a new rating table was drawn up for our Livingstone station. The gaugings taken up to the one done on 21/4/58 remained on this curve but on the next gauging taken on 3 June 1958 there was an apparent shift which was confirmed in a further gauging taken on 16 June 1958 and is confirmed on all subsequent gaugings. Gaugings are taken at Katambora cableway. The first shift of the rating curve could be explained by scouring action of the river due to exceptionally high floods but as pointed out this remained the same until after the peak flood of 1958. A collapse of a portion of the lip of the Falls could account for the further shift'. The CHE went to ask the Livingstone Town Engineer if he had any evidence to explain these suspected shifts in rating.

Reply by Livingstone Town Engineer to CHE on 3 September 1959 'Unfortunately I have no conclusive evidence which will help you in the matter. I am however convinced in my own mind that the cross-section of the river on the reach between the Northern Bank and Long Island downstream from the Pump Station has changed in the last few years following the floods of 1957 and 1958 .... having observed the lip of the Falls at flood and low water, I am convinced that more and more water is going over at the Southern end of the Falls ie Devils Cataract where erosion is greatest'.

Provincial Water Engineer to CHE on 1 October 1969 'Attached photograph is of the upstream point of Queen Elizabeth Island .... from the photo it seems as though the channels between Canary Island and King George VI island are silting up'.

The Victoria Falls discharge record used in the analysis of the feasibility of Kariba dam and its extension was compiled using two rating relationships - the first one applying to measurements before 1957 and the second applicable to the subsequent period. Use of these rating tables led to computed discharges that showed a significant change: an average annual flow of 31 milliards (km^3) in the period 1925 to 1950 and 50 milliards for the period 1950-1970. Subsequent investigation has led, in 1975, to the revision of the early data by recomputing discharges using the more recent discharge rating, on the premise that these measurements were made more accurately and that the rated section is reasonably stable. This led to a 10% increase in the computed discharges for the earlier period of record (CAPCO, 1978).

The situation at Victoria Falls continues to change and to present a complex picture. In 1988, Gilbert/Commonwealth Inc. reported that there were now three identified patterns of behaviour.

Water Year (Oct-Sept)

1924/25 to 1946/47	:	mean annual runoff 34.1 milliards
1947/48 to 1980/81	:	mean annual runoff 48.3 milliards
1981/82 to 1985/86	:	mean annual runoff 26.6 milliards

Collection of recent data, including the year 1988/89 produces a post 1980/81 figure of:

1981/82 to 1988/89	:	mean annual runoff 29.7 milliards

The time series data are plotted as a cumulative runoff diagram in Figure 2.3, and a bar chart in Figure 2.4.

The resolution of the causes of such apparent shifts in the behaviour of a large system are of fundamental importance to the electricity supply authorities as they are very influential in determining the 'firm power' that can be expected to be generated at their hydropower installations.

As in the Sahel the Zambezi River recovered considerably during the 1988/89 water year with a flow at Livingstone of around 55 milliards.

As can be seen in Figure 2.5, based on the Lake Kariba water balance over the period 1961/62 to 1980/81, there was considerable spillage in every year except 1972/73. However, after 1980/81 the situation changed quite dramatically with a serious reduction in inflow which resulted in hydropower generation being reduced by 20 percent to prevent reservoir levels falling below the minimum operating levels (Figure 2.6).

Moreover, the reduced flows in the Zambezi River has raised the question of whether there are adequate supplies to increase the generating power at Kariba through the projected Kariba South Station.

2.1.3 Other River Systems

In the NMPRWSS it is noted that recorded mean annual runoff rates vary between 1 mm or less in Matebeleland South to over 300 mm in the high rainfall areas along the Eastern Border. Runoff rates averaged 50 mm a year over the country.

The present surface water resources in Zimbabwe are constrained by a number of factors, including:

- highly seasonal rainfall on impervious catchments leading to runoff that is also seasonally very variable, and usually ephemeral;

- a very long history of the use of water for irrigated agriculture, and the legal allocation of rights to the water resource;

- a large variation year-to-year in the volume of runoff;

all of which lead to the general conclusion that additional allocation of water above the existing rights can only be made after the provision of storage reservoirs.

As a consequence the country has many dams, large and small, to help with the temporal redistribution of the surface runoff. At present over 10 000 dams are registered within the country, with over 100 registered with the International Commission on Large Dams. The first major dam was constructed at Matopos in 1901, and development has continued vigorously since that date. Kabell (1988) has described an ambitious programme of dam construction in Zimbabwe, leading towards a complete harnessing of the country's internal water resources. Using results of an earlier paper (Kabell, 1984) and the techniques of Mitchell (1977, 1978) he made an estimate of the surface water resources of the country by Hydrological Zone, and the storage capacity needed to harness this, reproduced here as Table 2.3.

Figure 2.3

Zambezi River : Cumulative Annual Discharges

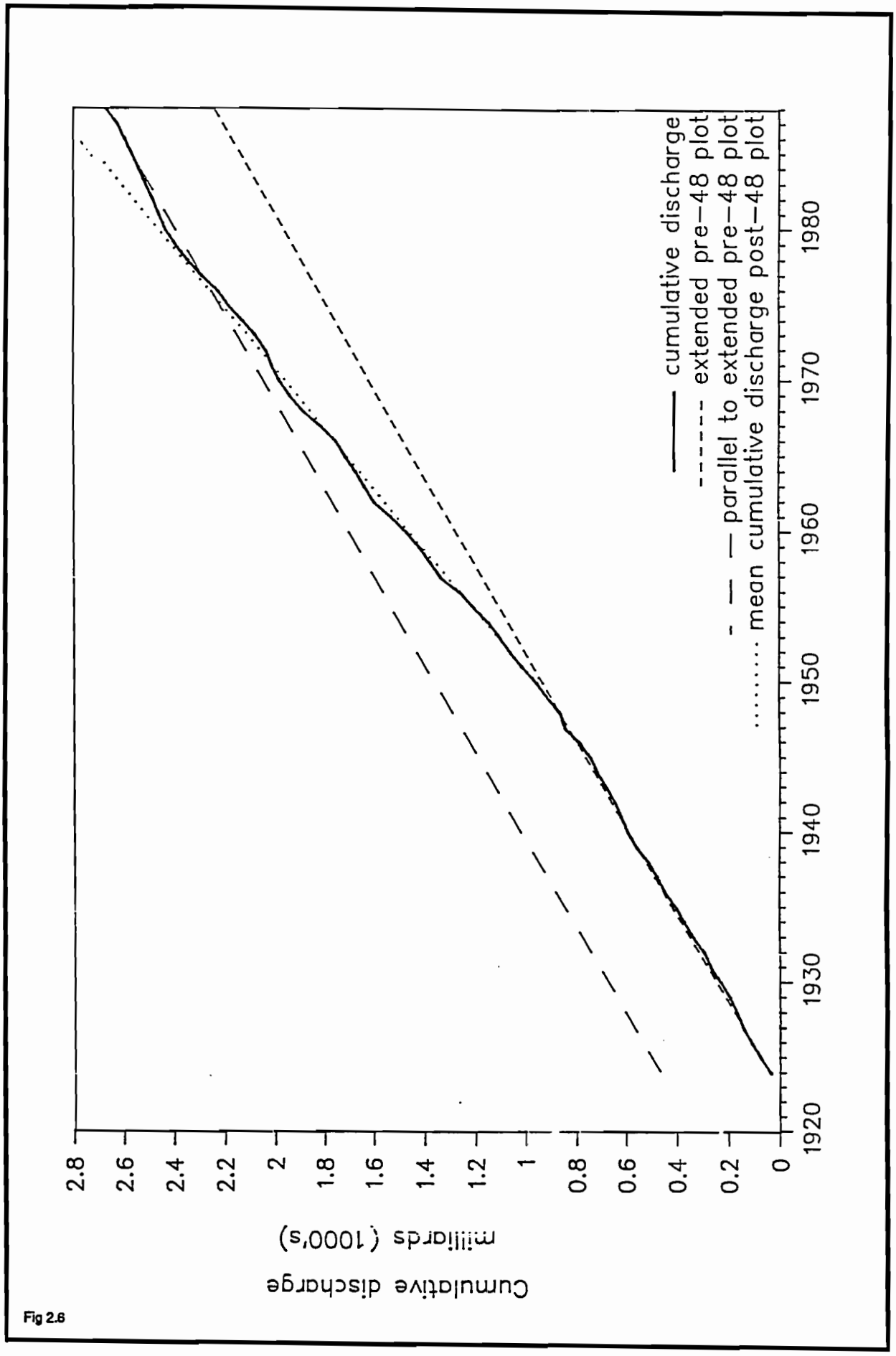


Fig 2.6

Figure 2.4

Zambezi River at Livingstone : Annual Discharge 1924/25 to 1988/89

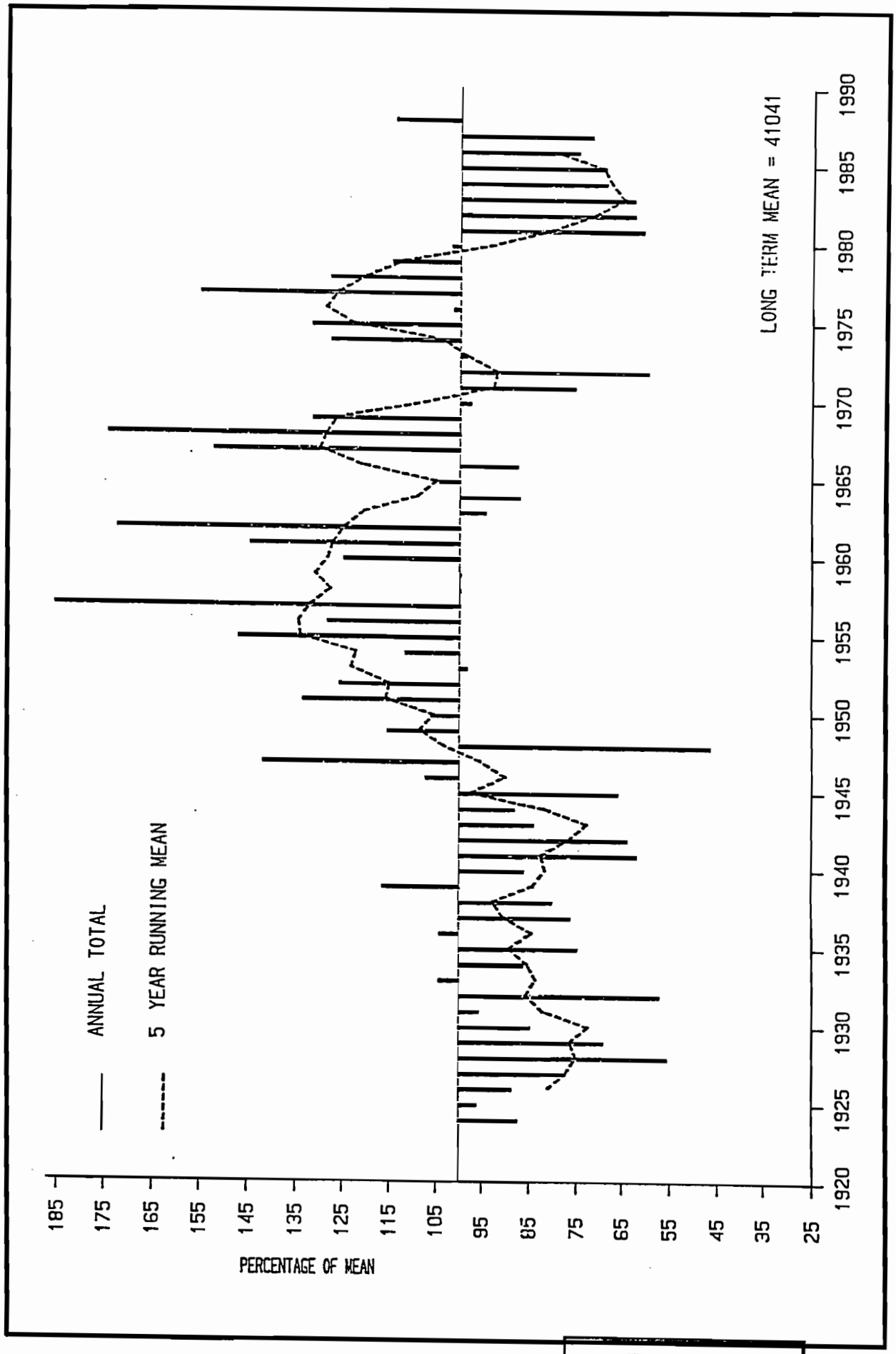
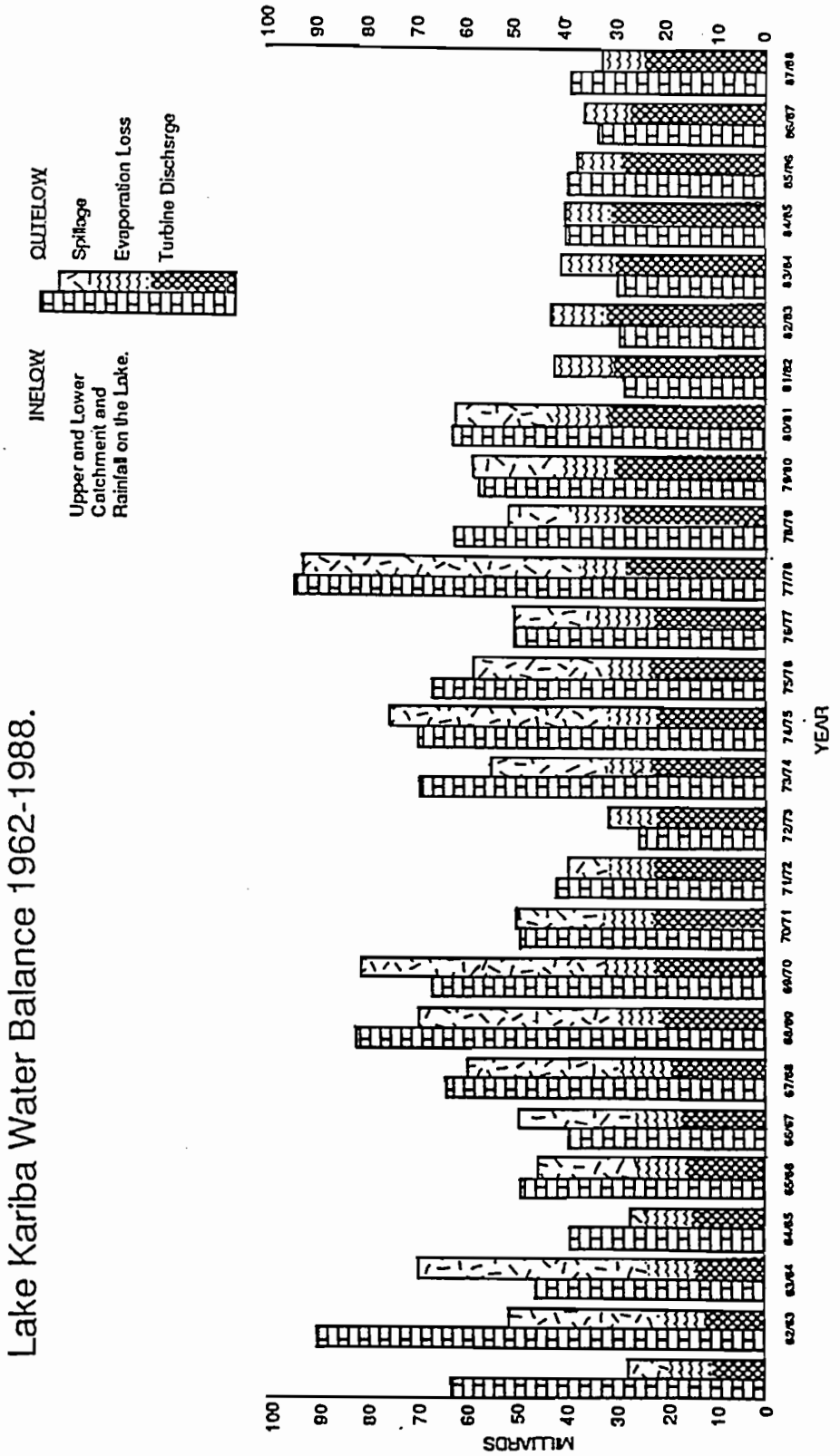


Figure 2.5

Lake Kariba Water Balance
(1961/62-1987/88)



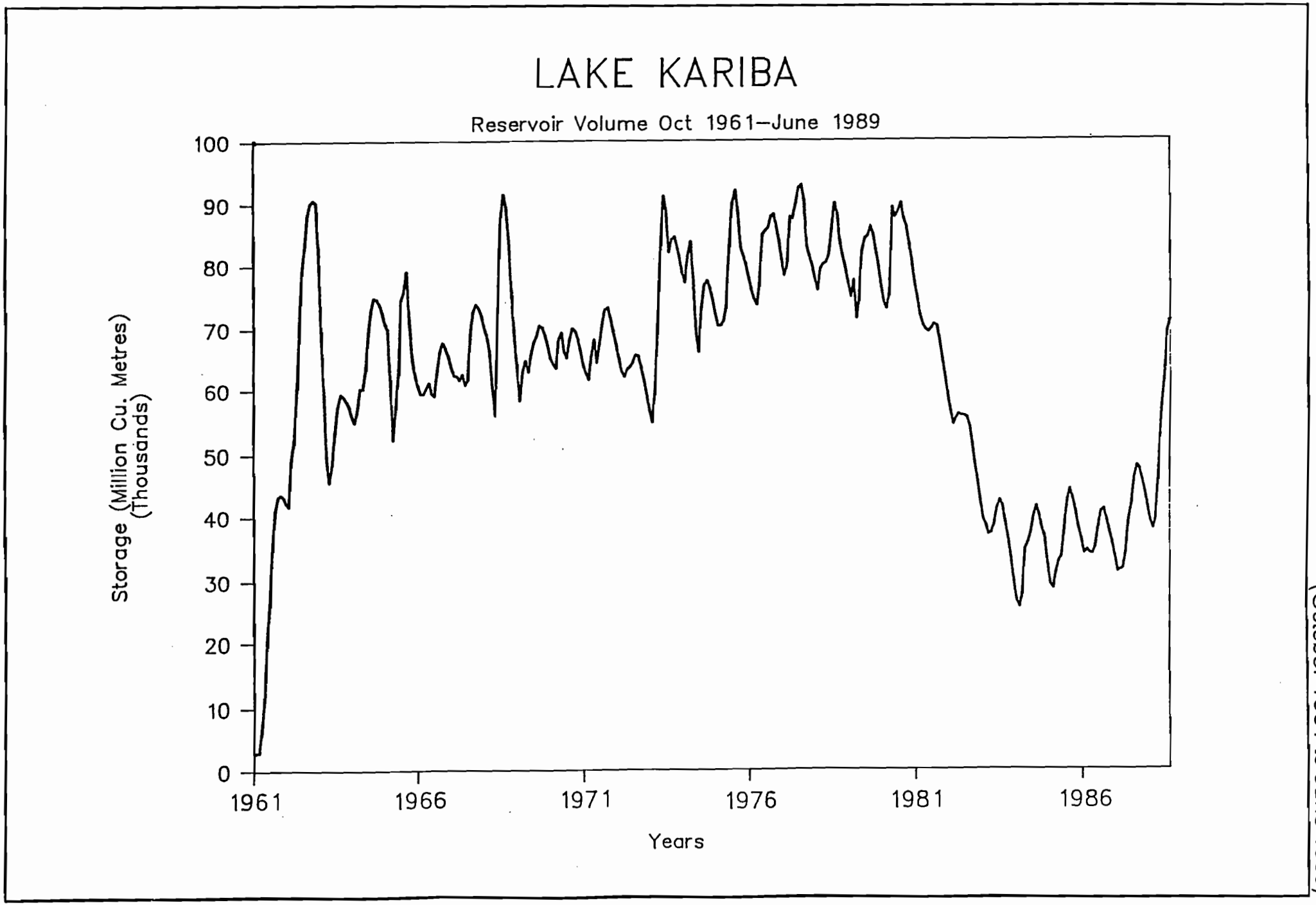


Figure 2.6
Lake Kariba Levels
(October 1961 to June 1989)

TABLE 2.3

Surface Water Resources Summary($m^3 \times 10^6$)

ZONE	Mean annual runoff	Potential Storage	Potential Yield	Present Storage	Present Use	% Use
A	1 756	3 512	816	252	82	10
B	1 157	2 314	529	687	213	40
C	5 638	11 276	3 083	1 586	676	22
D	4 133	8 266	2 436	262	208	9
E	5 954	11 908	3 451	3 019	1 248	36
F	1 272	2 544	945	25	49	5
TOTAL	19 910	39 820	11 260	5 831	2 476	22

Source: Kabell, 1988.

The programme of development envisaged by Kabell over the next 25 years or so is summarised in Table 2.4.

Responsibility for the construction of large dams will lie with the government, and the MEWRD. There are some existing large dams constructed privately to serve more extensive irrigated areas, but the government now intends to control this work directly, selling stored water to recover the capital cost of what is considered to be basic infrastructure in the country. Medium and small dams are likely to be continued to be constructed mostly by commercial farmers.

This possible development of storage is equivalent to nearly three times the existing storage capacity (excluding Lake Kariba, storage 116 milliards) but is still nevertheless only half the additional storage required for full development. Table 2.5 gives details of major dams in the planning, design and construction stage, together with the locations and storages of some of the other identified sites.

TABLE 2.4

Possible Dam Construction by Year 2013

Category	Total storage capacity ($m^3 \times 10^6$)
Large dams constructed over past five years	470
Small dams over next 25 years	250
Medium dams by private sector over next 25 years	500
Medium dams to be built in districts	300
Urban supplies to major centres	560
Large dams for short-term development	2 510
Large dams for longer-term development	12 350
TOTAL	16 940

Source: Kabell, 1988.

2.2 Water Demands

2.2.1 General

Zimbabwe has a very long history of the administration of water abstractions, dating back to the 1889 Royal Charter issued to the British South African Company, and the 1914 Water Act. These established the 'water court' to examine any application for water use, and determine whether it would affect downstream users. Presently, in the MEWRD Water Rights Database, around 17 000 entries have been made, and some 500 or so new applications are received each year. These relate, in the main, to applications made by the farming community.

Throughout Zimbabwe, many small-scale dams and diversion weirs have been constructed, usually by individual farmers, for such purposes as providing water sources for irrigation or stock-watering. These are long-established practices, and consequently have had a significant influence over dry season discharges that have been measured in the smaller rivers of the country.

TABLE 2.5

Details of Potential Storage Sites

(i) Major Dams Currently being Developed or Planned

Province	River	Dam	Capacity (million m^3)	Year
Mashonaland West	Mukwadzi	Mazwikadei	365	Complete
Masvingo	Shashe	Muzhwi	110	1988/89
Manicaland	Odzi	Osborne	420	1989/90
Matabeleland South	Umzingwane	Shobi	125	
Mashonaland Central	Dande	Dande	160	
Midlands	Munyati	Kodu	1 230	
Mashonaland East	Mupfure	Muda	100	
Matabeleland North				

(ii) Other Potential Sites

Manicaland	Save	Chitowe	2 600
Manicaland	Save	Condo	3 200
Manicaland	Busi	Mirror	10
Masvingo	Tokwe	Mukorsi	1 800
Masvingo	Runde	Tende	1 500
Masvingo	Tokwe	Tokwane	40
Masvingo	Mkwasine	Mkwasine	40
Matabeleland South	Umzingwane	Glass Block	170
Matabeleland South	Tuli	Lower Tuli	400
Matabeleland North	Shangani	Gwaai-Shangani	800
Mashonaland West	Manyame	Biri-Manayame	380
Mashonaland West	Manyame	Glyn-a-Mel	300
Mashonaland West	Mupfure	Mhondoro	270
Mashonaland West	Mupfure	Seigneury	90
Mashonaland Central	Umsengedzi	Silvestroom	140
Mashonaland Central	Umwindzi	Lions' Head	210
Mashonaland Central	Mazowe	Bindura	90
Mashonaland East	Inyagui	Inyagui	140
Mashonaland East	Shavanhoye	Shavanhoye	170

2.2.2 Irrigation

The development of irrigation is an important feature of the Five Year National Development Plan and Zimbabwe is fortunate in having considerable potential for the expansion of irrigated agricultural production.

Irrigation development in Zimbabwe is well covered in the recent report:

> Study on Options and Investment Priorities in Irrigation Development, Country Report - Zimbabwe, Euroconsult, World Bank and Directorate-General of International Development for The Netherlands, April 1987.

The cropped area in Zimbabwe is estimated to total some 3 million ha of which only some 150 000 ha is irrigated (World Bank Land Subsector study 1986). Euroconsult estimated the irrigated area as 134 000 ha. Some 98% of the irrigated area is farmed by commercial farmers; larger company estimates accounting for 23%. Only about 2% of the irrigated area is in communal areas.

The main irrigated crops are sugar cane, wheat, cotton, tea, fruits, vegetables, tobacco, maize, groundnuts and edible beans. Identified existing irrigation projects are listed in Table 2.6.

Zimbabwe has considerable potential for the expansion of irrigation, with the total potential irrigation areas generally estimated at around 0.6 million ha. The major constraint on irrigation development is water availability; with development being reliant on surface water sources as groundwater resources are relatively small. Estimates of the ceiling for irrigation development range between 284 000 ha (Euroconsult 1987) and 420 000 ha (World Bank Agricultural Sector Review 1983). The Euroconsult estimate is based upon an estimate of water available for irrigation of 4 570 million m^3/year whereas the World Bank assumed 6 000 million m^3/year water available for irrigation.

Potential future developments separately identified by Euroconsult are listed in Table 2.6.

2.2.3 Municipal, Industrial and Rural Water Supplies

The present situation of the rural water supply sector in the Communal Lands and Resettlement Schemes of Zimbabwe is well presented in the report:

> National Master Plan for Rural Water Supply and Sanitation, Ministry of Energy and Water Resources Development, Interconsult A/S, Norad, December 1985.

No data are readily available on the status of urban water supplies. The NMPRWSS estimated that only about 33% of the population in communal areas (which account for some 60% of the total population of Zimbabwe), draw water from acceptable sources. No similar data are available for the balance of the

TABLE 2.6

Existing and Planned Irrigation Schemes

Existing irrigation schemes		Planned irrigation schemes	
Scheme	Area (ha)	Scheme	Area (ha)
Bondi	600	Devule	245
Chakowa	85	Matabara	132
Chibuwe	326	Kanyemba (Chapoto)	13
Maranke	40	Nyagande	30
Murambinda	35	Nyakasoro	
Mutema	283	Banga	35
Nyachowa	45	Chilonga	120
Nyamaropa	406	Dabgwa	30
Nyanvadzi	573	Fuve	40
Tawona	221	Gudo's Pool	35
Gutsa	36	Manjinji	63
Gache-Gache	5	Roswa	80
Malikango	24	Rupangwana	15
Makonese	56	St. Joseph	50
Mapanzura	48	Tambara	18
Mutevo	15	Jalunganga	45
Muzuugwa	60	Mkoba	
Fanisoni	10	Senkwazi	30
Lambo	2	Umridzi Irrigation Project	2 460
Likosi	12	Maziwikadei	7 000
Nabusenga	3	Claw Dam Irrigation Scheme	1 000
Sinamatelele	7	Mwenji Irrigation Stage II	1 500
Tsheziya	4	Umfuli River Project	5 600
Jotsholo	570	Umwedsi Lions Head	11 300
Tshaba Vleir	4	Middle Sabi Stage III B	960
Zinapi	16	Mzarabani Stage IV	462
Bili	21	Mushumbi Pools	7 384
Chikwarakwara	60	Musikavanku	400
Duncal	15	Batanai	3
Kwalu	4	Chikoro	15
Maitengwe	20	Goto	78
Makwe	202	Murara	30
Mambale	14	Nyandiri	50
Mankonkoni	36	Nyamatanda	20
Masholomoshe	40	Shinga	12
Mbebeshana	6	Shumba	10
Mzinvatini	32	Bondolfi	120
Rustler's Gorge	27	Fube/Panganai A	18
Sabasa	60	Fube/Panganai B	88
Shashe	128	Fube/Panganai C	115
Silalabuhwa	350	Fube/Panganai D & E	240
Sukwe	22	Sand Abstraction	30
Tongwe	27	Chirundazi	340
Bangure	8	Madzongwe	250
Charandura	4	Kapambere	380
Exchange	168	Masomo	270
Hozori	7	Chiduku	
Mabodza	12	Siyoka	
Mabwe Matema	48	Midlands Irrigation Package	
Mhende	80	Masoswa	10
Mondi Matanga	7	Hama	50

population in rural towns and the urban centres but it is likely that some 80% of this population is served with an acceptable supply. Based on this assumption, it would seem that some 50% of the total population of Zimbabwe is not served by an acceptable supply.

Water supplies are provided from both surface water and groundwater sources. Most supplies for large urban areas and small townships are abstracted from surface water sources whereas existing rural water supplies are predominantly provided from either shallow protected wells or boreholes (some 9 000 in 1984).

There are many ongoing projects to improve water supplies to both large and small towns and in rural areas. Development project planning in the communal lands and resettlement areas has been provided in the National Master Plan. Urban water supply schemes are largely based on the construction of dams to allow abstraction from surface water bodies - designed by the MEWRD. Projects of this type that have been identified in the Five Year Plan are entered in Table 1.6. With demand rising and resources limited the use of Zambezi water might be required to supply such urban centres as Bulawayo (Mitchell, 1988).

2.2.4 Hydropower

The existing electricity generation facilities in Zimbabwe are listed in Table 2.7 and the total energy generated in recent years is given in Table 2.7. The Zimbabwe power system is dominated by the hydropower station at Kariba and the thermal power station at Hwange (see Figure 2.7).

The Zimbabwean and Zambian power systems are inter-connected and operation is co-ordinated. Zimbabwe and Zambia share equally the available output at the Kariba complex, (Kariba north and south power stations and the dam) and Zimbabwe is able to import energy from Zambia. The installed capacity at Hwange was increased by 440 MW in 1986/87 and since March 1987 Hwange has operated on base load thereby conserving water in Lake Kariba and reducing the importation of energy from Zambia.

Zimbabwe still has very substantial hydropower potential, mainly based on the Zambezi River. Zambia would be entitled to 50% of the output of any further developments on the Zambezi. Identified schemes are summarised in Table 2.9 and shown in Figures 2.8 and 2.9.

The Five Year National Development Plan includes provision for the extension of Kariba south hydropower station and investigations have been instigated at Batoka Gorge.

In addition it is understood that there is the possibility of mini-hydro installations at Sebakwe, Manyuchi and Mazvikadei.

Figure 2.7

Sources of Power for Zimbabwe

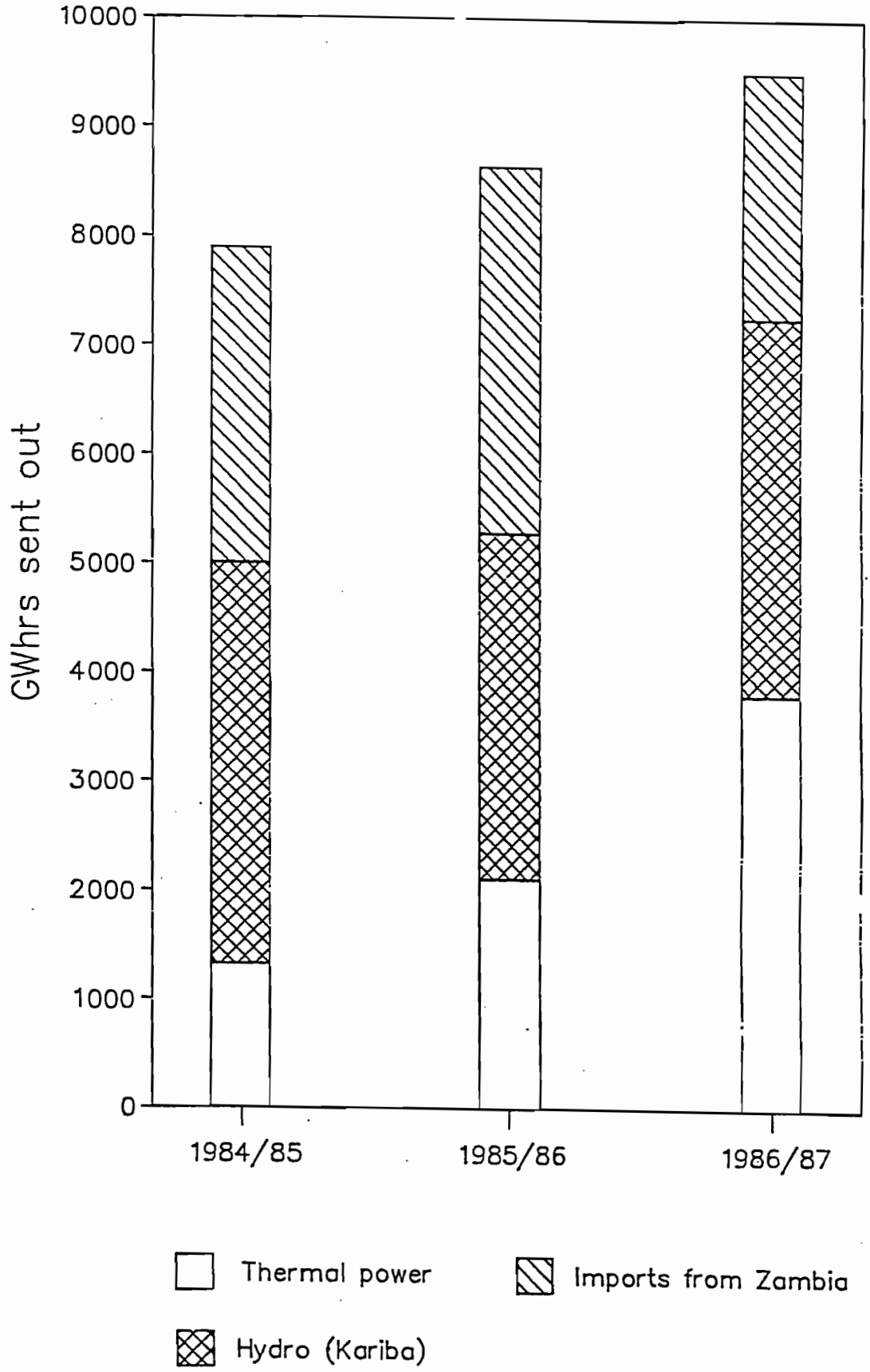


TABLE 2.7

Existing Power Generation Facilities

Name	Available capacity (kW)
Interconnected hydropower station	
Kariba south	666 000
Interconnected thermal stations	
Hwange	920 000
Munyati	120 000
Harare	120 000
Bulawayo	120 000
TOTAL	1 946 000

Source: ZESA Annual Report 1987

TABLE 2.8

Energy Generation, Consumption and Imports (all in GWh)

Year	Generation				Consumption	Imports
	Kariba south hydro	Inter-connected thermal	Other	Total	Total	Total
1982	3 605.3	329.4	199.7	4 134.4	7 742.5	3 608.1
1983	3 733.7	427.7	219.7	4 381.1	7 466.7	3 085.6
1984	3 458.0	881.5	198.4	4 537.9	7 455.0	2 917.1
1985	3 096.8	1 791.1	135.5	5 023.4	8 093.0	3 069.6
1986	3 154.7	2 702.9	129.8	5 987.4	8 498.0	2 510.6
1987	2 506.4	5 099.9	137.6	7 743.9	8 713.7	969.8

Source: Quarterly Digest of Statistics, Central Statistical Office, Harare

TABLE 2.9

Identified Potential Hydropower Schemes

Scheme	River	Turbine capacity (MW)	Average energy (Gwh/year)
Kariba extension	Zambezi	600	Not applicable
Batoka gorge	Zambezi	1 600	10 300
Devil's gorge	Zambezi	1 240	7 070
Mupata	Zambezi	1 200	6 700
Victoria Falls	Zambezi	390	2 200

Source: Zimbabwe: Issues and Options in the Energy Sector, World Bank, 1982.

Debate over the desirability of each of the investment options for the provision of additional generating capacity has been highlighted by the recent problems encountered within the interconnected system. In May 1989 a fire in the main cable duct at Kafue gorge completely disabled the Zambian hydropower station, abruptly cutting off its 900 MW generating capacity. This has provoked a crisis within the Zambian Electricity Supply Corporation (ZESCO), leading to increased demands made on Kariba generation, power imports from Zimbabwe (rather than the usual exports to Zimbabwe) and load shedding. Unfortunately this crisis has occurred at the same time as problems at the Hwange plant, and the temporary loss of about 50 per cent of its generating capacity. Fortunately, the recent run of low flows in the Zambezi, leading to very low lake levels at Kariba, ended in March 1989 with the arrival of above-average wet season inflows, and an extensive recovery of lake levels. Because of the current crisis, Kariba has recently been generating around 10% above its nominal capacity, sustained 24 hours a day.

Consultants Gilbert/Commonwealth International have prepared a System Development Plan for the Zimbabwe Electricity Supply Authority (ZESA) in June 1988, updated January 1989. Development of the Batoka Gorge site is the cornerstone of their recommendations, with the extension of Kariba delayed until after Batoka energy generation is available. ZESA was, at the time of our visit, still considering the report, but site investigations at Batoka were continuing.

Figure 2.8

Potential Hydropower Development Sites on the Zambezi River

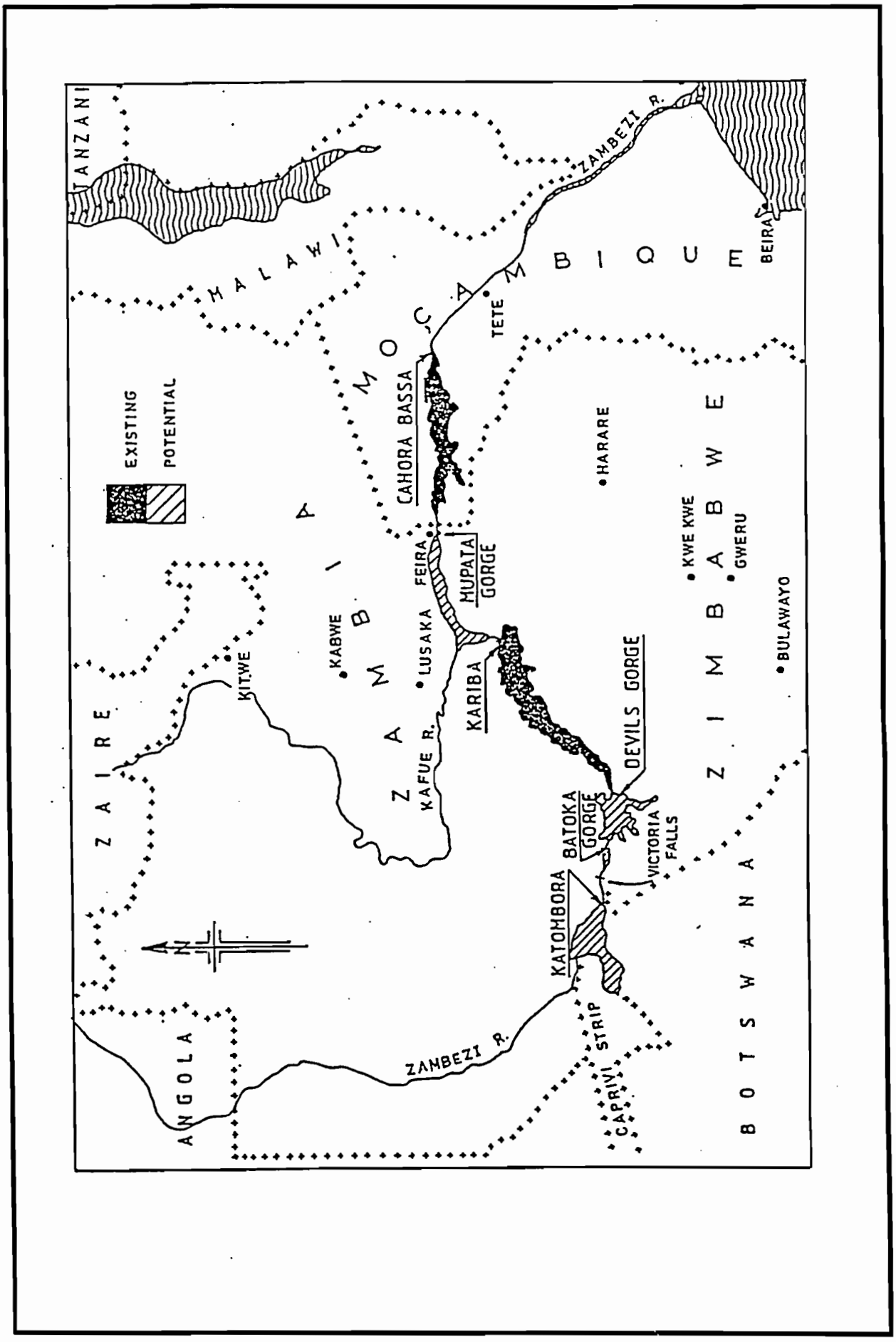


Figure 2.9

Longitudinal Profile of the Zambezi River

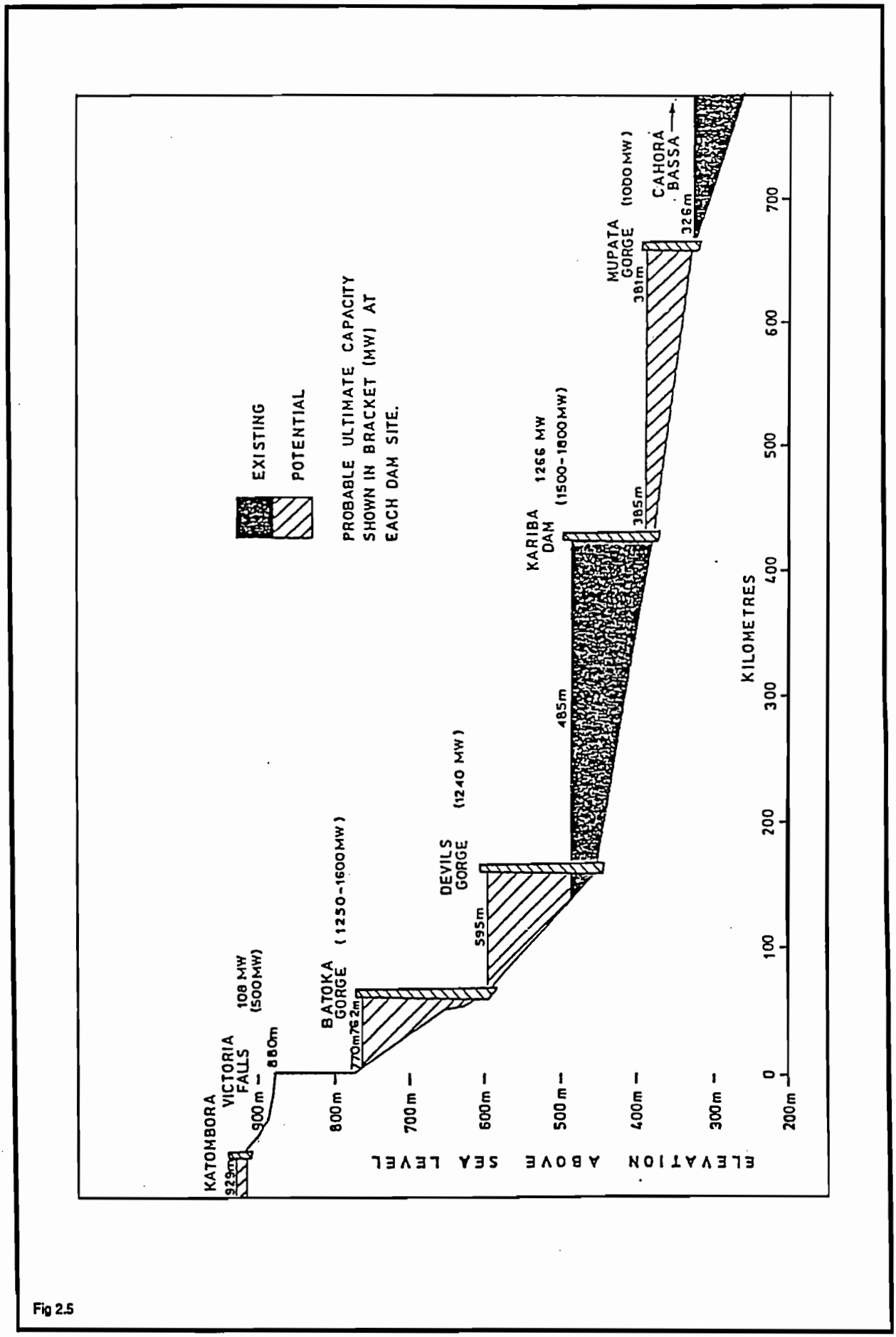


Fig 2.5

CHAPTER 3

HYDROMETEOROLOGY

3.1 Organisation of Data Collection

3.1.1 Rainfall Station Network

The earliest raingauges in Zimbabwe were established in the last years of the 19th century and the first decade of the 20th century, following the construction of the railways and the establishment of European settlements. Subsequent development of the network has seen over 2 600 raingauges opened in the country. The density of gauges has always been greatest in the more populated areas of the country, in the eastern border area, and the area around Harare. Lowest densities are found in south-western regions on the fringes of the Kalahari desert, and the north-western areas adjacent to Lake Kariba. Although the Department of Meteorological Services (DMS) records indicate that data exist for over 2 600 raingauges, these have never all been operational at one time. The size of the operational network is shown in Figure 3.1, the network reached a maximum in the 1970s, with some 1 500 gauges reporting regularly. This pattern was disturbed by the liberation war, with the active network falling to under 1 000 gauges by 1979. Steps have since been taken to improve the situation, and presently about 1 200 gauges are operational.

The raingauge network is operated largely by volunteers, the exceptions being salaried observers at the DMS climate stations and people whose official duties are extended to include the reading of a raingauge. Most gauges are sited at farms, missions and schools, although the National Railways, National Parks, Research Stations and the Prison Service also make a major contribution. This use of volunteers appears to be very successful, with no lack of requests from people wishing to participate in the data collection exercise.

There is very little direct contact between the DMS and the observers, partly due to transport and manpower constraints. Where a perceived gap in the network exists and a potential observer is identified, the raingauge, instructions and data entry forms will be mailed to the observer. The instructions include information on how the gauge should be sited and installed, and how and when measurements should be made. No follow-up visits are made to check that the instructions are followed.

The standard raingauge used is a locally manufactured gauge, made in a hard plastic with a 5 inch rim. The design is very similar to the UK Meteorological Office standard design. Gauges are installed with the rim set 0.76 m (30 inches) above the ground.

Observations are entered on to forms provided by DMS, in duplicate. At the end of the month one copy is mailed to DMS headquarters at Harare, under a pre-payment arrangement.

The inventory of daily raingauges is included as Appendix B.

Autographic raingauges are installed at all primary climate stations, and some supplementary stations. These are listed in Table 3.1. There are also a number of Dines 'rate of rainfall' recorders installed at these climate stations, but these are not believed to produce reliable information. A consignment of 23 rainfall logging gauges have been recently received, and a few have now been deployed in the field on an experimental basis. Unfortunately most of the gauges did not work when they were tested, and have been returned to the manufacturers for repair.

3.1.2 Climate Station Network

The primary climate station network is that operated directly by DMS, in conjunction with that operated by the Department of Research and Specialist Services of the Ministry of Lands, Agriculture and Rural Settlement, with the assistance of DMS. These stations are listed in Table 3.1. Forty six of the stations are currently operational.

This network is extended by 'associated stations' which offer a partial range of climatological observations, and are operated by other agencies or volunteers.

A further network of climate data collection is the evaporation pan network that is the responsibility of the hydrology branch of MEWRD. Although the equipment is owned by MEWRD, many are sited in the DMS climate stations, and maintained by the DMS observers. The evaporation pan network is listed in Table 3.2.

Climatological observations are made at 0600 hours local time (0400 GMT), 0800, 1100, 1400, 1700 and 2000 hours. Where full time observers are not available, this routine is reduced, as it is on Sundays and public holidays.

The principal climate stations are usually comprehensively equipped, with instrumentation summarised in Table 3.3. The standard of equipment will naturally be less in the associated stations, with fewer parameters measured.

Every effort is made to ensure that at least the principal stations are inspected every year, and appropriate maintenance carried out. This task is made significantly more difficult by the absence of any serviceable vehicles for this task. The observers receive a very thorough training at the department's headquarters, included in which is basic instruction in the care and maintenance of instruments. For example, observers are generally competent to change clocks on instruments, and they are issued with a spare clock for just such an eventuality. It is also the observer's task to draw attention to any maintenance or repair needed that is beyond his capabilities or resources, in his monthly return to headquarters.

Figure 3.1

Historic Development of the Raingauge Network

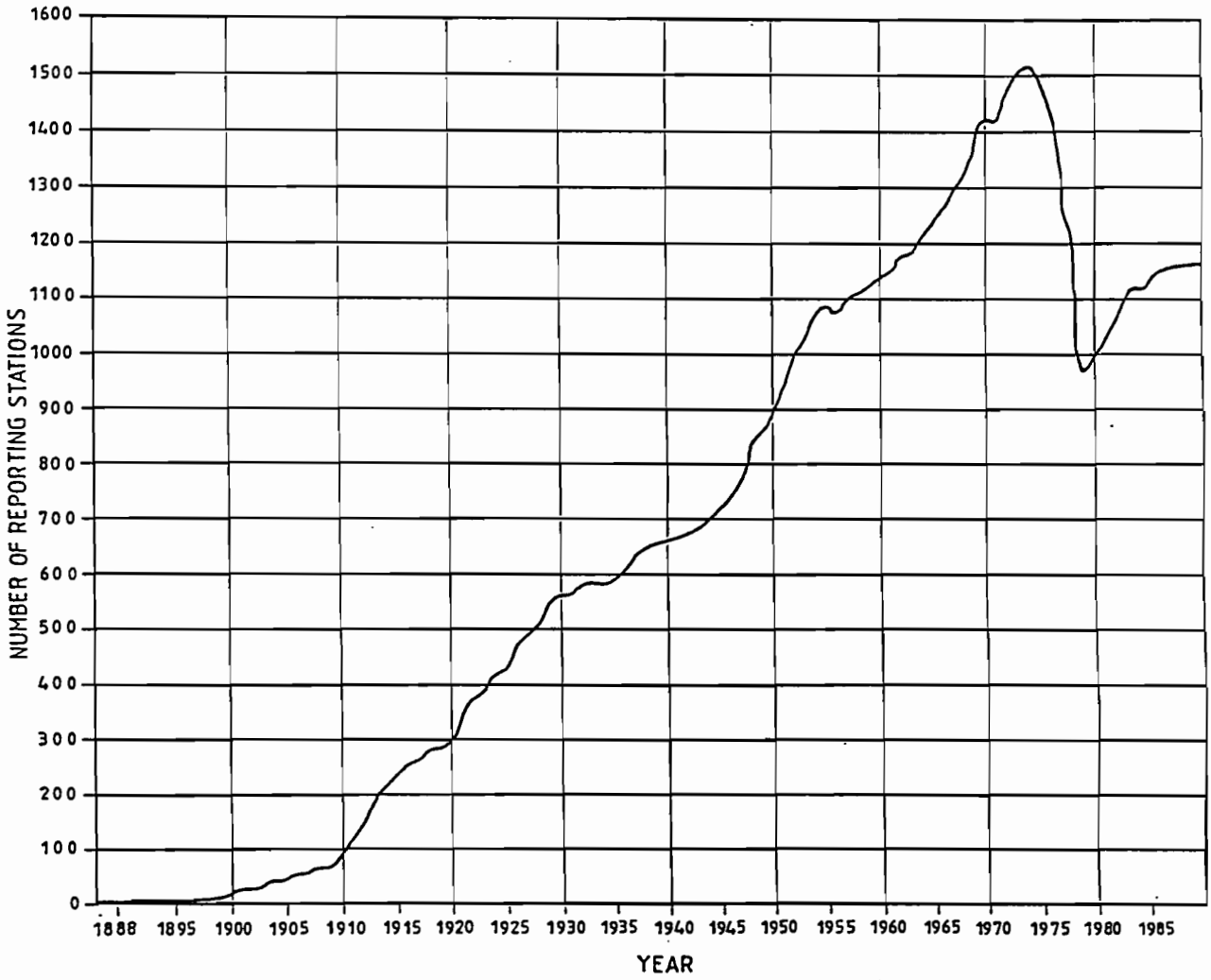


TABLE 3.1

Main Climate Stations

As at 1 May 1988

Station	Stn Nr	Alpha Nr	Elevation bar	Elevation screen	Lat S	Long E	Corrections Max	Corrections Min	Corrections Dpt
Banket Res. Stn.	769 1	0223		1 244	17 19	30 24	00	00	00
Beitbridge	991 2	0303	457	456	22 13	30 00	-65	-44	-36
Binga	755 3	0470	617	617	17 37	27 20	-52	-35	-29
Buffalo Range	977 4	0653	430	429	21 01	31 35	-67	-46	-38
Buhera	875 1	0670		1 192	19 19	31 26	-05	-03	-03
Bulawayo Airport	965 5	0703	1 326	1 326	20 01	28 37	06	04	03
Bulawayo Goetz Obsy.	964 2	0769	1 344	1 343	20 09	28 37	08	05	04
Chibero	893 2	0946		1 335	18 06	30 40	07	05	04
Chinhoyi	771 3	1063		1 143	17 22	30 13	-09	-06	-05
Chipinge	983 3	1176	1 132	1 131	20 12	32 37	-10	-07	-05
Chisengu	897 2	1336		1 483	19 53	32 53	19	13	11
Chisumbanje	985 2	1370		421	20 48	32 14	-68	-46	-38
Chivhu	871 2	1453	1 459	1 458	19 02	30 53	17	12	09
Gokwe	861 3	2503	1 282	1 282	18 13	28 56	03	02	01
Guruve	773 2	2620		1 177	16 39	30 42	-06	-04	-03
Gweru Thornhill	867 5	2943	1 429*	1 428	19 27	29 51	15	10	08
Harare Airport	775 5	2953	1 507	1 497	17 55	31 06	20	14	11
Harare Belvedere	774 1	2956	1 472	1 471	17 50	31 01	18	12	10
Harare Kutsaga TRS	791 1	2959	1 479*	1 479	17 55	31 08	19	13	11
Harare Res. Stn.	795 1	2963		1 506	17 48	31 03	21	14	12
Henderson	785 2	3103		1 292	17 35	30 58	03	02	02
Hwange Nat. Park Airport	853 3	3293	1 077*	1 079	18 38	27 00	-14	-09	-08
Kadoma Cotton Res. Inst.	869 5	3613	1 157*	1 149	18 19	29 53	-08	-06	-05
Kanyemba	767 2	3776		340	15 39	30 20	-75	-50	-41
Kariba Airport	761 6	3839	518	518	16 31	28 53	-60	-41	-34
Karoi	765 2	4073	1 344	1 343	16 50	29 37	08	05	04
Kezi	961 2	4443		1 015	20 55	28 27	-19	-13	-11
Kwekwe	865 3	4539	1 215	1 213	18 56	29 50	-03	-02	-02
Makoholi	879 2	5110		1 204	19 50	30 47	-04	-03	-02
Marondera Res. Stn. Irrig.	877 7	5366	1 632	1 631	18 11	31 28	31	21	17
Masvingo	975 4	5443	1 095	1 094	20 04	30 52	-13	-09	-07
Matopos Sandveld	963 4	5533		1 338	20 24	28 28	07	05	04
Mhondoro	891 1	5726		1 260	18 19	30 36	01	01	00
Mount Darwin	779 3	6143	966	965	16 47	31 35	-23	-16	-13
Mikandi	895 5	6559		1 274	18 43	32 51	02	01	01
Mutoko	781 3	6593	1 245	1 244	17 25	32 13	00	00	00
Mvurwi	789 1	6596		1 481	17 02	30 51	19	13	11
Nyanga Exp. Stn.	889 3	7563		1 878	18 17	32 45	51	35	29
Plumtree	951 2	7726		1 390	20 29	27 48	11	08	06
Rusape	881 4	8060	1 430	1 430	18 32	32 08	15	10	08
Thuli Estate	967 2	9228		765	21 23	28 59	-40	-27	-22
Victoria Falls Airport	843 2	9679	1 062	1 061	18 06	25 51	-15	-11	-09
Wedza	899 1	9743		1 384	18 37	31 34	11	07	06
West Nicholson	969 2	9779	861	860	21 03	29 22	-32	-22	-18
Zaka	979 2	9809		774	20 20	31 28	-39	-27	-22
Zvishavane	971 2	9993		975	20 19	30 04	-23	-15	-13

* = Barometer Reference Level

TABLE 3.1 (cont)

As at 1 Sept 1985

Station	Stn Nr	Alpha Nr	Elevation bar	Elevation screen	Lat S	Long E	Corrections Max	Corrections Min	Corrections Dpt
Associated Stations Published									
Chipinge Exp. Stn.	911 1	1179		985	20 13	32 39	-22	-15	-12
Lusulu	854 1	5040		988	18 04	27 50	-21	-15	-12
Middle Save	989 4	5786		479	20 13	32 23	-63	-43	-35
Mutare Fire. Stn.	887 3	6586		1 113	18 58	32 40	-11	-08	-06
Ncema Dam	966 2	6950		1 070	20 22	29 01	-15	-10	-08
Rukomechi	766 1	7959		503	16 08	29 24	-61	-42	-34
Rupere Mountain	817 1	8013		1 850	18 44	32 50	49	33	27
Rupere Nursery	819 1	8016		1 611	18 43	32 50	29	20	17
Shamva Panmure	778 2	8896		881	17 16	31 37	-30	-21	-17
Triangle Res. Stn.	977 2	9373		416	21 01	31 25	-69	-47	-39
Associated Stations Not Published									
Chimanimaki Pork Pie	897 4	1050			19 47	32 53			
Inyangani Luleche	890 1	3436		869	18 21	32 55	-31	-21	-17
Matopos Nursery	959 1	5499		1 347	20 23	28 30	08	05	04
Muzarabani Estate	772 1	6599		450	16 25	31 01	-65	-45	-37
Nyanga Nut Orchard	823 1	7569		1 845	18 17	32 45			
Nyanyadzi	901 2	7590		530	19 45	32 25	-59	-40	-33
Rattray Arnold Res. Stn.	793 1	7929		1 341	17 40	31 13	07	05	04
Southdown	987 1	9216		747	20 16	32 49	-41	-28	-23

TABLE 3.2

Zimbabwe : Evaporation Stations

HYDR ZONE	REF No.		NAME OF STATION	ALT	LAT	LONG	OPENED	CLOSED	MEAN AN EVAP
				m	° 'S	° 'E			mm
AZ4	AE/	4	Gokwe	1280	18 13	28 56	1958		2114
AG3	AE/	5	Umgusa Dam	1220	20 01	28 32	1959		1894
AZ2	AE/	7	Binga	620	17 37	27 21	1959		2285
AB1	AE/	8	Lupane	1000	18 55	27 47	1959		1950
AG3	AE/	9	Bulawayo Goetz Observatory	1340	20 09	28 37	1959		1969
AG5	AE/	10	Kame Dam	1280	20 08	28 25	1959		1785
AZ1	AE/	13	Victoria Falls Pump Station	884	17 55	25 51	1965		2126
AD	AE/	14	Whange National Park Airport	1070	1844	26 55	1966		
AG4	AE/	15	Tsholotsho Experimental Station	1070	19 52	27 47	1967		2267
AZ1	AE/	16	Vic. Falls Airport Met. Station	1060	18 06	25 51	1967		2023
AN	AE/	17	Mananda Dam	1318	20 13	28 03	1968		1824
BT4	BE/	2	Matopos Research Station Nursery	1340	20 25	28 28	1959		1935
BUZ3	BE/	3	West Nicholson	860	21 04	29 22	1959		1941
BL2	BE/	4	BeitBridge	460	22 13	29 59	1959		2133
BNC	BE/	5	Ncema Dam	1120	20 22	29 00	1960		1858
BT4	BE/	6	Matopos Research Station Sandveld	1340	20 24	28 29	1961		2070
BUZ4	BE/	8	Umzingwane Dam	1100	20 24	28 59	1963		1737
BIK	BE/	9	Inyankuni Dam	1100	20 22	29 07	1963		1835
	BE/	10	Shashi Irrigation Scheme	580					
BB1	BE/	11	Chikwarakwara	244	22 19	31 03	1967	1977	
BIN2	BE/	12	Rixon Dam	1220	20 00	29 12	1969		1873
CH5	CE/	4	Cleveland Dam	1530	17 51	31 09	1958	1974	
CH5	CE/	9	Kutsaga Tobacco Research Station	1470	17 56	31 05	1958		1929
CH4	CE/	11	Lake McIlwaine	1350	17 53	30 46	1958		1612
CZ2	CE/	12	Chirundu Sugar Estate	410	16 01	28 54	1957	1967	
CZ1	CE/	13	Lake Kariba	560	16 32	28 37	1958		2331
CA2	CE/	14	Karoi	1350	16 53	29 37	1958		1827
CUN5	CE/	16	Ngesi Dam	1310	18 43	30 33	1958		1946
CU5	CE/	18	Kadoma Cotton Research Station	1160	18 19	29 54	1958		2171
CUN3	CE/	19	Dutchmans Pool Dam	1710				1979	
CH5	CE/	20	Grasslands Research Station	1690	18 10	31 29	1961		1696
CH4	CE/	21	Harare Agricultural Research Station	1500	17 48	31 03	1965		1662
CUF3	CE/	22	Chibero Agricultural College	1330	18 05	30 40	1968		1915
CH4	CE/	23	Gwebi Agricultural College	1450	17 41	30 51	1969		1830
CH3	CE/	27	Banket Research Station	1240	17 19	30 24	1972		1782
DM7	DE/	2	Henderson Lysimeter	1290	17 35	30 58	1957		1805
DM2	DE/	3	Mount Darwin	960	16 47	31 36	1958		1853
DN1	DE/	4	Mutoko Pump House	1260	17 45	32 13	1958		
DR6	DE/	5	Rhodes Inyanga Orchard	1860	18 18	32 45	1962		1384
DM4	DE/	7	Shamva Panmure	880	17 16	31 37	1972		1794
EO3	EE/	3	Grand Reef	1020	18 58	32 28	1958		1943
ET2	EE/	4	Umshandige Dam	950	20 09	30 48	1958		1529
EL1	EE/	5	Hippo Valley Estate	350	21 10	31 33	1958	1967	
EL6	EE/	6	Gwenoro Dam	1140	19 46	29 53	1958		1823
EUT2	EE/	8	Kyle Dam	1050	20 16	31 03	1962		2060
EO5	EE/	9	Erin Hydro Station	1890	18 23	32 40	1961		1389
EO1	EE/	10	Nyanyadzi Irrigation Scheme	530	19 45	32 25	1961	1977	
ES2	EE/	11	Chisumbanje Research Station	420	20 46	32 13	1961		2074
EUT1	EE/	13	Esquilingwe Weir	460	20 51	31 18	1963		2096
EUT2	EE/	14	Bangala Dam	555	20 42	31 14	1963		1923
EUT3	EE/	15	Makaholi Experimental Station	1189	19 50	30 47	1964		1887
EUT1	EE/	17	Buffalo Range	430	21 01	31 35	1967		1891
EO4	EE/	18	Odzani Dam	1510	18 46	32 43	1973		1624

TABLE 3.2

Zimbabwe : Evaporation Stations

HYDR ZONE	REF No.		NAME OF STATION	ALT	LAT	LONG	OPENED	CLOSED	MEAN AN EVAP
				m	° 'S	° 'E			mm
EUT3	EE/	19	Masvingo PWE Office	1080	20 04	30 49	1972		1786
EC2	EE/	21	Manjirenji Dam	540	20 38	31 37	1975		1863
EUT1	EE/	22	Triagle Research Station	410	21 01	31 25	1970		1536
ES2	EE/	23	Middle Save Met. Station						
FB	FE/	1	Chipinge Meteorological Station	1134	20 12	32 37	1960		1612
FB		4	Chipinge Experimental Farm	1006	20 14	32 39	1963		1449
FI1		7	Rupere Mount John Meikle Res. Stat.	1850	18 43	32 49	1969		1009
FI1		8	Rupere Nursery John Meikle Res. Stat.	1610	18 43	32 50	1969		1101

All stations are equipped with painted and screened U.S. Class A pans.
Mean annual evaporation data upto 1980

TABLE 3.3

Instruments Used at Climate Stations

Parameter	Instrument	Where used
Temperature	Maximum/minimum thermometer	All primary stations
	Thermograph	All primary stations
	Thermometer	All primary stations
Relative humidity	Wet and dry bulb thermometer	All primary stations
	Hydrograph	Most primary stations
Pressure	Barometer	Some stations
	Barograph	Most primary stations
Wind	Wind run anemometer	Some stations
	Wind strength anemometer	Some stations
	Wind vane	Some stations
	Anemographs	Most primary stations
Radiation	Campbell-Stokes sunshine recorder	Most primary stations
	Cloud cover observations	All stations
	Pyranometers	Most primary stations
Rainfall	Daily raingauge	All stations
	Autographic raingauge	All primary stations
	Rate of rainfall recorder	Some stations
Evaporation	Evaporation pan	All stations

Instrument maintenance does not appear to be a major problem, although many instruments are quite old. The period of enforced self-sufficiency during the trade sanctions of the late 1960s and 1970s led to the development of robust instruments and an ability to manufacture the necessary spare parts. Nevertheless, the lack of adequate fencing at some sites which leads to instrument damage by livestock might perhaps be avoided; the occasional damage by elephants would appear hard to prevent.

The DMS has recently received three automatic weather stations, to supplement the existing network. These are currently undergoing trials prior to their deployment around the country.

3.1.3 Equipment Maintenance

In addition to the training given to observers to effect minor repairs to the climatological instruments, the department maintains a repair workshop, staffed by an instrument technician, and a more sophisticated radar and electronics branch run by an electronics engineer, with several radar technicians. The radar branch has its responsibilities beyond the maintenance of simple climatological instruments, and so the task of repair and maintenance lies with the instrument technician, who is also responsible for station inspections.

The retention of trained technicians within the department is something of a problem, as private sector pay is considerably better than that in the public sector. Two technicians are currently being trained.

3.2 The Department of Meteorological Services

3.2.1 Organisation

The department comes under the Ministry of Transport, and is run by a Director, assisted by two Deputy Directors. The structure and staffing levels are shown in Figure 3.2. The branches of closest concern to the present study are advisory services, station management and drought monitoring.

The station management branch is responsible for maintaining the basic data collection systems, and for the processing of the data through standard computer processes.

The advisory services branch is responsible for the dissemination of the collected data, either through routine publications via the library, or in response to specific requests for data. The Agricultural Meteorology section provides a link to the early warning/food security information systems.

The drought monitoring branch is currently being developed with the assistance of internationally funded assistance projects, and is to form a SADCC regional centre for the use of remote sensing for monitoring and early warning of droughts and hence food shortages.

Organisation Structure of Department of Meteorological Services

Figure 3.2

3.2.2 Staffing and Training

The numbers of established staff posts within the DMS is summarised, by grade, in Table 3.4. The basic qualifications of the various grades are given in Table 3.5.

TABLE 3.4

Staff Establishment in the Department of Meteorological Services (as at 1.6.89)

Grade	Number of established posts
Director	1
Deputy Director	2
Chief Meteorologist	3
Principal Meteorologist	1
Meteorological Officer I	20
II	9
III/IV	86
Executive/Stores Officer	9
Senior Clerk/Senior Meteorological Assistant	39
Clerical/Meteorological Assistant	67
Other	18
TOTAL	255

TABLE 3.5

Basic Qualifications by Grade
Department of Meteorological Services

Grade	Minimum qualification
Meteorological Officer I	Degree in mathematics or physics Postgraduate qualification in meteorology (obtained abroad)
Meteorological Officer IV	A-levels, plus 2 year internal course
Meteorological Assistant	O-levels, plus internal training course

Over the last decade a considerable transformation has taken place within the department. This period has seen the departure of most of the experienced meteorologists, and the induction of a new generation. This process has been considerably assisted by the WMO project ZIM/81/006 to rehabilitate the service, and to assist with training. A large number of fellowships were provided to allow the younger generation of meteorologists to study abroad, and two trainers were provided to run a two-year internal course to train recruits up to the WMO Class II standard, and strengthen the observer training to Class IV standard. With the end of the WMO project the trainers left, but an officer is currently undergoing training to become a trainer and re-run the course.

Recruitment into the department is straightforward, with the department free to carry out its own selection of candidates for all but the lower grades of staff. There is no shortage of applicants, as the Zimbabwe economy is as yet unable to absorb all qualified school leavers and graduates, and a considerable unemployment problem exists. Retention of recruited staff is also reasonably good, largely because of the specialised nature of the training given, and the lack of demand for such skills in the private sector. Those areas where more commercial skills are taught, such as data processors or electronic technicians, loss rates are much higher, and it is proving very difficult to retain trained staff. This is largely because of the considerable disparity of the rates of pay in public and private sectors.

3.3 Rainfall Database

3.3.1 Rainfall Data Handling

The daily read raingauge data are recorded in 'points' (tenths of a millimetre) and sent to the DMS headquarters on a monthly basis. The observers complete a standard form, with a layout shown in Figure 3.3, and mail it to the DMS on the first of the following month, using a 'postage prepaid' arrangement. Upon receipt of the data, the rainfall section note that the data have been received, and make a preliminary check of the quality of the data, by checking it against data from reliable adjacent gauges. If no questions are raised by this check, the information is passed for entry on to the computer system. If data have not been received by mid-month, or the quality of data sent has been questioned, reminders are mailed to the observers to send a further copy of the data, or to explain the difficulties experienced during the previous month.

There is a need for more up-to-date rainfall data during the wet season, and a network of some 90 stations or so are used to collect day-by-day data. This network, shown in Figure 3.4, is contacted by telephone or radio to assemble the information. Just under half of the stations used are the department's own climate stations.

Computer processing of data takes place on the department's in-house Perkins-Elmer 7/32 mini-computer system that was installed in 1979, and currently has severe operational problems due to limited availability of spare parts. Data entry is on to floppy disk on stand-alone machines, of which only two are working. The system configuration includes:

Figure 3.3

Standard Rainfall Reporting Form

MS 304

DEPARTMENT OF METEOROLOGICAL SERVICES

Station _____ Month of _____, 19___ № 052544

PLEASE—1. Enter the rainfall reading taken at, or about, 8 a.m. against *yesterday's date*.
2. Make an entry for every day on which any measurable rain has fallen.
3. Report all occasions of HAIL (including size).

Year				Month		Catchment		Station Position								CD
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	9															
Please enter year and month above						3	4	11	12	13	14	15	16	17	18	6

Card Columns—

Date	Rainfall Number of points	Time rain began	If only one storm, time rain ceased	NOTES ON UNUSUAL WEATHER Please note the occurrence of— hail, squalls, exceptionally heavy rain, severe thunder, floods, etc.
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Total		Number of raindays with 3 points of rain or more.		

If no rain has fallen throughout the month, write NIL across the form.
Please post completed returns as promptly as possible.

Postal address _____

Observer's signature _____

Network of Daily Reporting Raingauges

Figure 3.4

central processor of 384 kB RAM, with 3 x 20 MB fixed hard disks
3 x 20 MB removable hard disks
unit to read in from 7 inch diskette
tape reader
graphics unit
3 terminals
1 medium speed (300 lines per minute) Centronics 353 printer.

Magnetic tapes are mostly 2 400 inch format with a data density of 1 600 bpi. Approximately 600 tapes have been used to compile the data archive.

Software used on the computer was all developed within the department. It currently matches the department's procedures well, and staff are familiar with its use. There are no reported problems with the software.

Following verification of data entered on to the floppy disk, the data are read into the main computer, sorted on the hard disk, and output on to a working magnetic tape.

Printouts of daily data for a group of gauges located in a similar environment are used as a cross-check on the data quality by providing a visual cross-check on consistency and correlation of the reported daily catches. Problems such as booking catches against the wrong day, recording too few raindays or rounding the measured catches to an integer number of millimetres are then noted. The observer will usually be informed of these comments, and the data will be rated as:

A or good
B or monthly data only reliable (as readings apparently not taken every day)
C or unreliable

Where necessary the data will be corrected before further processing.

After correction, the monthly printouts are bound each year, to provide a permanent and visual reference book of all rainfall in the country.

Each year the monthly tapes are sorted and merged to give annual tapes. From these the Annual Rainfall Report is printed, containing monthly and annual totals for selected stations and catchment monthly means and annual totals (all stations used), a copy of whcih is sent to the Government Printer for printing. Other analyses, such as five-day totals which have been found to be a valuable research tool in analysing the season's rainfall and relating to agricultural crop-growth statistics, are produced routinely.

There is a weekly back-up system to safe-guard against loss of records due to power failures or operator error.

When Hollerith machines were first introduced in 1962, much effort was put into the punching of past records on to computer cards, and some types of climatological data were punched back to 1951, as well as rainfall to start of records. Some back records have been put on to tape, duly editing out Hollerith control overpunches (which caused havoc when read by a computer), allowing the DMS access to a longer series of homogeneous data.

Great care is presently taken over the storage of data. In addition to the computer printouts, that have become the standard reference material for assistance with data requests, the original data returns are carefully preserved. The magnetic tape archive for the computer is copied on a routine basis, and tapes held at a number of locations.

Currently, there is a significant backlog in the processing of rainfall data, that has developed largely through technical problems with some of the data punching machines, and reliability problems with the computer, and the increasing frequency of breakdowns. It would appear that the daily read raingauge data are accorded lower priority than the climate data when it comes to computer processing. At present data for 1986/87 are being processed.

Problems with the computer have led to plans to obtain a replacement. Negotiations with the British Government over the supply of a replacement machine had reached an advanced stage, and delivery has been expected for a long time. A WMO project (number ZIM/86/031) to develop an agrometeorological database is currently under way within the department, with a data processing expert and an instrumentation repair and maintenance expert active at the time of our visit. The WMO has now decided to supply the mini-computer as part of its project, rather than continue to await the British machine. The new mini-computer will run a number of terminals allowing direct access to the system, one of which is planned to have the CLICOM data processing package, and so will be used for the basic data entry and quality control procedures. Direct on-line disk storage will be far greater than the existing system, allowing much more rapid access to historic data. A tape streamer will also form part of the configuration, to facilitate transfer of historic data currently on the Perkins-Elmer system. It is also hoped to find a facility to read in the estimated 9 million data cards prepared for the earlier generation Hollerith machines, and output these data on to magnetic tape, for subsequent loading on to the new system.

The WMO project also includes a major training element, with four officers currently undertaking training in computer programming.

It is hoped that the new computer system will eventually be linked with the FAO remote sensing databases generated by their DIANA programme, and to be established within the new SADCC regional drought monitoring section within the department.

New sets of software and data handling procedures are currently being developed by the WMO expert, based on experience gained on a similar project implemented in Nairobi for the Kenya Meteorological Department.

3.3.2 Rainfall Data Quality

The use of locally manufactured raingauges, sited with the use of only written instructions from the DMS and no system of inspecting installations all suggest that there may be problems with data quality. That all tests suggest that the quality is uniformly good in the principal stations, and most of the minor ones, shows remarkable success for the department whilst equipped with minimal resources. Reasons for the sustained good quality of data might be:

- the use of well motivated observers, aware of the value and importance of good quality data;
- careful quality control procedures on receipt of data;
- high quality of locally manufactured raingauges;
- careful selection of potential observers and gauge locations.

Tests were carried out on the consistency of rainfall data collected for 17 stations, listed in Table 3.6, for the periods noted. In some cases the record obtained was a composite of a number of gauge records from within an area of the country. The use of such composite data sets is a standard procedure in Zimbabwe, and used to incorporate the earliest data available for a town into the more modern data returns. Our analysis has shown that this technique does not create any internal inconsistencies within the compiled data record, thus validating subsequent use of the extended records, in any statistical analyses.

The present day backlog in the processing of daily rainfall data may have some effect on the quality of recent data, as the feedback of information (from the checking of the compiled data set on the computer) to the observer becomes more difficult when a three year time lag is introduced. It is consequently hoped that the acquisition of the new computer will allow this backlog of work to be rapidly made up.

It is understood that the dislocation caused by the liberation war and independence, with the consequent large-scale movement of civil servants and farmers, had a deleterious affect on data quality. The network size certainly reduced sharply during this period as observers moved away, with the reporting network shrinking by over 30%. In many cases, especially with gauges within government institutions, the old observers were replaced by less skilled and less conscientious new ones. However, the situation is now improving, with measures taken such as the Ministry of Agriculture training its new field officers in the art of reading raingauges.

3.3.3 Rainfall Data Gaps

The areal distribution of raingauges is shown in Figure 3.5. The areas where DMS is keen to increase these network densities are in the Kalahari and Sebungwe catchments, but these efforts are hampered by a lack of suitable observers in these areas. The department is now looking towards new devices, such as rainfall loggers, to provide information in areas without observers, but these devices will require regular visits, thus needing access roads, vehicles and personnel to make the visits. Some monthly read

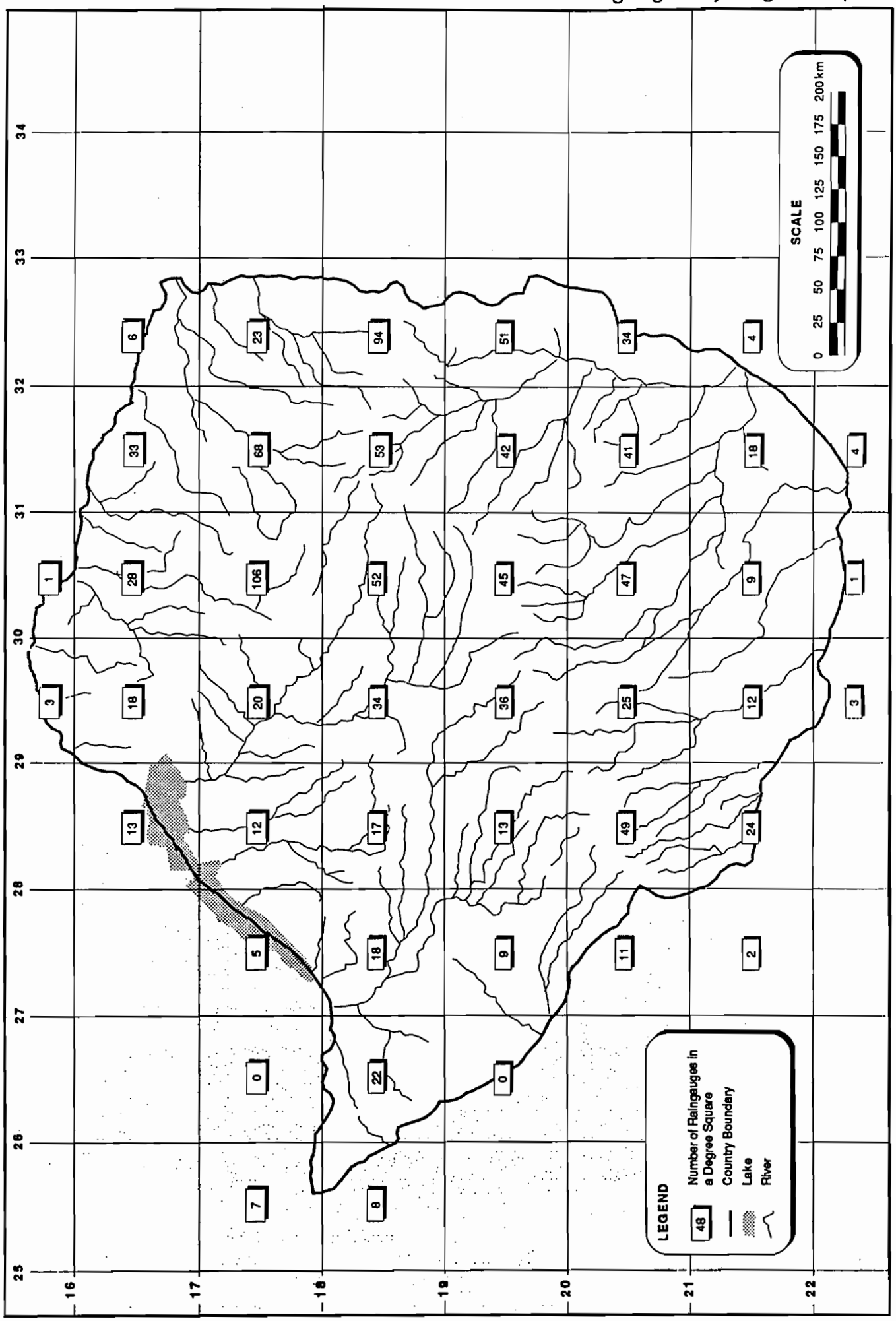
TABLE 3.6

Rainfall Data Collected for Consistency Analyses

Name of station	Area	Data from → to
Beit bridge	Limpopo	1946 - 1989
Bulawayo Goetz	Guaai	1896 - 1989
Chinhoyi	Hunyani	1901 - 1989
Chipinge	Eastern Border	1912 - 1989
Chivhu	Sanyanti	1904 - 1989
Gokwe	Sebungwe	1912 - 1989
Guruve	Hunyani	1904 - 1989
Thornbill*	Guaai Gweni	1898 - 1989
Harare	Hunyani	1890 - 1989
Huange	Guaai	1909 - 1989
Inyanga Dams	Mazde Ruenya	1931 - 1989
Kadoma	Sanyanti	1908 - 1989
Masvingo	Lundi	1898 - 1989
Mount Darwin	Mazoe Ruenya	1901 - 1989
Mutare	Sabai	1898 - 1989
Mutoko	Mazoe Ruenya	1908 - 1989
Victoria Falls*	Guaai	1904 - 1989

Figure 3.5

Number of Raingauges by Degree Square



raingauges are already deployed in places such as the Hwange National Park, but data interruptions occur whenever the budget available is insufficient to meet the fuel costs for a vehicle to take an observer to make the monthly reading.

The current rainfall database is remarkably free from minor interruptions to the flow of data, with the majority of gauges having virtually complete records from opening to the present day (or the closing of the gauge). This achievement may be partly due to the efficiency of the local postal service, but must be largely due to the conscientiousness of the department and its observers.

3.3.4 Rainfall Data Users

The users of rainfall data are varied. The annual summaries printed and sold by the Government Stationer, are also distributed to various government departments by the library. The department has also prepared 'Mean Rainfall in Rhodesia' in 1977 as Supplement 8 of the 'Southern Rhodesia Rainfall Handbook', which has been widely distributed. Actual monthly and annual rainfall data have also been published in a series of booklets, some of which are still available.

Users of data who contact the department directly include agriculturalists (often officers of the Ministry of Agriculture) the MEWRD (especially the hydrology branch), students, consulting engineers and similar groups. These enquiries are usually satisfied by photocopying some of the 'Master' computer printouts that are used for reference within the rainfall section, or transcribing by hand specific data from the summary printouts, or from data returns not yet input to the computer. The service provided sometimes extends to the plotting of isohyets and computation of average areal rainfall totals. Data enquiries are usually handled promptly, but it is rare for the computer to be used to provide the data requested. This is partly due to other demands on the computer, but partly due to the rather clumsy procedures to be followed to abstract the record for a single station from an archiving system structured by years. A single station record will lie on several tapes, making considerable use of the tape drive facility. It is much easier to photocopy summarises generated earlier, covering the period up to 1982/83, with hand-written extension to 1985/86 and even more recent data.

The abstraction of other data, such as the maximum recorded daily rainfall in each year for a station, is done by hand. The value is identified in the annual summary for each station, and so is quick to find but the present data handling software does not prepare a separate datafile containing this type of information.

3.4 Climate Data

3.4.1 Climate Data Handling

The observer employed by DMS at all the primary climate stations has considerable responsibility for the primary analysis of the climatological data he collects. In addition to the observations made six times a day, the observer's duties include:

- reduction of chart records by taking off values from the chart at hourly or two hourly intervals;
- computation of mean daily values from these taking-off sheets;
- correction of observations to allow for instrument calibration;
- computation relative humidity;
- calculation of corrections of barometric readings;
- compiling daily reports to headquarters;
- transcribing data on to coding forms;
- computing monthly means at the end of the month, and sending all forms, charts and the daily register to headquarters.

For this he is equipped with a solar-powered calculator.

Upon receipt of the observer's return in the data processing section, the observer's calculations are checked and any errors corrected. The summary forms are then passed for punching on to diskettes and verification of the data entry accuracy. The diskettes are then read into the Perkins-Elmer computer and the usual climatological means, totals and extremes are derived. About a month after receipt of data, the computer prints a climatological summary which is sent to the Government Printer for printing. Bulk supplies may be returned in a week or a month, with library staff undertaking further distribution. All incoming data are committed to the computer and each month the corrected working data are transferred from the working disks to storage tape and archived. Thus, the stored data include observations for all times of observation, hourly or two-hourly records of pressure, temperature, humidity, wind; wetbulb and dewpoint for a few stations; upper wind directions and speeds for about 10 stations; and radiosonde temperatures, humidities and winds for two stations. Processing is expected to be completed within a month, so that output remains up-to-date, approximately two months after the month in which the observations were made.

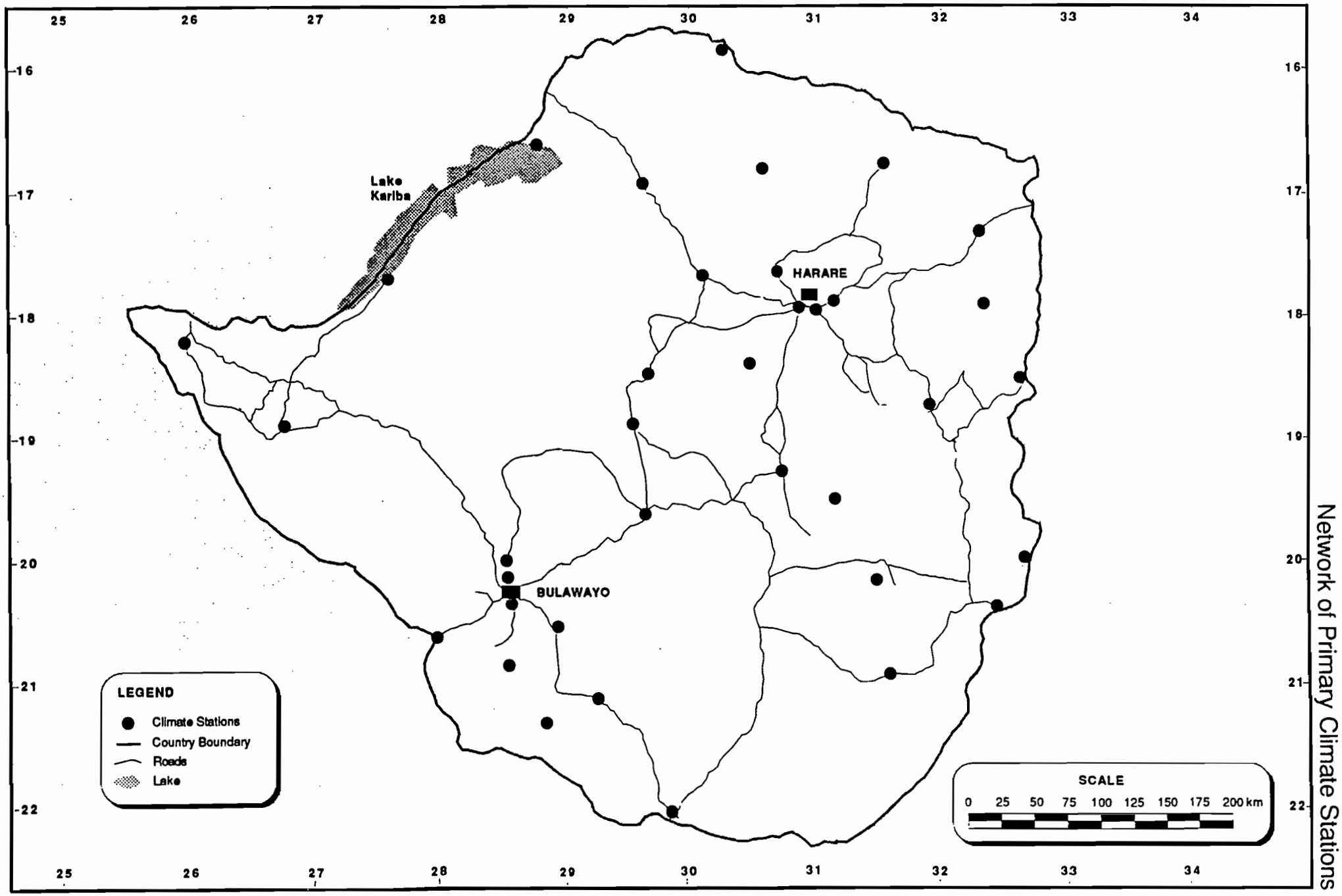
Further analyses of such data, to meet enquiries from other departments, industry, the public, etc, or for preparing handbooks or reference books on some meteorological parameters, are undertaken by members of the advisory services branch.

3.4.2 Climate Data Quality

The standard of maintenance of the climate stations and instruments, the training of observers and the data quality control procedures are very impressive. The quality of data from the primary climate stations is, as a consequence, likely to be very good indeed.

3.4.3 Climate Data Gaps

The areal coverage of the primary climate stations is good (see Figure 3.6), with the areas poorly represented limited to parts of the upper Sabi and Sebungwe catchments.



Network of Primary Climate Stations

Figure 3.6

Average station density of about 12 stations per 10^5 km^2 compares well with the recommended minimum density of 3 stations per 10^5 km^2 (UNESCO/WMO, 1988).

The deployment of the three automatic weather stations obtained by the department will further improve coverage of the country.

There is no problem of temporal gaps in the climate data, with an impressively complete, lengthy series of data available for most of the primary stations.

3.4.4 Users of Climate Data

Users of data come from the same group of users identified for the rainfall data, augmented by recent use of agrometeorological parameters by the Food Security Project of FAO and SADCC.

Use of the principal hydrological parameters derived from observations made at climate stations, rainfall intensity data and evaporation estimates, is at present largely limited to use as published analyses in the 'Climate Handbook of Zimbabwe' (1981) and 'Rainfall Intensity in Rhodesia' (1977). Access to the original data for specific application to any particular study is made more difficult by problems with the computer, and such basic analysis is discouraged by the quality of the published analyses. The opportunity presented by the acquisition of the new computer system should be taken to improve data retrieval facilities, and allow more specific analysis of data whenever required.

Of greatest concern, perhaps, is the tradition within Zimbabwe to rely on evaporation pans as the best predictor of evaporation rates from reservoirs or evapotranspiration rates from crops. This tradition has led to familiarity with the technique, and presumably familiarity with its drawbacks, inaccuracies and appropriate 'pan factors' to be applied to the data to derive the required estimates. Once again, it is suggested that the new computer might be a suitable opportunity to spread more widely within Zimbabwe the use of Penman evaporation estimates employed throughout most of the world as a more reliable predictor of evaporation rates. An opportunity might also be taken to initiate a major research project to reprocess historic climate data, and determine suitable parameters for Zimbabwe for the empirical relationships of the Penman equation, possibly with additional instrumentation to record actual evaporative losses.

CHAPTER 4

SURFACE WATER

4.1 Hydrometric Data Collection

4.1.1 Hydrometric Network

Zimbabwe has been divided into six main drainage basins termed hydrological zones. These are:

Zone A	-	Most of this zone drains north-west into the Zambezi. The remainder drains into Botswana via the Nata and Gwabazabuya Rivers
Zone B	-	Drains into the Limpopo River
Zone C	-	Drains north into the Zambezi downstream of Kariba dam
Zone D	-	Drains north-east into the Zambezi
Zone E	-	The Save/Runde river system which drains into Mozambique
Zone F	-	A small high-rainfall area on the eastern slopes of the eastern highlands which drains into Mozambique.

These six zones are divided into 151 sub-zones.

The hydrometric stations are of nine different types, listed below.

(i) Recorder Stations

Over 500 automatic river flow water level recorders have been installed in Zimbabwe by the hydrological branch. These are listed in Appendix D.

For one reason or another (flooding by dams constructed subsequently, damage by floods, unreliability of calibration etc) many have been closed down and 310 are now in operation. These stations are numbered by hydrological zone - thus station Nr C70 (termed Zone Reference Number) is located in Hydro Zone C. The location of these stations was usually determined by the need for:

- flow records on rivers where many water rights have been granted;
- accumulating runoff data for possible major dam sites;
- filling in geographical information gaps.

The stations in the tables are listed by hydrological sub-zone.

(ii) Gauge Post Stations

427 gauge post stations on rivers and dams were opened. These stations are read daily, weekly or in some cases monthly. They were installed in order to:

- record the dry season flow which does not vary significantly on a daily basis
- record the water levels in major dams (the hydrological branch publishes, weekly during the flood season and, monthly during the dry season, a state of dams report for 47 of these major dams in the country).
- these stations have the suffix GP, thus EGP100 is a gauge post station in Hydro Zone E.

(iii) Canal Recorders

87 automatic water level recorder stations were installed on canals to record the discharge at various water supply schemes. These are now in operation. These stations have the suffix C thus, E/C45 is a canal recorder in Zone E.

(iv) Zambezi Seiche Recorders

Four water level recorders have been installed on Kariba dam to monitor the water levels at four points along Lake Kariba - these are Kariba dam, Sebungwe, Mlibizi and Binga. The seiches on Lake Kariba have been analysed by Ward (1979) over the period 1962 to 1976.

(v) Meter Stations

In addition there are six stations equipped with water meters. The suffix is /M.

(vi) Underground Water Stations

There are 14 stations in operation in hydro Zones A and C where the water levels in boreholes or wells is recorded continuously or read at fixed intervals. These stations have the suffix /BH for boreholes or /WT for wells.

(vii) Evaporation Stations

There are 55 evaporation stations in the country and these are listed in Table 3.2. These are maintained by the Department of Meteorological Services and the figures are published by the hydrological branch of MEWRD. US Class A evaporation pans, screened and painted are used. The screening is to prevent birds from drinking and polluting the water.

(viii) Water Quality Monitoring Stations

There are 96 water quality monitoring stations, listed in Table 4.1.

(ix) Sediment Transport Monitoring Stations

There are 21 sediment transport monitoring stations. These are listed in Table 4.2.

The areal distribution of the principal stations, the recorder stations, is shown in Figure 4.1.

The principal driving force behind the development of this network of recorder stations has been the responsibility of the hydrologist to provide evidence in the water courts, which were set up to ensure that abstraction licences granted would not substantially affect the requirements for primary use downstream. This requirement was included in the 1914 Water Act, which led to the establishment of the post of hydrographic engineer within the Division of Irrigation in the 1920s, and the establishment of early gauging stations, some of which are still in use. The network of stations has steadily expanded since then, in step with the development of dams on the nation's rivers and the growing need to ever more accurately determine the residual flows in the rivers. The widespread use of gauging structures has come about partly as an adjunct to the construction of diversion weirs across the rivers and partly to allow the rapid acquisition of accurate streamflow estimates without the extensive fieldwork necessary to establish a rating relationship on a natural river section. This policy is similar to that applied in the RSA where dubions results have been obtained at some sites due to sediment deposition and scour behind structures. The current network is used to produce a very wide range of streamflow data with the absolute minimum of fieldwork.

Field data collection is largely limited to changing charts at the automatic water level recorders located at the principal stations, and the taking of occasional water levels at the secondary stations. Some 100 observers or so are employed by the branch to do this work, and when an observer's duties cover more than one station a bicycle is provided to allow him to reach the other stations. Distances of 70 km or so are travelled in this way.

The water level recorders used are mostly made by Kent Instruments, with a seven-day clock and a variable recording range of 1, 3 or 6 m. Other instruments used are 'H' type recorders (developed locally and named after Mr Holdstock, an instrument technician of the hydrology branch) and Fisher and Price punched paper tape recorders.

4.1.2 Methods of Discharge Measurement

In most of the hydrometric stations, the flow measuring device will be a standard V-notch, a rectangular notch, broadcrest weir, flume, or combination of these. In cases where a combination of notches is used, these notches are separated of 0.5 m wide x 3 m long division walls to suppress any possible contraction

TABLE 4.1 ZIMBABWE : WATER QUALITY MONITORING STATIONS

STATION No.	RIVER	GRID REF.	TYPE	REMARKS
AC1	Canal (Alsleby Farm)	PH 635 819	WPC	
AR1	Gweru	QJ 964 478	WPC	
AR10	Dollar's Spruit	QJ 980 451	WPC	
AR11	Curarang's Creek	QJ 911 435	WPC	
AR14	Bulawayo Spruit	PH 643 722	WPC	
AR15	Bulawayo Spruit	PH 628 710	WPC	
AR16	Bulawayo Spruit	PH 628 715	WPC	
AR17	Trib Matsheumhlope	PH 662 699	WPC	
AR18	Umguza	PH 694 779	WQM	
AR19	Umguza	PH 594 863	WPC	G/W A24
AR2	Umguza	PH 676 794	WQM	G/W A51
AR20	Matsheumhlope	PH 693 659	WQM	Gauge post AGP24
AR21	Trib. Umguza	PH 622 827	WPC	
AR23	Trib. Umguza	PH 645 813	WPC	
AR24	Trib. Umguza	PH 629 814	WPC	
AR25	Trib. Ngame	QJ 890 433	WPC	
AR26	Matsheumhlope	PH 694 631	WQM	
AR27	Lukwe	PH 565 775	WPC	
AR28	Mpopame	PH 556 737	WPC	
AR29	Bulawayo Spruit	PH 654 735	WPC	
AR3	Umguza	PH 622 828	WPC	G/W A50
AR30	Ngame	QJ 821 423	WPC	
AR4	Umguza	PH 983 930	WPC	
AR5	Bulawayo Spruit	PH 670 765	WPC	
AR6	Matsheumhlope	PH 673 762	WPC	
AR7	Gweru	QJ 924 508	WPC	
AR8	6-Mile Spruit	QJ 896 537	WPC	
AR9	Gweru	QJ 986 465	WPC	
BR7	Limpopo			
CC1	Seke SDIP 1 (Imbgwa Farm)			
CC1	Canal (Imbgwa Farm)	TR 880 050	WPC	
CC2	Seke SDIP 4 (Imbgwa Farm)			
CC2	Canal (Imbgwa Farm)	TR 874 047	WPC	
CC3	Seke SDIP 5 (Imbgwa Farm)			
CC3	Canal (Imbgwa Farm)	TR 874 047	WPC	
CC4	Workington			
CR1	Trib. Munyati	QK 958 216	WPC	
CR10	Kwe Kwe River	QJ 986 830	WQM	
CR11	Kwe Kwe River	RJ 079 674	WQM	
CR12	Seke 2			
CR13	Seke 3			
CR14	Seke 4			
CR15	Nyanpfupfu			
CR18	Nyatsime	TR 946 012	WQM	G/W C23
CR2	Trib. Munyati	QK 979 198	WPC	
CR20	Ruwa	UR 036 159	WQM	G/W C82
CR21	Manyame	UR 041 093	WQM	G/W C81

STATION No.	RIVER	GRID REF.	TYPE	REMARKS
CR24	Mukuvisi	TR 776 144	WQM	G/W C22
CR25	Marimba	TR 736 188	WQM	G/W C24
CR26	Castle Rock Stream	TR 768 173	WPC	
CR28	Manyame	TR 631 226	WQM	G/W C17
CR29	Muzururu River	TR 516 329	WQM	G/W C79
CR30	Gwebi	TR 455 496	WQM	G/W C83
CR4	Trib. Munyati	QK 985 317	WPC	
CR43	Trib. Sebakwe	QK 987 100	WPC	
CR46	Marimba	TR 884 294	WQM	
CR47	Mukuvisi	TR 846 175	WPC	
CR48	Mukuvisi	TR 889 212	WPC	
CR49	Mukuvisi	TR 954 271	WPC	
CR5	Sebakwe	QK 995 124	WQM	Weir C29
CR50	Mukuvisi	UR 028 259	WQM	G/W C28
CR52	Marimba	TR 833 254	WPC	
CR53	Marimba/8-Mile Spruit	TR 775 258	WPC	
CR54	Trib. Chavarayi River	UR 078 243	WPC	
CR55	Chavarayi	UR 085 241	WPC	
CR56	Ruwa	UR 108 224	WQM	
CR57	Marimba/8-Mile Spruit	TR 815 327	WPC	
CR58	Munwa Huka River	TR 628 234	WPC	
CR59	Manyame	TR 042 113	WQM	G/W C3
CR6	Trib. Munyati	QK 984 198	WPC	
CR60	Manyame	TR 351 280	WQM	G/W C89
CR62	Trib. Munyati	QK 966 199	WPC	
CR63	Sebakwe	QK 979 128	WQM	Flume C36
CR64	Trib. Sebakwe	QK 991 119	WPC	
CR66	Kwe Kwe River	QJ 887 963	WPC	
CR68	Kwe Kwe River	QJ 892 941	WQM	G/W C9
CR70	Trib. Kwe Kwe	QJ 914 958	WPC	
ER1	Mucheke	TN 720 791	WQM	
ER10	Sakubva	VQ 567 002	WPC	
ER11	Sakubva	VP 558 982	WPC	
ER12	Sakubva		WPC	
ER13	Dora	VQ 607 945	WQM	
ER14	Trib. Lyndhurst River	QJ 984 395	WPC	
ER15	Umzinto	QJ 978 402	WPC	
ER16	Runde	QJ 936 409	WPC	
ER17	Save River	VN 194 092	WQM	
ER2	Umshagashi	TN 742 807	WQM	G/W E2
ER3	Umshagashi	TN 760 763	WQM	G/W E69
ER4	Trib. Mashava River	TN 746 694	WPC	
ER5	Mutare	VQ 570 101	WQM	
ER6	Nyapfumbi	VQ 649 022	WQM	
ER7	Nyapfumbi	VQ 625 014	WPC	
ER8	Sakubva	VQ 636 018	WQM	
ER9	Trib. Sakubva River	VQ 634 005	WPC	

NOTES
AR denotes a river sampling station in Hydrological Zone A
BR denotes a river sampling station in Hydrological Zone B
etc.
AC denotes a canal sampling station in Hydrological Zone A
BC denotes a canal sampling station in Hydrological Zone B
etc.
WPC: Water Pollution Control
WQM: Water Quality Monitoring
SDIP:Sewage Disposal Islet Pond

Figure 4.1

Location of Flow Recorder Stations

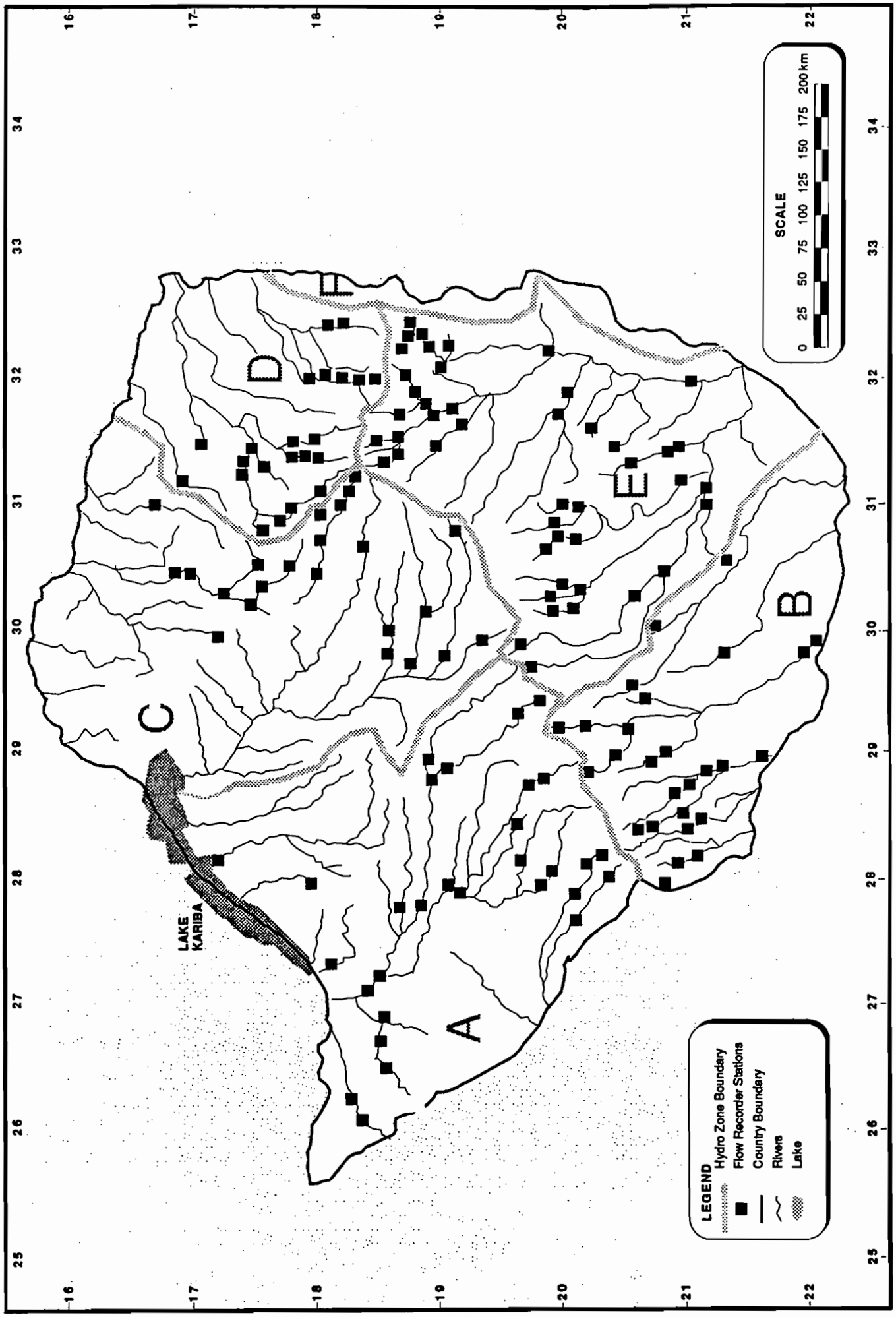


TABLE 4.2

Sediment Sampling Stations

HYDR ZONE	REF NO.	RIVER : NAME	LAT. S	LONG. E	PERIOD	
AG1	A68	Gwayi D/S Bembesi confluence	19 01	27 44	1976-1979	
AS4	A32	Shangani River	18 55	28 47	1975-1976	
BL2	B35	Limpopo Beitbridge	22 13	29 00	1976-1979	
CH5	C21	Manyame:Hunyani Poort U/S G/W	17 58	30 54	1976-1988	
CUS	C48	Umsweswe:Claw Dam D/S G/W	18 27	29 52	1976-1985	
CUS	C87	Umsweswe:Claw Dam U/S G/W	18 27	29 59	1976-1988	
DM3	D42	Umfurudzi:Eben Dam U/S G/W	17 10	31 30	1986-1988	
DM3	D43	Umfurudzi:Eben Dam D/S G/W	17 09	31 32	1986-1988	
DM4	D41	Mazowe:Lions Den G/W	17 17	31 33	1981-1988	
DUR1	D48	Wengi:Mwenje Dam U/S Flume	17 15	30 57	1986-1988	*
DUR1	D49	Sawi:Mwenje Dam U/S G/W	17 10	30 59	1986-1988	*
DUR1	D50	Nyamasanga:Mwenje Dam U/S Fl.	17 13	30 59	1986-1988	*
DUR1	D61	Wengi:Mwenje Dam Outlet Flume	17 16	31 02	1986-1988	*
EM1	E19	Macheke:Condo U/S G/W	18 55	31 57	1981-1988	
EM2	E136	Lesapi:Lesapi Dam U/S G/W	18 33	32 07	1979-1981	
EO1	E130	Odzi:Odzi Gorge G/W	19 46	32 24	1981-1988	
EO4	E61	Odzi:Odzi Bridge C/S	18 55	32 25	1976-1988	
ES1	E149	Save Causeway	21 00	32 10	1979-1988	
ES4	E118	Devure:Chisurgwe Flume	19 54	32 08	1981-1988	
ES6	E161	Save Nyamasanga G/W	19 42	32 17	1987-1988	
ES8	E21	Save:Condo Dam Site G/W	19 13	32 01	1981-1988	

* Sampling only when Mwenje Dam is spilling.

in flow over the notches (see Plate 1). There are a few stations (usually labelled C/S for control section) where the calibration is carried out by current meter, radio isotope, or other method of gauging. Problems can occur when one extrapolates out of the range of the standard devices in high flood and the specifications for accurate calibration are exceeded. A sketch of a typical gauging weir is given in Figure 4.2.

Control section gauges account for about 4% of those listed in Appendix D, and only 2% of the stations presently in use.

The branch is believed to possess two or three current meters, but none of them are regularly used, and there is, at present, no proposal to recommence current metering within the country.

The hydrology branch was near the forefront of technology in the mid-1960s with the development gauging techniques using radioactive tracers. Much of this pioneering work continues, with artificial gamma-emitting radio-tracers still being used to measure streamflows of up to 50 m^3/s with an accuracy of ±5% (Wurzel, 1987). Tritium has also been used to gauge floods as large as 3 000 m^3/s (Wurzel and Ward, 1982).

Recently, Hydraulics Research Ltd has been engaged on an ODA-funded project to re-examine discharge measurement techniques in Zimbabwe, with particular reference to the accuracy of the theoretical ratings used for gauging structures and to the utility of using natural vegetable horseradish (a chemi-luminescent compound) as a tracer in dilution gauging.

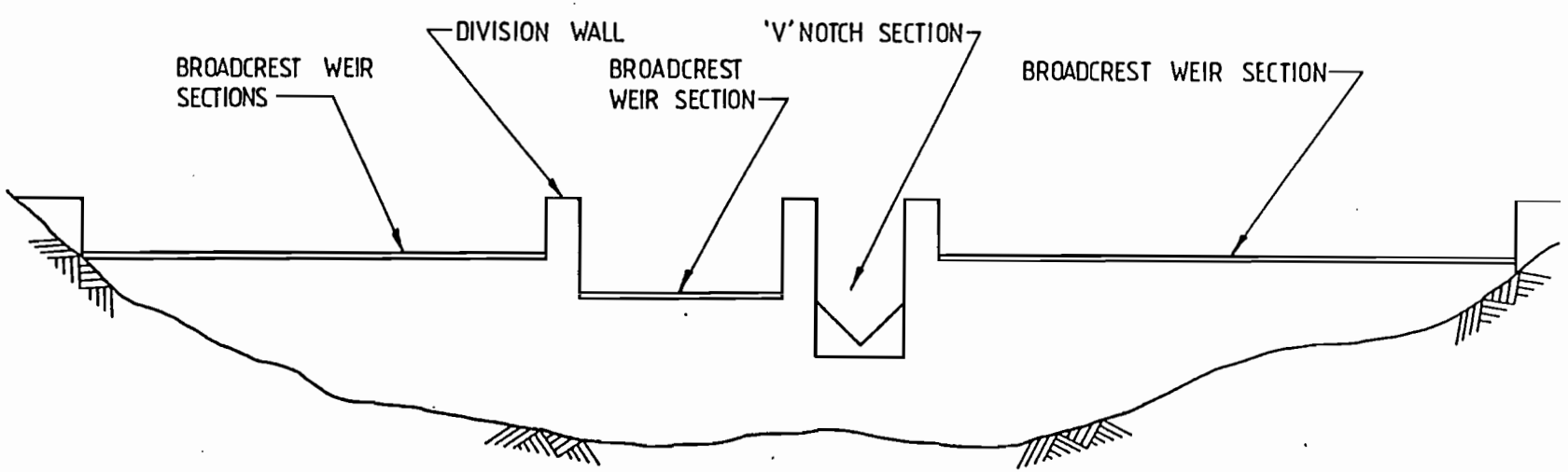
The use of horseradish as a tracer was pioneered in the medical field, with the development of techniques to detect the vegetable at very low concentrations. The technique was easily transferable, as the raw material is cheap to buy, and being a natural substance is unlikely to have significant side effects or pollution potential. Unfortunately, early work has shown that the material reacts with the river water on dilution, decaying in concentration with time. Work still continues to try to get around this problem, but the initial optimism has waned.

4.1.3 Equipment and Maintenance

The bulk of equipment owned by the hydrological branch is made up of water levels recorders, with over 300 recorders deployed in the field. Maintenance of these is largely carried out in the branch's own workshops in Cranborne, Harare, or the subsidiary workshops at Bulawayo, Masvingo and Mutare. The in-house capabilities in this direction are comprehensive, possibly due to problems in obtaining spare parts during the period of trade sanctions. At present, spares for both the Kent and 'H' recorders are made locally, and spare clocks and complete instruments are also held in stock.

Plate 1

A Typical Gauging Weir



SOURCE : INTERCONSULT, 1985

Figure 4.2
Sketch of Commonly Used Gauging Weir

Site maintenance of the gauging structures is also required, and this is proving to be more of a problem, caused largely by a shortage of funds and transport. Hydrologists in the section are aware of the siltation of some of the structures, and the growth of rushes upstream affecting the hydraulic performance, but are unable to obtain the necessary funds to rectify such problems. Repairs to structures, such as the replacement of flume floors eroded by floods, takes place at perhaps 5% of structures per year.

4.2 Organisation of the Hydrological Branch

4.2.1 Organisational Structure

The hydrological branch forms part of the planning division of the Water Resources and Development Department of the Ministry of Energy and Water Resources Development (MEWRD). The organisation of the branch is shown in Figure 4.3. The branch is led by the Chief Hydrological Engineer, assisted by the Deputy Chief Hydrological Engineer.

Activities are divided into two parts - data collection and data processing. Data collection is the responsibility of regional engineers (nominally for Mashonaland, Matabeleland, Manicaland and Masvingo but there are insufficient establishment posts for all these to be filled). Data processing is carried out in the branch's head office, controlled by a data processing engineer.

4.2.2 Staffing and Training

The establishment of the branch is summarised by grade in Table 4.3. There are, in addition, four posts of Civil Engineer V held against other branches. The basic qualifications of the various grades are given in Table 4.4.

The civil engineers and technicians staffing the hydrological branch do not have any formal hydrological training and are posted to the branch as and when required. Such expertise as they acquire is picked up in the branch. It is recommended that they should become hydrological specialists and to this end the engineers could be sent to suitable universities to acquire MSc Hydrology qualifications (these courses are not available at the University of Zimbabwe).

The hydrological branch has never been a popular choice for engineers or technicians. On the whole, they prefer to engage in work in the designs branch which they regard as 'true' engineering. Provincial work is the second choice open to them and their last choice is usually the hydrological branch. Working in hydrology, an engineer is less likely to be exposed to all-round civil engineering experience. Neither does a hydrologist rate highly his chances of gaining rapid promotion in other fields of engineering on the merits of his performance in hydrology: any expertise he may acquire in this field will not assist him in gaining promotion in 'main-line' civil engineering.

TABLE 4.3

Staff Establishment in the Hydrological Branch (as at 1.7.89)

Grade		Number of established posts	Number of filled posts
Chief Hydrological Engineer		1	1
Deputy Chief Hydrological Engineer		1	1
Civil Engineer IV		2	2
Civil Engineer V		2	2
Research Officers		2	1
Civil Engineer Technician	I	2	1
	II	3	3
	III	3	3
	IV/V/Cadet	10	4
Laboratory Technician		1	1
Other Technical Staff		18	14
Administrative Staff		19	18
Workshop Staff, etc.		10	5
Accounting Officer Posts:			
- Workshop, etc		53	39
- Observers		105	98

Figure 4.3
Organisation of the Hydrological Branch.

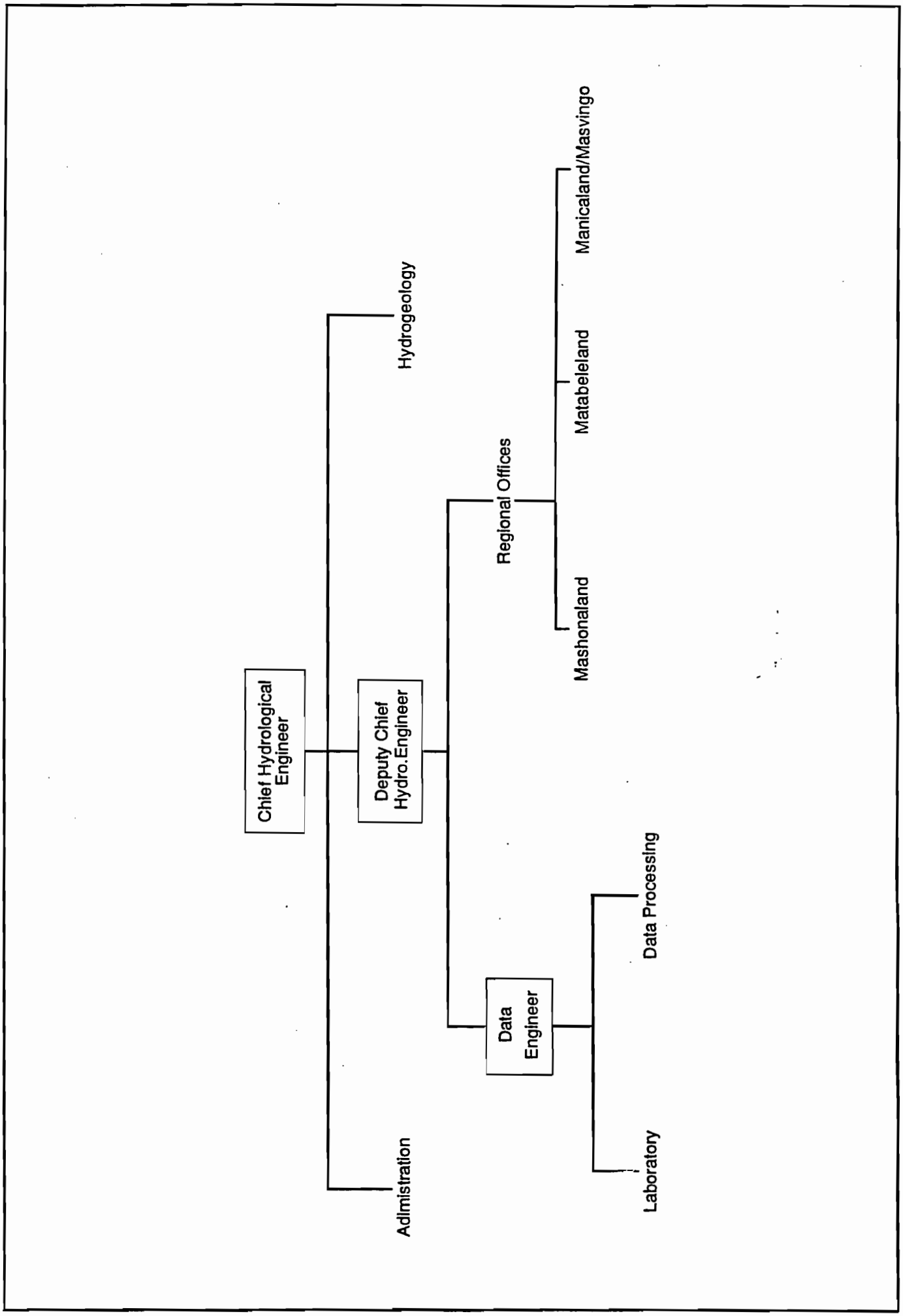


TABLE 4.4

Basic Qualifications by Grade
Hydrological Branch

Grade	Minimum qualification
Civil Engineer V	Civil Engineering Degree
Research Officer	Science Degree
Civil Engineering Technician V	Diploma in Civil Engineering from a polytechnic college
Observer	O-levels

These recruitment and retention problems are seen in the current paucity of Zimbabwean nationals within the professional ranks of the branch, with less than half of the posts filled by nationals, and of those few have significant hydrological experience. The use of expatriates to support the hydrological service is understandable in a newly independent country, but it is disappointing in a country with hydrological traditions as rich of those of Zimbabwe that more promising young hydrologists are not being trained.

Over the past years a steady deterioration in the numbers of established staff for the hydrological branch has taken place despite an increase in the network and an increase in the fields of activity such as sedimentation. This is illustrated in Table 4.5. The Acting Chief Hydrological Engineer has reported:

> '...the present establishment is totally inadequate to meet the basic objectives of data collection and surface water assessment programmes required for an efficient and economic planning of water development works. It cannot even cope with their routine work, eg quality control of data and processing of water right applications - at present some 250 applications are pending and some of these go back to 1986. Unless remedial action is taken now the development of the national surface water resources will be based on inadequate hydrological data with all the consequent adverse effects'.

A further area of concern is the doubtful quality of the hydrological data that are presently being processed. The hydrological information is coming from the gauging stations to the processing section with very little scrutiny of its validity by qualified and experienced staff because these staff are not available. There are many things that can go wrong to produce wildly inaccurate results, such as incorrect range settings on the recording machines, incorrect water levels inserted by the observer on the recorder charts, inaccurate compilation of the discharge tables for each station particularly at high flood level etc. All this requires the attention of special data quality control staff. In this last area much work needs to be done.

It is recommended that the strength of the hydrological branch be increased so that its capability can be improved in the following fields:

- preparation of hydrological reports for water right applications;
- quality of data processing;
- determination of gauging station discharge at high flow;
- sediment deposition data collection and research;
- sediment transport monitoring;

To achieve these objectives, the recommended professional and technical staff needed are shown in Table 4.5. The recommendations of the NMWP consultants on the hydrological branch, which have not yet been implemented, are summarised briefly below:

TABLE 4.5

Hydrological Branch: Professional/Technical Posts: 1974 to Date

	1974	1980	1988	Proposed
Chief Hydrological Engineer	1	1	1	1
Deputy CHE	2	2	1	2
Civil Engineers CE4	4	2	2	6
Civil Engineers CE5	7	4	2	2
Research Officers	3	4	2	2
TOTAL	17	13	8	13
Civil Engineering Technician CET1	1	2	2	5
Civil Engineering Technician CET2	2	1	3	6
Civil Engineering Technician CET3	1	3	3	9
CET4/5/cadet	13	7	10	9
TOTAL	17	13	18	29

(i) An additional Regional Hydrological Office be established in the Midlands Province to bring the total number of regional offices to five.

(ii) The number of regional hydrological engineers be increased to five.

(iii) All regional Engineers to be in charge of and deal with both data collection and water rights as well as maintenance and construction in their respective regions.

(iv) Data collection and laboratory services to be removed from the Data Engineer's Office. Data collection to be dealt with by the regional engineers and the laboratory to be headed by a technician under the Deputy Chief Hydrological Engineer.

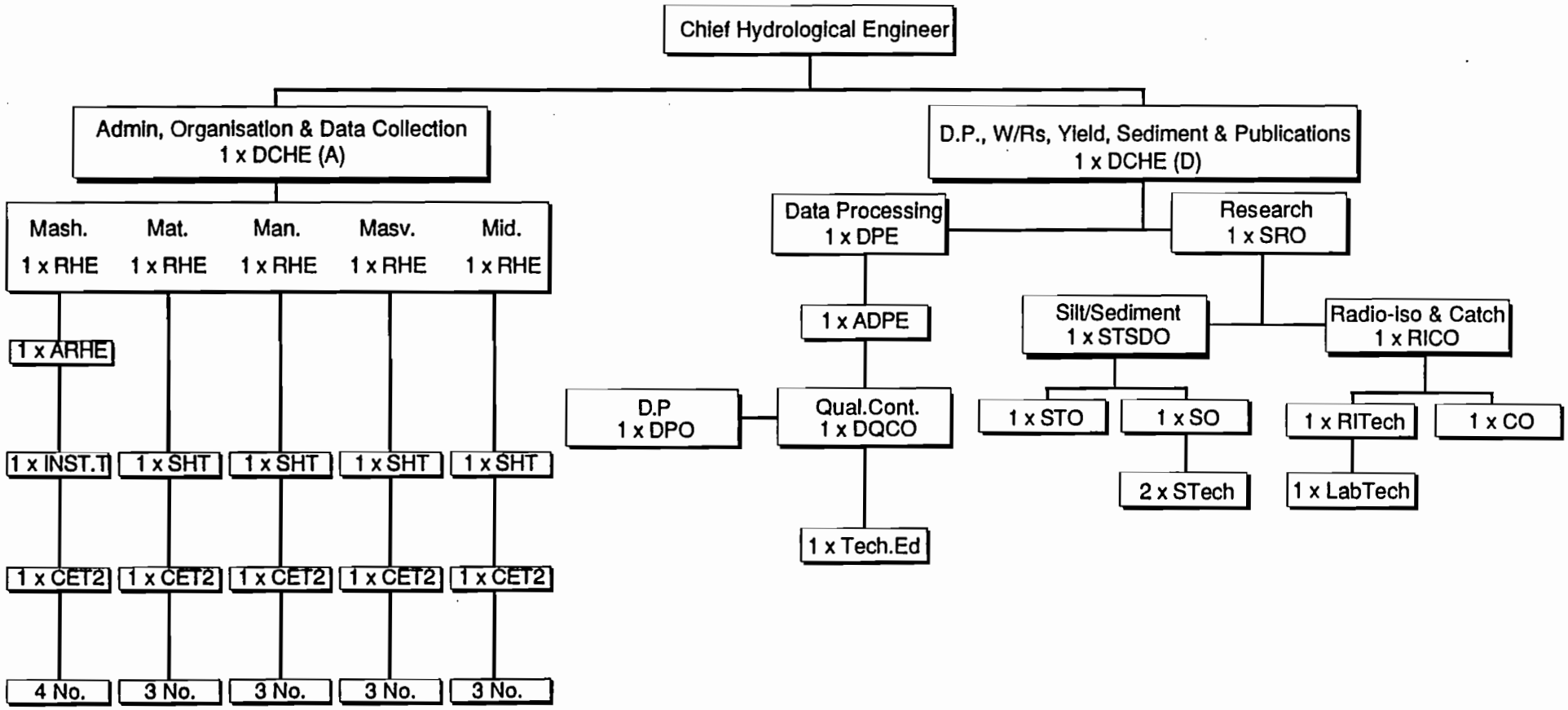
(v) The Water Rights Office be headed by a Water Rights Engineer under the DCHE. However, most of the water right work would be carried out by the regional engineers.

These recommendations are supported apart from (v). The hydrological branch used to have an establishment of two Deputy Chief Hydrological Engineers in 1974. There is one DCHE at the moment and the provision of a further DCHE is fully justified in view of the proposed activities of the branch. It is recommended that the one DCHE (A) be responsible for administration, organisation and data collection and the other DCHE (D) be responsible for data processing, co-ordination of water right activities, dam yield estimates, sediment and publications. If the water right work is carried out by the regional engineers then the need for a water rights engineer falls away - the co-ordination would be carried out by the DCHE (D). The staff requirements are included in the proposed hydrological establishment shown in Figure 4.4.

The present inability of the hydrological branch to attract or retain adequate numbers of high quality national staff is a major worry, especially with the urgent need to expand the branch. The present policy of requiring staff to have civil engineering qualifications is not helping these matters, and it is suggested that the idea of allowing graduates in other disciplines, such as geography, entry and promotion within the branch be seriously considered. It is understood that the major activities of the rest of the Ministry are predominately concerned with civil engineering, and such a policy change might have administrative repercussions, but it is believed that graduates in other disciplines might prove to be:

- more firmly committed to a full career in hydrology;
- much happier with the type of work to be undertaken within the branch;
- less likely to be offered lucrative posts in the private sector.

With a policy of recruitment specifically for the hydrological branch it would then be easier to justify the specialist training that is urgently needed for most levels of staff in order to increase the general awareness of the overall objectives of hydrological data collection and the importance of sound and



ADPE	Assistant Data Processing Engineer
ARHE	Assistant Regional Hydrological Engineer
CE	Civil Engineer
CET	Civil Engineering Technician
CO	Catchment Officer
DCHE	Deputy Chief Hydrological Engineer
DP	Data Processing
DPE	Data Processing Engineer
DPO	Data Processing Officer
DQCO	Data Quality Control Officer
Inst.T	Instrument Technician
Man	Manicaland
Mash	Mashonaland
Masv	Masvingo
Mat	Matabeland
Mid	Midlands
RHE	Regional Hydrological Engineer
RICO	Radio Isotope & Catchment Research Officer
RITech	Radio Isotope Technician
SHT	Senior Hydeological Technician
SO	Survey Officer
SRO	Senior Research Officer
STech	Survey Technician
STO	Sediment Transport Officer
STSDO	Sediment Transport & Silt Deposition Officer
Tech,Ed	Technical Editor of Hydrological Yearbooks & Summaries

Professional Grades: CE, RO, SRO

Technical Grades: CET, RITech, LabTech, STech

Employee Grades:DPO, DQCO, DPO, RICO, STO, SDSDO, Tech.Ed.

New Designations For Civil Engineering Grades

Chief Engineer	CE2
Principal Engineer	CE3
Senior Civil Engineer	CE4
Civil Engineer	CE5

Proposed Hydrological Branch Establishment

Figure 4.4

accurate hydrological techniques. The experience of the Department of Meteorological Services over the last decade has shown how a data collection agency can be revitalised, and the hydrological branch is in need of similar treatment.

4.3 Streamflow Data Processing

4.3.1 Rating Relationships

As most hydrometric stations comprise combinations of standard measuring devices, the compilation of the rating curves is carried out by computer. Each device has a code (VV for a 90° V-notch and so on). These codes are summarised in Table 4.6 together with the discharge formulae which, in most cases, has been taken from the USBR Water Measurement Manual (1967). The dimensions describing the device are fed into the computer and the resulting rating curve is stored in the computer as a table with discharges corresponding to each 20 mm of stage. The rating table is based on zero head at the invert of the lowest gauging device. There is room for a maximum of 1 000 entries which permits a maximum head of 20 m for a composite station.

At some stations there are two water level recording instruments measuring the flow at two points. Usually one is the spillway of a dam which measures the flood flow and the other is a small measuring device (flume or notch) to accurately measure the low flow. There are therefore two sets of charts coming in from the field and the rating table will comprise two sections to process the two different sets of charts. These stations are termed 'composite stations' and the computer accesses the appropriate section of the rating table depending on the code number that the data processor has fed in.

It is not possible for economic reasons to construct a standard measuring device that will accurately measure all major floods. In the absence of any other information in these cases and in order to provide a basis for the extrapolation of the rating table above the capacity of the measuring device, it has been the practice to compute the rating table to a height above the device's cutoff wall of 0.5 m or half the height of the device, whichever is less. The flow over the cutoff wall is usually treated as broadcrest weir (Code BC) flow. The height to which the computation is carried out is termed the maximum head and the computer calculates the discharge above maximum head as a log/log curve based on two points, one being the discharge reading at maximum head and the other being the discharge at a level that is five increments of head below the maximum head. Assuming that the specifications regarding height above bed etc are still valid at this stage, this procedure tends to overestimate the extrapolated flow. However, as the restrictions will be violated in most cases with significant approach velocity heads, it is probable that the extrapolated curve is reasonable.

Nevertheless, in order to improve the accuracy of these extrapolations, a systematic programme of rating these stations at high flow by means of radio-isotope methods, conventional current meter methods or hydraulic modelling is a high priority.

TABLE 4.6

Summary of Discharge Formulae Used

The following is a list of relevant new names as published

Symbols:

b = length of notch or weir or breadth of flume : m
C = discharge coefficient
D = rise in height along slope : m
h = head : m
L = thickness of broad crest weir or length of cutthroat flume : m
p = height of device above bed : m
Q = Discharge : cubic metres per second

COMP. CODE	DESCRIPTION	CONDITIONS	FORMULA / NEW NAME
	Gotooma		Kadoma
	Hartley		Chegutu
	Mangula		Mhangura
BC	Rectangular broad crest weir:		Q = .552*C*b*h^1.5
	Mrewa	0< h/L <0.15	C=2.18+3*h/L
	Salisbury	0.15< h/L <0.45	C=2.63
	Selukwe	0.45< h/L <0.75	C=2.392+0.531*h/L
	Shabani	0.75< h/L	C=3.32
	Sinoia		Chinhoyi
	Cut throat Flume:		Q=c*b^1.025*h^n
CD	Umtali	L= 0.495 m	Mutare
CC	Que Que	L= 0.990 m	C=1.43+1.82/(L-0.16)
CB		L= 1.485 m	n=1.38+0.55/(L+0.25)
CT		L= 2.745 m	
	Rivers:		
HC	Rectangular contracted notch		Q= 1.84*(b-0.2*h)*h^1.5
	Bubye		Bubi
HF	Rectangular suppressed notch (Francis formula)		Q=1.84*h^1.5
	Hunyani		Gweru
			Manyame
HS	Rectangular suppressed notch (Angle iron crests - see note 1 below)	h/p = 0.25 0<h<0.6 m h>0.6 m	Q=C*b*h^1.5 C=1.84*(1+0.012/h^.8) *see note 1 C=1.84
	Manzamnyama		Amanzamnyama
	Mazoe		Mazowe
OG	Ogee section weir		Q=0.552*C*b*h^1.5
	Nora		C=0.61+(5.8*h/HD+5.49)^.5
	Nuanetsi		HD=design head:m
	Nyadiri		Nyadire
PP	Parshall flume	0<b<0.15	Q=2.326*b*h^1.55
	Head measured in stilling well as specified in note 2	0.15<b<2.75	Q= 0.3717*b*(h*3.2808)^(1.57*L^0.026)
		b>2.75	Q=(2.293*b+0.474)*h^1.6
	Umniati		Munyati
MP	Parshall Flume (Head measured at upstream pool level)		As for PP but substitute: h= 0.83 x upstream pool h above throat invert.
SB	Sloping broad crest weir	0<h<D	Q=0.22*C*b*h^2.5/D
		h>D	Q=0.22*C*b*(h^2.5-(h-D)^2.5)/D
SC	Sloping contracted notch	0<h<D	Q=0.735(h/D-0.1)*h^2.5
		h>D	Q=0.735*(b/D-0.1)*(h^2.5-(h-D)^2.5)
SS	Sloping suppressed notch	0<h<D	Q=0.735*b*h^2.5/D
		h>D	Q=0.735*b*(h^2.5-(h-D)^2.5)/D
VV	90 V notch		Q=1.34*h^2.48

Notes:

1) - Most rectangular suppressed notched gauging weirs in Zimbabwe are constructed with an angle iron (usually 150mm x 100mm) crest. For low heads the flow over the angle iron is, because of the rounded crest, greater than the theoretical flow over a thin plate weir. The quoted formula is the approximate representation of the curve given by Kriel J.P. (1963).

2) - Formulae given in USBR Water Measurement Manual (1967) and metricated.

4.3.2 Data Handling Procedures

All processing of flow data is carried out by computer. Each hydrometric station is allocated a six-digit code number which is used by the computer to access the rating table from the rating table directory and to process the incoming field data. The code number is of the form: ABCCDE

Where:

A	=	Hydrological zone:	1	=	Hydro Zone A
			2	=	Hydro Zone B
			3	=	Hydro Zone C
			4	=	Hydro Zone D
			5	=	Hydro Zone E
			6	=	Hydro Zone F
			7	=	Zambezi
			8	=	Standard notches
B	=	Station type	0 to 4	=	river flow recorders
			5 and 6	=	canals
			7 and 8	=	gauge post stations
			9	=	gauge post canals

CC = Station number within zone. If CC is greater than 100 then B is augmented by 1. Thus GP station 'Nyamatonora: Nerutanga Dam U/S Notch' Zone Ref. Nr EGP 131 is coded 583101.

D = Rating Table Modification Number.
For the original measuring device as constructed D = 0. Every time the structure or gauge datum level is physically changed, the modification number is augmented by 1. On the rating table the date of the change is inserted in the 'Date Opened' field. When a new modification is added to the directory, the appropriate 'date closed' field is filled in on the previous modification. All rating tables for stations with different modification numbers are retained in the rating table directory. The computer checks the modifications number, date opened and date closed to ensure that it is processing the incoming field data with the appropriate rating table.

E = Rating Table Version Number.

For the first compilation of the rating table, E = 1. If subsequent additional information eg isotope gaugings at high flow, warrants changing this rating table, then the version number is augmented by 1 and all previous water level data should be reprocessed from the opening date of the relevant modification number. A new rating table version overwrites the old version in the rating table directory.

To illustrate station code number 515112 refers to the second version of the E151 Ingezi Sivumba flume rating table after it was physically modified once.

The hydrological observer at the station always marks in on the chart the starting and ending days, times and water levels. He also, in the case of the usual seven-day chart, marks in check readings during the course of the week. The charts are then monitored by the Area Engineer/Technician before they are processed, in order to check that the chart range has been entered correctly, the check water level values correspond to the chart trace and that the chart time base is correct. Once checked, the charts are sent to the processing section, where current practice is to hold charts until a complete year of records are available before they are processed. Processing is carried out by a digitizer. The processing computer program always corrects the incoming chart data to the hydrological observer's figures. It is essential, therefore, that the observer has adequate training in this regard.

Data is usually processed annually, the hydrological year being the 1 October to the 30 September. The printout, an example of which is shown in Table 4.7 lists:

- annual volume of runoff;
- monthly volumes of runoff;
- maximum monthly peak flow;
- number of days of no flow each month;
- duration table showing number of days when the flow was within selected classes;
- average flow for each week of the year;
- average flow for each day of the year.

The stage/time data are stored initially on disc and then transferred on to magnetic tape.

Every year the summary for each station is updated with the new year's data and the summary program rerun. This lists:

- monthly volumes of runoff;
- annual volumes of runoff;
- mean monthly and annual volumes of runoff by pentade;
- mean monthly and annual volumes of runoff over the period of record;

TABLE 4.7

Example of Flow Data Printout

WH0201 HYDROLOGICAL BRANCH W.W.R.D. RIVER FLOW AND RUNOFF 2/12/88

RIVER - WAZOE

R/T CODE NO - 402802

RECORDER STATION - WAZOE DAM U/S SEASON - 1965/66

ZONE REF. NO - 028 DATE OPENED - 62/10/01

LAT - 1735 S LONG - 3101 E CATCHMENT AREA - 223.00 SQ.KM.

NOTCH CAPACITY - 2.493 CUMECS

MONTH	TOTAL RUNOFF 3 3 10 M	UNIT RUNOFF MM	FLOW IN CUBIC METRES PER SECOND MAX	MIN	MEAN	DAYS NO FLOW
OCT	156	0.7	0.139	0.042	0.058	0
NOV	420	1.9	1.430	0.047	0.162	0
DEC	591	2.7	0.921	0.095	0.231	0
JAN	332	1.5	0.530	0.034	0.124	0
FEB	2310	10.4	7.950	0.034	0.955	0
MAR	2340	10.5	2.240	0.368	0.874	0
APR	754	3.4	0.368	0.233	0.291	0
MAY	350	1.6	0.233	0.072	0.131	0
JUN	321	1.4	0.150	0.089	0.124	0
JUL	292	1.3	0.150	0.072	0.109	0
AUG	264	1.2	0.139	0.078	0.099	0
SEP	147	0.7	0.078	0.034	0.057	0
	8280	37.1	7.950 MAX		0.263 MEAN	0

REMARKS -

INPUT - IMPERIAL M/T

R/T NOTES

NUMBER OF DAYS WHEN FLOW WAS LESS THAN OR BETWEEN VALUES SHOWN IN FIRST ROW

1.0		1.5		2.0		3.0		4.0		5.0		7.0		10.0		CUMECS
0	0	0	0	0	0	0	7	7	27	34	38	72	68	140	X	0.01
	90	230	22	252	44	296	22	318	10	328	9	337	9	346	X	0.10
	7	353	7	360	3	363	2	365	0	365	0	365	0	365	X	1
	0	365	0	365	0	365	0	365	0	365	0	365	0	365	X	10
	0	365	0	365	0	365	0	365	0	365	0	365	0	365	X	100
	0	365	0	365	0	365	0	365	0	365	0	365	0	365	X	1000

WH0201 HYDROLOGICAL BRANCH W.W.R.D. RIVER FLOW AND RUNOFF 2/12/88

RIVER - WAZOE R/T CODE NO - 402802 1965/66

DAILY FLOW IN CUBIC METRES PER SECOND

MONTH	DAY	FRIDAY	SATURDAY	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	3 3 10 M PER WEEK
OCT	1	0.052	0.052	0.054	0.057	0.059	0.062	0.064	34
OCT	8	0.069	0.072	0.075	0.077	0.114	0.071	0.054	46
OCT	15	0.049	0.061	0.062	0.060	0.057	0.057	0.054	34
OCT	22	0.052	0.049	0.047	0.047	0.047	0.047	0.047	26
OCT	29	0.047	0.047	0.047					
NOV	1				0.047	0.049	0.054	0.057	29
NOV	5	0.059	0.064	0.067	0.074	0.095	0.123	0.176	56
NOV	12	0.254	0.345	0.447	0.837	0.414	0.263	0.195	236
NOV	19	0.156	0.126	0.104	0.090	0.086	0.083	0.080	82
NOV	26	0.075	0.072	0.069	0.067	0.236			
DEC	1						0.383	0.356	108
DEC	3	0.297	0.355	0.208	0.146	0.124	0.113	0.101	116
DEC	10	0.214	0.654	0.366	0.309	0.253	0.223	0.233	194
DEC	17	0.243	0.253	0.263	0.268	0.233	0.195	0.164	139
DEC	24	0.144	0.129	0.113	0.102	0.101	0.101	0.101	68
DEC	31	0.098							
JAN	1		0.095	0.205	0.281	0.243	0.223	0.203	116
JAN	7	0.186	0.177	0.170	0.149	0.129	0.115	0.101	88
JAN	14	0.069	0.078	0.067	0.056	0.054	0.052	0.052	38
JAN	21	0.049	0.047	0.045	0.040	0.120	0.125	0.103	45
JAN	28	0.174	0.080	0.263	0.069				
FEB	1					0.059	0.054	0.049	44
FEB	4	0.045	0.038	0.038	0.106	0.443	0.430	0.520	139
FEB	11	0.287	0.263	0.423	0.729	0.424	0.320	0.275	235
FEB	18	0.235	0.538	1.020	1.880	1.930	3.890	2.550	1040
FEB	25	2.360	3.340	2.560	1.940				881
MAR	1					1.800	1.580	1.370	410
MAR	4	1.160	0.976	0.817	0.678	0.590	0.546	0.879	467
MAR	11	1.200	0.914	1.600	1.560	1.430	1.260	1.110	801
MAR	18	0.958	0.833	0.716	0.594	0.545	0.516	0.467	401
MAR	25	0.459	0.432	0.406	0.373	0.368	0.368	0.368	239
APR	1	0.355	0.320	0.285	0.263	0.274	0.205	0.308	180
APR	8	0.319	0.331	0.355	0.368	0.355	0.331	0.319	205
APR	15	0.308	0.285	0.274	0.257	0.253	0.263	0.274	165
APR	22	0.274	0.274	0.274	0.274	0.263	0.253	0.253	141
APR	29	0.243	0.233						
MAY	1			0.213	0.189	0.177	0.177	0.170	121
MAY	6	0.162	0.162	0.156	0.144	0.118	0.095	0.076	76
MAY	13	0.075	0.117	0.153	0.162	0.156	0.144	0.139	81
MAY	20	0.134	0.124	0.116	0.113	0.110	0.104	0.101	69
MAY	27	0.098	0.095	0.092	0.089	0.089			
JUN	1						0.089	0.089	55
JUN	3	0.092	0.095	0.095	0.097	0.104	0.110	0.116	61
JUN	10	0.124	0.132	0.144	0.150	0.144	0.139	0.134	83
JUN	17	0.129	0.124	0.120	0.120	0.120	0.124	0.129	74
JUN	24	0.134	0.139	0.144	0.150	0.150	0.144	0.139	86

- coefficient of variation (by moments and method of maximum likelihood) of the annual volume of runoff;
- average dimensionless annual hydrograph by month.

4.3.3 Computer Data Processing

The data handling system was computerised in the early days of computers, well over a decade ago. The machine currently used is a Perkin-Elmer mainframe, based at the Government's Scientific Computer Centre (SCC) in Harare. The hydrological branch has a direct link to the computer through a satellite terminal, equipped with a digitiser and a graphics capability. Prior to 1982 an earlier generation computer was used, accessed through a card reader. As a consequence, all early data and the processing software that was developed in house is all on cards.

There are a number of limitations in the present computing set-up, which include:

- problems of access due to power cuts, computer breakdowns, line breaks or faults with the terminal equipment;
- insufficient hard disk storage available to store all data, and clumsy, time consuming procedures to allow the reading of magnetic tapes from the data archive;
- inefficient data handling software;
- lack of transport whenever visits do have to be made to SCC.

In addition, there are a number of stand-alone micro-computers within the branch, used for:

- digitising charts when the main computer link is not functioning;
- compilation of the water rights database;
- word processing.

Recently, Interconsult undertook a major study of the computational requirements of the department, recommending a Computer Aided Water Information and Design System ('CAWDIS'). Subsequently, a Wang mini-computer system has been purchased and installed, capable of running up to 32 terminals. The mini-computer is intended primarily for use as a word processing, accounts and management information system: the original idea being that the scientific work would still be done at SCC. However, the presence of a powerful, modern machine within the department with the capability of handling the section's data processing requirements much more efficiently than the present arrangements, provides a very attractive proposition, which is worthy of detailed consideration. The recent arrival of a data processing expert (funded by the Commonwealth Technical Fund) within the section also provides the opportunity for a thorough overhaul of the section's data processing software.

4.3.4 Data Archiving and Publication Systems

Historic data are stored on three media: on the original charts; as digitised water levels on magnetic tape and, for data prior to 1982, on punch cards. Only the most recent data are stored on hard disk at the SCC. The punch card information, whenever required, can be translated on to a magnetic tape at the Ministry of Agriculture.

Historic data have also been published. Annual yearbooks have been prepared from 1956/57 to 1978/79, and a book of hydrological summaries has also been published, covering the period from start of records to 1980. It is policy to continue this publication, and it is understood that the 1979/80 yearbook is currently awaiting typists to prepare the typescript. The data have also been assembled for subsequent years, and await resources to allow publication.

4.3.5 Users of Data

The principal users of hydrological data are the engineers of MEWRD. There are, apparently, few external requests for data, and so presumably most potential users satisfy themselves with published information, particularly the Hydrological Summaries to 1980. The difficulty of obtaining historic data from the computer has been demonstrated during the present study, when we were informed that it was likely to take weeks to find the right tape, find the computer working and with a free tape drive, download the information on to hard disk and printout the full daily summaries. Apparently, there is no program to identify monthly flow data and print it out, partly as data archiving is entirely in the form of time/water level co-ordinates, requiring reprocessing using the appropriate rating table.

Data use within the ministry is nearly always related either to water rights applications, or to dam design.

For dam design, there are some very well established methods of using the data, described in the internal document 'A Guide to the Design and Construction of Medium Size Earth Dams in Rhodesia' (1977). These are based on a number of comprehensive regional studies undertaken within the branch (for example, Mitchell 1974, 1977), but it is slightly worrying that these techniques now appear to be applied without thought, consequently halting the development of hydrology as a science within the branch.

The processing of water rights applications tends to use summary statistics of collected data in order to establish whether the stream from which abstraction is requested has any uncommitted resources for the season for which the application is made. These data might be the lowest daily discharge recorded each year during the season (for an application without storage).

For an application including the use of storage, analysis includes the use of a technique developed by Kabell (1984), using the mean annual runoff and its coefficient of variation to define a yield for a given storage volume.

For catchments without a suitable gauging station, the equivalent statistics are translated from a nearby 'similar' one. There currently appears to be no routine method used to correct for upstream abstractions, and hence data distortions, in these processes, an oversight that is becoming increasingly important as the catchments are developed. However, the technician currently processing water rights applications has over 30 years' service and is very familiar with river behaviour and existing rights. A crucial period may arise when he retires, and the whole methodology of resources assessment may benefit from a thorough and detailed review.

4.4 Quality of Surface Water Data

With the widespread use of gauging structures, the quality of data collected from the hydrometric network should be good. There are, however, a number of areas of concern identified below.

(i) Chart Range

For many years the hydrological branch has standardised on the Kent RL type recorder on the majority of the 300-plus automatic water level recorder stations. These machines can be set to 1, 3 or 6 m range. Thus, if it is set on 1 m range then there will be good definition and sensitivity at low flow, however, if the river stage rises to a depth greater than 1 m on the gauge plate, then the recording pen will come to the end of its travel and the pen trace will stick at the top of the chart. The tendency has therefore been to set the machines of 6 m range so that large flood peaks will be recorded: this causes a loss in sensitivity at low flow. Short of re-equipping the whole recording network with chart reversing analogue instruments or digital machines (which would require a large capital input and complete reprogramming of the computer software) there seems to be little that can be done if the present policy of recording flood peaks is to be retained. In this connection it should be noted that the present bank of flood data collected over the years has proved invaluable in arriving at a standard procedure for sizing of spillways in dam design - see Kabell (1988).

(ii) Quality Control

As explained above, the computer program that processes the stage/time data coming in from the field stations corrects all heads and times given by the recorded charts to those given by the hydrological observer. For various reasons there are always discrepancies between the observer and the charts; some are minor and some are significant. The data processing system is therefore very dependent on the education, training and zeal of the full-time hydrological observer. Some of these people are very reliable but, because they have usually had no formal academic training in this field (their maximum achievement is five O-levels) they cannot be expected to understand all of the technicalities of water flow measurement. There is a 'backup' in the data processing system in that all 'area' engineers and technicians in the hydrological branch are required to peruse the incoming charts and initial them to indicate that they are satisfied with their quality.

There is an establishment of four civil engineers (two with the grade of CE4 and two of CE5) and five civil engineering technicians (two of CET1 and three of CET2). The duties of only half these officers include the inspection of the more than 500 recorder charts, canal and gauge-post readings coming into the data processing section each week. Obviously they cannot be expected to give the detailed attention the task requires. With more than 300 current gauging weir stations, each with a capital cost of (say) $50 000 in today's terms, there is a total capital investment of $1.5 million tied up in this hydrometric network. It is therefore important that sufficient competent staff (hydrologists and technicians) should be provided to monitor and supervise the data collection process. The acting Chief Hydrological Engineer has submitted a proposal to the Permanent Secretary for MEWRD to increase the establishment of the hydrological branch by one CE3, three CE4s, one CE5, three CET1s and three CET2s. In view of the above, this is strongly supported.

(iii) Transport

At the present moment the hydrological branch is allocated two government vehicles with which to operate the hydrological network and to carry out all the other duties required for sediment transport monitoring and for the administration of the Water Act eg inspection of river flows in water disputes, inspection of site conditions for preparation of hydrological reports to the Administrative Court etc. This number of vehicles is quite inadequate and it is strongly recommended that the fleet be increased.

(iv) Calibration of Gauging Weirs

As mentioned above, the devices used for flow measurement are all standard devices, and they should be accurate during flow conditions when the specifications regarding height of device above bed, distance of sides of weir to sides of the approach channel and aeration are not violated. At low flows they are not, but at high flows, it is more than probable that they are violated. Hydraulics Research, Wallingford, UK, has been commissioned to examine this aspect and will, in due course, be presenting a report on 14 selected gauging stations, listed in Table 4.8.

Preliminary results have suggested that the relationships used are basically sound, but some fundamental errors have been found, such as the use of incorrect dimensions when deducing the stage/discharge relationship, which might introduce errors of up to 20%. Other potential problems, such as submergency at high flows or siltation at low flows are not believed to introduce significant inaccuracies.

(v) Upstream Abstractions

The demands on surface water are so great, (especially in the dry season), the number of constructed dams so large, and the history of water development in the country so long that the pattern of natural runoff has been obscured in all but the very least developed areas of the country. Data sets are therefore likely to show changing patterns with time, reflecting upstream developments. Consequently data must be used with care.

TABLE 4.8

Selected Stations for the Analysis of Flow Measurement Structures

Station Nr	River	Station name	Catchment area (km^2)	Notch capacity (m^3/s)	Maximum recorded flow (m^3/s)
C23	Nyatsime	Edinburgh	500	54.7	48
C22	Mukuvisi	Manyame Poort Dam	231	14.7	77
C21	Manyame	Manyame Poort Dam	1 510	95.1	549
C61	Manyame	Chinhoyi Old Rd Br	5 340	16.5	992
C74	Manyame	Mukwadzi	6 107	49.5	645
C24	Marimba	Manyame Poort Dam	189	17.1	300
C25	Mukwadzi	Ayres Poort	282	91.4	92
C75	Mukwadzi	Manyame Confluence	1 730	33.5	444
C79	Umzururu	Darwendale Dam	221	7.4	186
C83	Gwebi	Darwandale Dam	362	49.1	251
D38	Mazowe	Bindura Sangere	2 360	5.9	1 450
D41	Mazowe	Lion's Den	3 300	114.0	620
D60	Mazowe	Virginia	655	4.0	232
D39	Wengi	Mwenje Dam	570	26.5	500

TABLE 4.9

Densities of River Gauging Stations

Zone	Number of		Drainage Area (km^2)	Density (Stations per 10^4 km^2)	
	Discharge stations	Water level stations		Discharge stations	Water level stations
A	41	54	102 557	4.0	5.3
B	62	81	62 541	9.9	13.0
C	62	71	90 523	6.9	7.8
D	51	66	36 711	13.9	18.0
E	104	179	84 550	12.3	21.2
F	14	92	7 296	19.2	126
UNESCO/WMO Recommended minimum				2.0	2.4

4.5 Surface Water Data Gaps

The densities of river gauging stations, by hydrological zone, are given in Table 4.9, where they are also compared with the UNESCO/WMO minimum recommended densities. The installed network densities are all much greater than the minimum networks.

The necessity of maintaining the large number of stations currently operated has not been fully established, but it is believed to relate to the need to monitor resource abstractions and resource-sharing agreements. Given that the gauging structures have been built and are currently maintained on a minimal budget, reducing the size of network is unlikely to produce significant savings and consequently, for

the present, it is recommended that the present network of stations is not reduced. Detailed consideration should however be given to undertaking an in-depth review of the usefulness of each station in case resources are reduced in the future and there is a need to focus diminishing resources upon the most important stations. To this end, the classification of station into primary, secondary or tertiary stations is important. Primary stations would be those of fundamental importance, monitoring important catchments, producing accurate data and with long records. Secondary stations are those which can be used to give a better areal coverage of the principal hydrologic characteristics, supporting the primary stations, and tertiary stations are short-term stations established to fulfil a particular data need.

Despite the high average network density, there are some areas that are poorly served. These include smaller catchment areas in the lower rainfall areas in the communal lands such as:

(i) Mudzi River - Hydrological Zone DR1;

(ii) A representative small river in the Zambezi valley East of Kariba dam - say a tributary of the Musengesi - Hydrological Zone CUG1;

(iii) Sengwa and/or Ume Rivers - Hydrological Zones AZ3 and AZ4. This area has large coal deposits and development is taking place. Existing hydrological information is sparse.

The processing of water rights does draw very heavily on data produced by the recorder stations, and would obviously benefit from having every stream measured. This need is particularly important to assess current residual flows, rather than any pseudo-natural flow data set, as the granting of new licences must depend on the flows that are presently unused. Consequently data of, say, ten years ago are not particularly relevant to these applications, and neither are the flood flows. As long as the water court procedures maintain their current importance, every effort must be made to retain as widespread a network of accurate, low flow measuring gauges as possible with data that are promptly processed, providing the database needed for accurate considerations of applications. The allocation of additional resources to this area can easily be justified by the economic significance of abstraction licences to the applicants.

The need to maintain a gauge network to assist in the resolution of disputes over abstractions has diminished somewhat, with the formation of 'water boards' on all heavily exploited sub-catchments. These boards are formed by the holders of abstraction licences and have specific legal duties, but also form a forum to locally resolve water disputes. A grouping of representatives of water boards to resolve catchment problems has also been started.

4.6 Fluvial Sediment Yield

4.6.1 Introduction

Concern has been expressed for some time in Zimbabwe at the possible deleterious effects of accelerated erosion on the sedimentation of water supply reservoirs. This was highlighted by the Agritex survey of 1983 quoted by Interconsult A/S with an average of 39% siltation in 664 small dams that were investigated. In one province, Masvingo, the average siltation was 62%. In this province there is one reported case, Zaka weir, where the whole capacity of 100 Ml was filled with silt in two years. Sedimentation of reservoirs has become so much of a problem that MEWRD (Kabell 1983) has recommended that small dams should not be constructed with a storage capacity of less than 10% of the estimated mean annual runoff of the catchment.

4.6.2 Description of Network

Systematic sediment transport monitoring in Zimbabwe was first started in 1975. The work was initially sponsored by the University of Zimbabwe and the hydrological branch of MEWRD and is now wholly the responsibility of MEWRD. The monitoring sites were located at hydrometric recording stations and these are listed in Table 4.2.

4.6.3 Methods of Data Collection

These are:

(i) monitoring the sediment concentration at a river location over a period of time and integrating the sediment transport rate over time;

(ii) measuring the amount of sediment deposition in an existing reservoir.

Sediment monitoring was confined to measurement of suspended and dissolved loads. Sampling was carried out by the hydrological observers resident at the hydrometric station. At one station a Kahlsico Automatic sampler was used but this was discontinued because of breakdowns and shortage of spares. Samples were taken manually and frequency depended on the magnitude of discharge. At high flows up to six samples per day were taken and at low flow one sample was taken per day. For the suspended

load measurements a Corning Colorimeter was initially used and this was followed by the use of a Spectrophotometer. Dissolved solids were measured with a MC4 Soil Conductivity Meter. Published results by Chikwanha (1980) and Ward (1979) are listed in Table 4.10.

Sediment studies have also been carried out on the Save River by Hydraulics Research, Wallingford with a view to estimating the likely effect of siltation in two proposed major dam sites (Chitowe and Condo dams). These dams have been identified for many years to have a good potential for large-scale irrigation development in Zimbabwe. In Report EX 1020 (1983) the effects of three different sediment yields (100, 200 and 400 t/km^2 per year) were analysed.

As part of The National Master Plan for Rural Water Supply and Sanitation (NMPRWSS) the consultants, Interconsult A/S, carried out a silt survey in 1984 of 30 existing dams which are fairly representative of conditions in Zimbabwe. Three methods of survey were used:

(i) conventional air photography with ground control;
(ii) survey boat equipped with a multi-frequency echosounder and a computerised navigation system;
(iii) direct measurement of silt deposits using a penetrometer or by digging observation pits.

Methods (i) and (ii) required details of the original basin survey in order to calculate the volume of sedimentation by subtraction of the 1984 capacity from the starting capacity.

The results of the survey are given in Volume 3.2 of the NMPRWSS and are listed in Table 4.11.

4.6.4 Quality of Data

Inspection of Tables 4.10 and 4.11 reveals that the average annual sediment yield (excluding the low runoff year 1978/79) using the sediment transport monitoring method was 38 t/km^2 per year while the NMPRWSS measurement of sediment deposited in existing dams gives an average figure of 211 t/km^2 per year. There is a significant discrepancy which could be caused by:

- the sediment concentration figure obtained at each river cross-section in the monitoring method is not representative of the whole cross-section - in most cases this figure is obtained from a single sample at one particular point;

- the monitoring stations are generally located on larger catchment areas than the dams used in the NMPRWSS survey.

TABLE 4.10

Summary of Sediment Monitoring Yield Results
(Only Suspended Load)
Source: Chikwanha & Ward

STATION NUMBER	RIVER	CATCHMENT AREA km2	YEAR	SUSPENDED SEDIMENT YIELD t/km2/yr
A68	Gwayi	14400	75/76	13.50
			76/77	38.90
			77/78	115.30
B35	Limpopo	196000	76/77	25.90
			77/78	55.60
			78/79	3.20
C21	Manyame	1510	76/77	24.80
			77/78	21.10
			78/79	1.65
			79/80	2.80
			80/81	22.60
C87	Umsweswe	1990	75/76	21.00
			76/77	34.00
			77/78	80.40
			78/79	0.55
			79/80	12.00
			80/81	36.40
D41	Mazowe	3300	80/81	119.00
E149	Save	42300	79/80	7.60
			80/81	13.50
Average, excluding 1978/79 (low runoff year)				37.90

TABLE 4.11

Results of Interconsult A/S NWMWP SSEP Siltation Survey 1984

DAM	CATCHMENT AREA km2	SEDIMENT Apparent t/km2/yr	YIELD Nett* t/km2/yr
Chatikobu	2.40	421	449
Nyamembwe	7.00	410	589
Nyamasa	7.10	157	160
Masvaure	8.60	469	657
Demba	10.00	681	1216
Mabgwe Matema	28.00	80	120
Masunswa	29.00	348	885
Banga	38.00	12	20
Mopanzure	43.00	526	938
Dowe	52.00	306	724
Ngwenya	54.00	245	319
Hazeldene	59.00	91	176
Questeds	61.40	84	84
Nyarushangwe	108.00	704	864
Makaholi	154.00	10	12
Chikwedziwa	205.00	45	45
Mchingwe	298.00	35	41
Mazowe	348.00	64	111
Upper Umgusa	401.00	48	48
Sheet	435.00	88	88
Siya	518.00	300	300
Ngezi	1399.00	65	78
Manjirenji	1536.00	319	515
Ruti	2615.00	333	333
Kyle	3989.00	60	80
MEAN		236	354
WEIGHTED MEAN (by area)		170	211

* Net sediment yield = Total sediment deposited per year / (total area - (Class I +IIId areas))

Class I : No apparent erosion
Class IIId: Erosion along drainage lines

While a considerable amount of data have been accumulated on rates of erosion from small agricultural plots, there is very little hard data on rates of sediment transport in rivers. The NMPRWSS survey is the first comprehensive survey that has been carried out in Zimbabwe on sedimentation of existing dams and in view of the concern that is expressed at the apparently accelerating rate of deforestation and possible land degradation and its effects on water supplies, it is strongly recommended that MEWRD acquire the staff and equipment to continuously monitor the rate of sediment deposition in these and other dams. On page 36 of the Interconsult A/S report 'Application of the TERMOS 3D package for analysing sedimentation in reservoirs in Zimbabwe' it is estimated that the cost of providing the necessary equipment and training would be US$279 750 = Z$447 600.

4.7 Water Quality Monitoring

The responsibility of routine monitoring of surface water quality lies not with the hydrological branch but with the operations division of the ministry. Their monitoring programme is largely limited to the sampling of water at effluent outfalls in order to check that quality standards for effluent are being maintained.

Samples are currently analysed in of the Government Analyst Laboratory of the Ministry of Health, but MEWRD has for some time and for various reasons made representations for the establishment of a water quality laboratory within the ministry. (see 'Assessment of MEWRD's need for a Water Quality Laboratory' by the British Geological Survey, 3 November 1986).

It is understood that this matter has now been resolved and that government has approved, in principle, the establishment of this laboratory with the proviso that only 30% of the technical work (analyses) is carried out by the MEWRD laboratory while the remainder is carried out by Ministry of Health personnel. Donor funding is available for the construction of the laboratory and for the provision of the necessary equipment. There are, at present MEWRD personnel who can be allocated to staff such a laboratory in the immediate and short term. Obviously, in the long-term, staff will need to be trained for full-time attention to this project.

The lack of a regular sampling programme to determine 'base-line' quality standards of the surface waters of Zimbabwe was felt during the NMPRWSS, when efforts were made to analyse sporadic samples taken, and to interpret the results nationally. The conclusions drawn, that surface water quality is variable and generally more unreliable than groundwater quality were indicative of the paucity of data. The NMPRWSS did, however, stress very strongly the need for surveillance and monitoring of water quality at all water intakes.

The network of water quality monitoring stations currently in use is listed in Table 4.1. Just under two-thirds of the network of just under 100 stations are designated as water pollution control stations, intended primarily to monitor water bodies in danger of being polluted. The remainder are water quality monitoring stations, mostly used to monitor water quality adjacent to abstractions for water supply.

CHAPTER 5

GROUNDWATER

5.1 Groundwater Resources

The Basement Complex occupies a large part of central Zimbabwe. Vast areas of gneiss intruded by younger granites make up some 60% of Zimbabwe. Irregular shaped bodies of metalavas and metasediments (the greenstones) are contained within the Basement Complex of central Zimbabwe. Linear and sheet dolerites are found along the central axis and in the north-east.

The Karroo sediments underlie much of the west of the country and are also found along the Zambezi and Limpopo valleys. The basalt flows which closed the Karroo sedimentation period occur in the south-east and west.

Mudstones with subordinate clastics of Cretaceous age occupy areas in the Darwin and Gonarezhou districts. Tertiary and Quaternary age formations include the Kalahari sands which are extensively developed in the west, and alluvial deposits particularly along the Sabi valley.

A generalised map of the geology of the country is shown in Figure 5.1.

The Kalahari sands and the Karroo sediments form the most extensive aquifers in Zimbabwe; borehole yields are between 1 and 3.5 l/s although up to 10 l/s can be obtained from the Kalahari sands.

Within the Precambrian formations, groundwater occurs both within fractures and in the overlying weathered zone. The weathered zone is more thickly developed on the African surface than the post-African, leading to borehole yields in the range 0.6 to 1.1 l/s for the former and 0.1 to 0.3 l/s for the latter.

The higher yielding Basement Complex formations include the greenstones where yields range between 1.2 and 3.0 l/s and the Lomagundi dolomite and Tengwe River group. Higher borehole yields have also been located in the contact zones of the Great Dyke.

A summary of average borehole yields within the major geological divisions is given in Table 5.1.

TABLE 5.1

Average Borehole Yields

Geological division	Yield (m^3/d)
Archean granitic and gneissic rocks:	
Post-African and plio-quaternary surfaces	10 - 50
African surface	50 - 100
Greenstone:	
Bulawayan formation (metalavas)	100 - 250
Shamvaian formation (metasediments)	10 - 25
Argillites of Piriwiri, Lomagundi, Tengwe River and Sijarira formations:	
Mainly shales, slates and phyllites	10 - 50
Calcareous rocks of Lomagundi and Tengwe River group:	
Lomagundi dolomite and Tengwe River limestone	500 - 2 000
Umkondo group:	
Dolerites, quartzites	20 - 200
Karroo:	
Upper and lower Wankie sandstone	100 - 3 400
Madumabiza mudstone	10 - 25
Escarpment grit	100 - 300
Forest sandstone	50 - 300
Batoka basalt (Lower Jurassic)	20 - 100
Cretaceous formations:	
Mudstones, siltstones, sandstones	10 - 50
Kalahari sands:	100 - 1 000
Alluvial deposits:	100 - 5 000
Mashonaland dolerites:	
Associated with granites and gneisses	50 - 250

Source: National Water Master Plan

5.2 Groundwater Development

The total number of boreholes and hand dug wells in Zimbabwe is not accurately known but recent estimates suggest that over 25 000 boreholes exist of which 10 000 are located in Communal lands. Assuming an average discharge of 7.5 m^3/d the total abstraction is 70 million m^3 per year, equivalent to less than 0.1% of the total average rainfall of 800 mm.

Dore provided the following table of drilling activities in 1984.

Fig 5.1

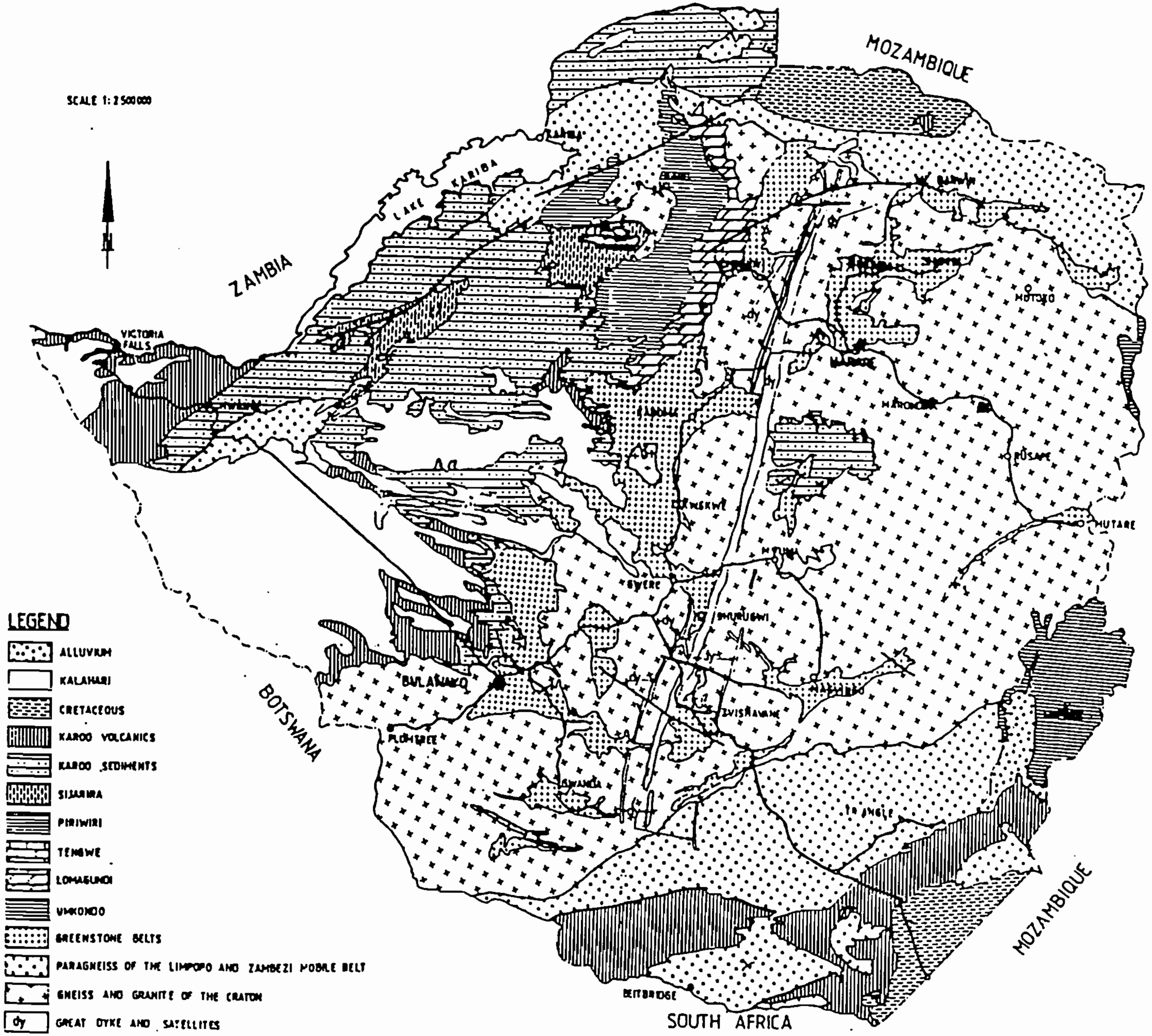


Figure 5.1
Generalised Geological Map

TABLE 5.2

Drilling Activities in 1984

Agency	Percussion rigs		Air hammer/ rotary rigs		Total number of boreholes
	Number of rigs	Number of boreholes	Number of rigs	Number of boreholes	
MEWRD	35	330	12	222	552
DDF	-	-	10	180	180
Contractors	65	650	14	504	1 154
Total	100	980	36	906	1 186

In 1986 and 1986 the number of boreholes drilled was 1 070 and 1 044 respectively with an average total depth of 48 m.

The typical borehole design includes 6 inch diameter 4 mm thick mild steel casing with torch slots. PVC Coordination Unit, National Action Committee and National Water Master Plan office have been set up to coordinate and plan activities and collect and assess data.

5.3 Organisation and Management

Some of the organisations involved in groundwater development, mainly through rural water supplies, include:

- Ministry of Local Government, Rural and Urban Development;
- Ministry of Engergy and Water Resources Development;
- District Development Fund;
- Ministry of Health;
- Ministry of Community Development and Women's Affairs;
- private drilling contractors including:
  - Whitehead and Jack
  - Steyns Waterboring
  - Drill well
  - Tone Boring Co, Japan
  - Water and Mineral, Botswana.

The Water Act of 1976 however provides the MEWRD with the technical, professional and engineering role in the investigation, development and management of groundwater.

The Groundwater Branch of the MEWRD presently employs the following technical staff in head office:

1	Chief Hydrogeologist (expatriate, ODA funded)
1	Deputy Chief Hydrologist
4	Senior Hydrogeologists (1 post is vacant)
4	Hydrogeologists (2 posts are vacant and 2 have recently resigned)
2	Technical Assistants (4 posts are vacant)

Five of the hydrogeologists have BSc and three have MSc qualifications. The Branch experiences difficulties in retaining staff: three trained staff have recently moved to the mining sector. The senior hydrogeologists are responsible for activities in the three provinces with important drilling programmes (Midlands, Mashonaland and Matabeleland).

The Branch operations 50 drilling rigs and 30 personnel vehicles. Most rigs also have a vehicle attached. The Branch is well supplied with surface geophysical equipment including two sets of electromagnetic equipment and two slingrams. Most geophysical surveys are carried out using resistivity equipment in the Schlumberger configuration. The Branch possesses four geophysical loggers.

Only 10% of the boreholes drilled in 1987 were adequately tested with a 3-day pumping test including step and constant discharge test.

Casing is also used; the PVC is of class 10 and in 110 mm and 125 mm diameters.

The overall drilling success rate is 80%, ranging between 60% in the Darwin area to over 90% in those areas where a high level of technical expertise is available.

The major areas of groundwater abstraction are:

- western Zimbabwe;
- Bulawayo area;
- Copper Queen;
- Gokwe;
- Sengwa;
- Sinoia/Mangula;
- along the Great Dyke.

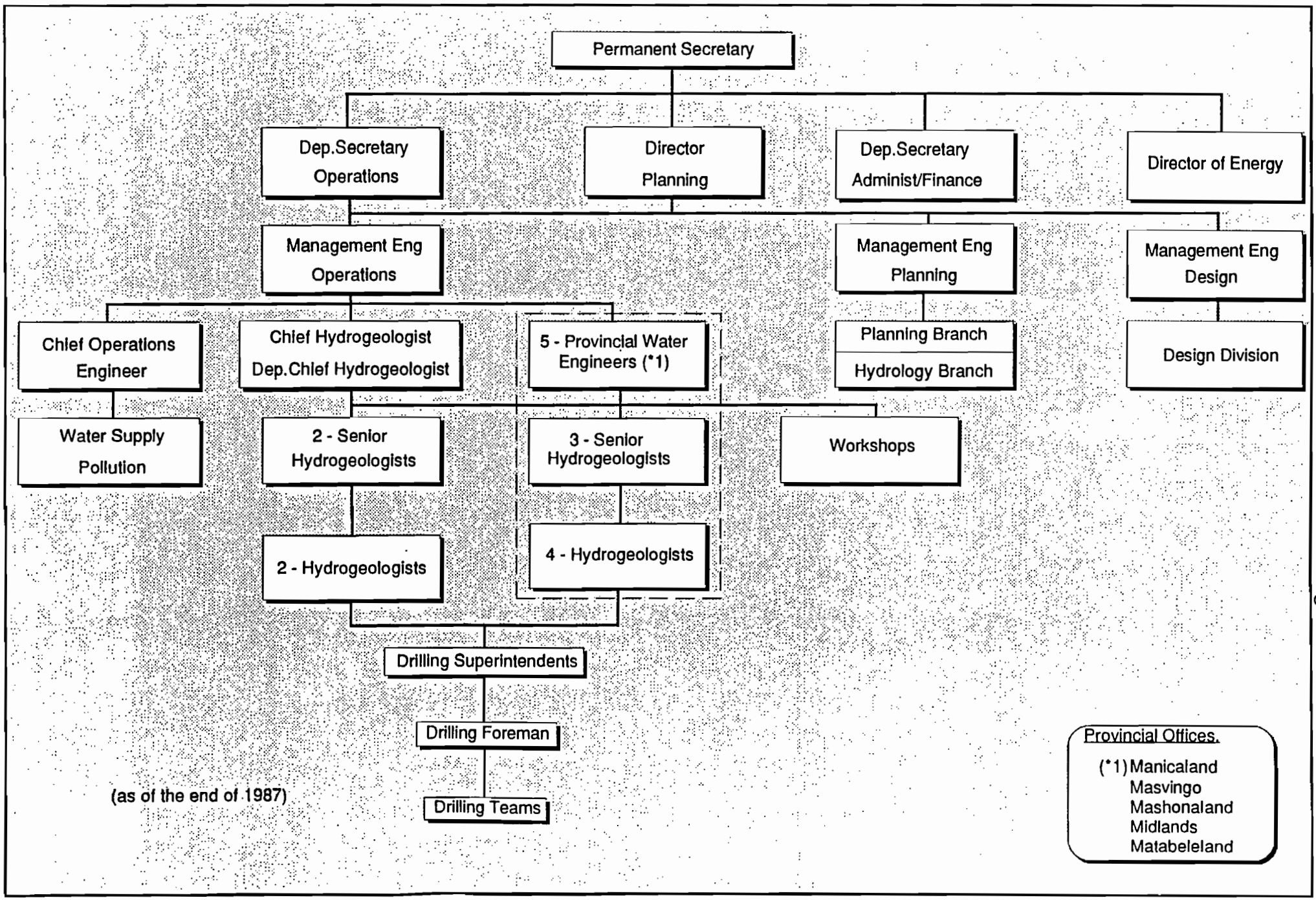


Figure 5.2 Organization Chart of MEWRD.

The major use of groundwater is for domestic water supplies although irrigation is important in the Sinoia/Mangula area, west of Bulawayo and along the Great Dyke. Implementation of the National Master Plan for Rural Water Supplies is presently underway, this calls for the construction of 25 000 boreholes and 12 000 hand dug wells over a 20-year project period. The average annual borehole construction rate is thus expected to increase by 25%. The boreholes would be drilled by District Development Funds through the Water Division, by the Drilling Sections of MEWRD and by private contractors.

5.4 Groundwater Database

Zimbabwe has very good coverage by aerial photography, topographic maps and geological maps. There is in addition a remote sensing station in Harare to provide satellite imagery.

The Water Data office in MEWRD has some 20 000 boreholes on record. The records vary in completeness. An additional 10 000 records are said to await processing. In particular many of the borehole locations are not shown on maps. Over 5 000 boreholes drilled by private contractors have no records at all.

Several computerised data banks have been set up in the last 10 years. The earliest attempt was a card based index of over 10 000 borehole records. The British Geological Survey established a computerised data bank on an Apricot computer; these records were of boreholes mainly in Victoria province. A NORAD funded project set up a further database using 5 000 records taken from existing sources and reports; this database is regarded as a trial for further work. Smaller databases have been established by consultants working in selected areas, for example Mashonaland.

A National Inventory Project has recently been started as part of the National Water Master Plan implementation. The National Water Master Plan office in MEWRD is responsible for developing a groundwater database for the national inventory. The intention is to inventory all boreholes and hand dug wells in the country. Two technicians will coordinate the inventory.

The office has produced a User Requirement Specification which is at present under discussion. The available computer facilities included are Wang minicomputer and 25 PCs. The intention is to input existing post-1980 borehole data summaries.

No regular monitoring of groundwater levels or groundwater quality is presently carried out by MEWRD. Some measurements are made during investigations for example in the Sinoia dolomites.

The Water Quality office within the MEWRD monitors 120 points in a monthly national water quality survey. The points are generating rivers and streams. Chemical and bacteriological analyses are made in the Ministry of Health laboratories. The quality of sewage effluent is the responsibility of

municipalities. Mining companies monitor the quality of their own discharges. A system of exemption permits is operated by the MEWRD: permits are issued on the basis of firm proposals to clean up effluents. At present 120 permits have been issued.

The MEWRD has requested that a water quality laboratory be set up within the ministry. ODA and Dutch finance have been agreed.

CHAPTER 6

CARTOGRAPHY

6.1 Introduction

There was no requirement to compile a groundwater map for Zimbabwe in the terms of reference, the work having already been done by Interconsult as part of the NORAD financed National Master Plan for Water Supply and Sanitation. A surface water map, at a scale of 1 : 4 000 000 has to be prepared.

6.2 Data Sources

Background information for the surface water maps was obtained by copying the ONC material produced as part of this study. The background included railways, large towns, major roads and rivers, and some topographic details.

6.3 River Gauging Stations

It proved impossible to include all discharge gauging stations that are currently operating on the map. Consequently, one had to be selective and, broadly, the criteria were:

- catchments to the gauging station should be greater than 1 000 km²;
- the record should be largely continuous, without a reported break;
- at and around dam sites where a number of gauges are established, preference was given to the upstream gauge;
- in addition, stations operating before 1940 were included, unless they had been largely superseded by a more recent station included under the above criteria.

6.4 Meteorological Stations

Those stations operated directly by the Department of Meteorological Services were included on the map because of their good spatial distribution and reliability of the information they provide.

6.5 Catchment Delineation

The major catchments were identified using the Hydrological Branch breakdown of the country into hydrological zones. The latter were identified from the published hydrological map of Zimbabwe (scale 1 : 1 million).

6.6 Isohyetal Information

The isohyetal pattern of mean annual rainfall was based upon the DMS map, published by the Surveyor General at a scale of 1 : 2 500 000, included in the Climate Handbook of Zimbabwe and reproduced in the National Master Plan for Water Supply and Sanitation. The isohyetal patterns along the border areas were adjusted to arrive at a compromise with maps published for adjacent countries: especially for Zambia, Botswana and Malawi.

CHAPTER 7

ASSESSMENT OF DATA COLLECTION SYSTEMS

7.1 Hydrological Data Needs

Future development of water resources in Zimbabwe can be divided into three dominant types:

(i) development of the hydropower potential of the Zambezi;

(ii) development of large and small dams on the rivers of Zimbabwe necessary to provide the storage needed to augment early summer flows for additional irrigation and water supply abstractions;

(iii) development of groundwater resources for rural water supply schemes.

For the first category of development a significant database already exists for Zambezi flows, albeit with some major question-marks over the quality and validity of the information. There is an urgent need to improve data quality by undertaking additional flow gauging at Victoria Falls and investigating possible underlying causes of the peculiar behaviour seemingly exhibited by the upper Zambezi catchment, and extrapolating such behaviour into the future.

For the second category, information is needed on the present low-flow behaviour of the country's rivers (in order to process the water rights applications), on the monthly patterns of runoff (in order to calculate reliable yields of schemes) and flood flows (to compute spillway capacities). At present, some very well established methods for collecting and processing these data are in use, but it is believed improvements are possible - particularly in the analysis of the influence of existing water rights and storage on the recent streamflow data collected, and summary statistics deduced from these distorted data-sets.

A significant element in assessing the yields from storage is the evaporative loss, and the techniques used for calculating this parameter that are presently used, based on evaporation pan data, might also be significantly improved. A detailed study of the potential evaporation rates throughout the country is recommended, bringing together the evaporation pan and other climatic data, use of the modified Penman equation and physical measurement of parameters such as net radiation and actual vapour flux rates.

7.2 Assessment of Climatological Data Collection

7.2.1 General Assessment

The UNESCO/WMO document 'Water Resource Assessment Activities - Handbook for National Evaluation' (1988) provides wide-ranging recommendations on the minimum acceptable hydrological station network densities, staffing levels and many similar criteria for assessing data collection systems. The principal hydrometeorological criteria are shown in Table 7.1, together with the equivalent statistics for Zimbabwe. This comparison indicates that the country is well provided with precipitation and evaporation stations,but short of equipment maintenance facilities and station inspection staff. The numbers of superstructure staff just meet the minimum recommended levels.

The UNESCO/WMO document contains an alternative breakdown of recommended staffing levels and these are shown in Table 7.2, together with our estimates of current staff activity in Zimbabwe. This analysis indicates shortfalls in staff levels on the data processing and field operations aspects of the work. These shortfalls, especially on the data processing side, are in part due to the department's policy of training the meteorological observers to carry out many of the fundamental tasks of data analysis and equipment maintenance and thus improving job interest for the observer at the same time as reducing the volume of work to be done at headquarters.

The above comparisons cannot provide the basis for recommendations of how the data collection agency should be strengthened - they merely indicate where current problems may lie. The overall density of observation stations is good, but there are wide regional variations in station density. In the master plan the following comments were made:

> 'Apart from a somewhat sparse rainfall station network in the Kalahari and Sebungwe zones and part of the Hunyani and Limpopo catchments the station network is considered to be adequate. From a hydrological point of view it is recommended that the mentioned areas be given preference when new raingauges are installed'.
>
> 'Although there are areas of considerable extension without any evaporation pans in operation, the installation of additional pans is not considered imperative for the knowledge of evaporation rates in Zimbabwe'.

It is understood that the Department of Meteorology is well aware of the areas in need of a denser raingauge coverage and efforts are being made to improve the situation. These are hampered by a lack of suitable volunteers to make the observations and it is hoped to deploy recording raingauges as a means of overcoming this difficulty.

TABLE 7.1

Climatological Data Collection Activity Levels

Element	Recommended[1] minimum density		Actual density
	Humid[2]	Arid	
Precipitation stations: non-recording (Number per 10^4 km^2)	40	6	31
Precipitation stations: recording (Number per 10^4 km^2)	2	1	1.2
Evaporation stations (Number per 10^5 km^2)	2	3	13
Repair and maintenance shops for meteorological equipment (Number per 200 precipitation stations)	1	2	0.2
Inspectors of meteorological stations (Number per 100 precipitation stations)	5	10	0.1
Superstructure staff: meteorology (Number per 100 precipitation stations)	3	3	3

Notes: (1) Recommendations from UNESCO/WMO (1988)

(2) Humid areas (where mean annual rain exceeds mean annual potential evaporation) only occur in Eastern Border hills.

TABLE 7.2

Manpower Requirements for Hydrometeorological Data Collection
(Number of Staff per 100 stations)

	Professional	Senior technician	Junior technician	Observers
Recommended levels (UNESCO/WMO, 1988)				
- Field operations	0.5	2	2	100
- Data processing	1	2	2	-
- Supervision	0.25	-	-	-
- Total	1.75	4	4	100
Actual levels (estimated)				
- Field operations	0.3	0.8	1.7	100
- Data processing	0.7	1.0	0.6	-
- Supervision	0.3	-	-	-
- Total	1.3	1.8	2.3	100

7.2.2 Present Constraints

The effectiveness of the work of the Department of Meteorological Services is hampered by a number of difficulties, including:

- insufficient transport facilities to carry out regular inspections of raingauges;
- a lack of experienced senior technical and professional staff, with a consequent lack of time allocated to the work of applied research;
- a lack of flexibility in the use of computers for data processing.

7.3 Assessment of Hydrometric Data Collection

7.3.1 General Assessment

The use of UNESCO/WMO Handbook (op cit) to assess the hydrometric data collection systems provides the comparisons of Tables 7.3 and 7.4 for the 'activity levels' and manpower requirements respectively. These underline the peculiarities of the methods adopted by MEWRD to collect and process hydrometric data, with points of particular divergence from 'standard' practice being:

TABLE 7.3

Hydrometric Data Collection Activity Levels

Element	Recommended[1] minimum density		Actual density
	Humid	Arid	
Surface water level stations: non-recording (Number per 10^4 km^2)	24	2.4	6.3 (17.6[2])
Surface water level stations: recording (Number per 10^4 km^2)	1	1	11.2
River discharge stations (Number per 10^4 km^2)	20	2	9.6
Sediment discharge stations (Number per 10^4 km^2)	3	0.4	0.4
Water quality of surface water (Number per 10^4 km^2)	3	0.4	0.8
Current meters (Number per 10 discharge stations)	1	2	0.05
Rating facilities for current meters (Number per 200 current meters)	1	2	Nil
Repair and maintenance shops for hydrological equipment (Number per 200 discharge stations)	1	2	2.2
Water sediment laboratories (Number per 100 sediment stations)	3	5	Nil
Water quality laboratories (Number per 100 water quality stations)	3	5	Nil
Hydrological field teams (2 to 3 persons) (Number per 10 discharge stations)	1	2	0.1
Special survey teams surface water (3 to 4 persons) (Number per 10^5 km^2)	1	2	Nil
Superstructure staff surface water (Number per 100 river discharge stations)	4	4	4.7

Notes: (1) Recommendations from UNESCO/WMO (1988)

(2) Including recording stations.

- very few current meters available or used, instead a high reliance placed on theoretical ratings of gauging structures;

- very few field gauging teams, or field staff;

- generally very low staffing levels.

TABLE 7.4

Manpower Requirements for Hydrometric Data Collection (Number of Staff per 100 Stations)

	Professional	Senior technician	Junior technician	Observers
Recommended levels (UNESCO/WMO, 1988)				
- Field operations	1	5	5	100
- Data processing	2	3	3	-
- Supervision	0.5	-	-	-
- Total	3.5	8	8	100
Actual levels (estimated)				
- Field operations	0	0.3	1.9	28
- Data processing	1.3	1.0	1.6	-
- Supervision	0.8	-	-	-
- Total	2.1	1.3	3.5	28

Nevertheless, the hydrology branch maintains a dense network of river discharge stations on a minimal budget, producing data of surprisingly good quality and well-suited to the applications for which the data are required. The principal difficulty would appear to be how this effort could be sustained.

Comments made in the Master Plan (Interconsult, 1986) included:

> 'Although the total number of river-gauging stations is fairly large information is scarce on rivers with undisturbed flows. Such rivers are mainly the smaller rivers in communal areas.
>
> 'Erection of stations on such rivers is recommended. However, until the staff situation in MEWRD has improved no increase in the network should be initiated. The running of the existing stations and processing of the current data is considered most important. Also natural flow at the existing gauging stations may be determined by calculation when both hydrological data and water rights data are fully computerized.'

'At most stations gauging weirs are erected and the flows are calculated from weir formulas. It is recommended that flow gaugings be carried out to check the theoretical calculations to extend the rating curves into the high flow ranges, where the weirs frequently are flooded. However, the consultant is fully aware that these extreme difficulties in obtaining flood gaugings in most areas, and that such gaugings require adequate staff, equipment and transport'.

7.3.2 Present Constraints

The principal difficulties currently facing the hydrological branch include:

- a severe shortage of staff, especially those trained and interested in hydrological work;
- a severe lack of transportation facilities;
- a lack of equipment with which to carry out flow gaugings.

7.4 Hydrogeology

The problems of the present groundwater data collection and data storage systems in Zimbabwe are recognised and efforts are being made to improve the systems. A national well inventory and national groundwater database are being set up. Although it is intended that all wells and boreholes will be located in the field only selected data will be stored. A more detailed database is required on the lines of the ODA financed project. Such a base would show all the information presently shown on the borehole data sheets including lithology, construction, pumping test data, pumping equipment installed, water quality data and water level information. This base would include all data presently catalogued and the 10 000 records said to be outstanding. Efforts would be made to obtain records from drilling contractors. This base would be accessed by the provincial offices.

The absence of regular waterlevel and groundwater quality monitoring data has been noted. A national network needs to be set up.

Improved test pumping practices should be introduced with a larger number of standard tests.

Groundwater investigations are proceeding in the north-east of the country. Additional projects could include:

- the dolomites south of Sinoia;
- Forest Sandstones;
- Wankie sandstones;

- Tengwe River limestones;
- Sabi river valley;
- alluvial deposits.

Detailed hydrogeological maps at a scale of 1 : 50 000 to 1 : 100 000 are required for the planning of rural water supplies during the implementation of the National Water Master Plan. These maps could show existing boreholes and wells, depths to waterlevel, water quality and geological features with groundwater potential such as regional fractures. The map would be accompanied by a short report. The production of these maps would greatly help the present well siting teams.

Additional staff recruitment is required to fulfill these objectives. Procurement of equipment appears to present few problems at present using foreign aid donors; test pumps, electrical conductivity meters and field water quality laboratories are required.

CHAPTER 8

RECOMMENDATIONS

8.1 Introduction

In the following sections recommendations are made to improve the hydrometic data collected to better serve the country's future water development needs. Some of the recommendations are beyond the capacity of the existing bodies and will require outside technical and financial assistance. These recommendations have been grouped into 'packages' which are detailed in Appendix G. In the case of Zimbabwe four country packages have been identified (shown in Table 8.1), in addition to the two regional projects which will relate to all the SADCC countries.

8.2 Department of Meteorological Services

8.2.1 Climate Data Collection

The Department operates a network of primary climatological data collection stations that record data to a very high standard, giving good areal coverage of the country. From a hydrological point of view, there is no perceived need to further extend this network.

8.2.2 Rainfall Data Collection

The network of daily read raingauges currently operating gives good coverage of most of the country, with only one or two areas identified where densities are less than desirable. Consideration should be given to the feasibility of using recorder systems in these areas capable of running unattended for periods in excess of one month.

There is a need to inspect all reporting raingauge stations to check on instrument siting and maintenance and provide an estimate of the reliability of recorded catches. Such an inspection should start with the raingauges used to compile the monthly bulletins and summaries.

8.2.3 Data Processing

The computer processing system currently in use within the Department is in need of updating: a task currently being undertaken under a WMO/UNDP project. Data handling prior to entry into the present computer system is excellent.

TABLE 8.1 SADCC HYDROMETRY DEVELOPMENT PROGRAMME SUMMARY OF COUNTRY PROJECTS

-ZIMBABWE-

REF	TITLE	EXECUTING AGENCY	OBJECTIVES	DURATION	INPUTS EXPERTS	INPUTS COUNTERPARTS	INPUTS VOLUNTEERS	COST US$ X 1.000 EXPERTS	COST US$ X 1.000 EQUIPMENT	COST US$ X 1.000 TRAINING
				months		man-months				
Zim1	Provision of Transport for Hydrometeorological Network Maintenance	Department of Meteorology	To provide the means for regular inspection of raingauge and climate stations, which will enable proper control over compilation of station histories and assessment of data reliability, plus the opportunity to effect instrument maintenance and repair, and observer training	12	0	0	0	0.0	25.0	0.0
Zim2	Rehabilitation of Hydrological Branch	Ministry of Energy and Water Resources Development	To revitalise the Hydrological Branch	18	10	x	0	85.0	250.0	100.0
Zim3	Improved Electronic Data Processing for Hydrology	Ministry of Energy and Water Resources Development	To provide new equipment, software and training for hydrological data processing	6	4	54	0	34.0	50.0	55.0
Zim4	Improved Sediment Monitoring	Ministry of Energy and Water Resources Development	To expand the current sediment monitoring programme to achieve a more detailed insight into patterns of land erosion, transportation of sediment in rivers and the influence of changing land use	48	12	124	36	224.4	300.0	40.0
			x -all available staff			SUB-TOTAL S		343.4	625.0	195.0
						TOTAL US $			1,163,400	

Every effort should be made to ensure that all meteorological data at present held on computer cards has been transferred to magnetic tape, in order that it can be used by the new computer system that is due to be purchased in late 1989.

There is a perceived need for the Department to further develop its analytical research activities in the fields of agrometeorology and hydrometeorology. More work needs to be done to:

- develop rainfall intensity and rainfall depth-area-duration relationships for use in engineering design;

- produce an authoritative work on evaporative rates in Zimbabwe, bringing together evaporation pan data and 'Penman' evaporation estimates, together with work to refine the regression constants within the Penman equation and the use of equipment to measure directly evaporative flux transfers;

- investigate periodicity, trend or other non-random variation in the occurrence of seasonal rainfall and drought durations;

- investigate the effectiveness of the cloud-seeding operations conducted each year.

8.2.4 Management

Despite the remarkable development that has taken place within the staffing of the Department in recent years, one or two areas still require strengthening, particularly the equipment maintenance and computer data processing sections. Assistance in these areas is currently being provided by the WMO/UNDP project.

A significant increase in transportation facilities is required, especially if the field visits needed to inspect gauge sites and ensure good equipment maintenance are to be undertaken. This item is addressed in the proposed project ZIM1, Appendix G.

Consideration should be given to the development of the Department of Meteorological Services in Harare as a regional centre of excellence in hydrometeorology, and the development of a training centre (possibly in conjunction with the University of Zimbabwe) to provide a training facility for the whole SADCC region.

8.3 Hydrological Branch

8.3.1 General

The Hydrological Branch has suffered a severe loss of skills since independence, and currently operates with an acute manpower problem, and with inadequate equipment and transport facilities. The most worrying problem is the failure to develop a nucleus of young, trained staff keen to replace the Europeans who have left the service, (through emigration and retirement) over the last two decades. Consequently, much work needs to be done to:

- recruit the right calibre of staff to meet the future needs of the Branch, and to develop the science of hydrometry within Zimbabwe;

- train this staff in basic hydrometric techniques, and to provide the basic education in hydrology to apply and use data collected;

- provide the transport and basic river gauging equipment necessary to improve the theoretical ratings of the flow gauging structures, especially for high discharges;

- improve the data processing techniques, the computer software and hardware.

The recommended way forward is to introduce an assistance package to the Hydrological Branch similar to that used by the Department of Meteorological Services in the 1980s (WMO/UNDP project ZIM/81/006). A necessary precursor to this activity would be the identification of suitable candidates to join the Branch and receive the training. A project, ZIM2, has been proposed to address these problems (Appendix G).

8.3.2 Recruitment

The present policy of using civil engineers to fill most of the professional and technical grades within the Branch has a number of draw-backs, and recruitment and promotion policies should be modified to allow equal opportunities to geographers, mathematicians, statisticians, environmental scientists and the like. For professional grades, postgraduate hydrological education should be provided whenever possible. Specific, formal training should also be provided for all technicians recruited.

8.3.3 Rehabilitation Programme

The major emphasis of the assistance programme to the Branch must be, in the initial phases, on manpower development. This should be done by:

- providing fellowships for postgraduate study in hydrology overseas;

- providing trainers to run local courses for hydrology technicians and observers;

- providing the foundations to develop an in-house training capability to provide future recruits with a proper appreciation of hydrology;

Other elements to be included within the rehabilitation project should be:

- transportation;

- basic flow gauging equipment, such as current meters, cableways and equipment for the moving-boat gauging method;

- reservoir sedimentation survey equipment;

8.3.4 Data Processing

The systems operation of the Government Scientific Computer Centre Perkins-Elmer mainframe computer presently imposes severe constraints on the retrieval and use of stored hydrometric data. The newly acquired Wang minicomputer system within the ministry seems to be a much more appropriate hardware system to be used for the data-processing, and efforts should be made to transfer as much of the workload as possible to this machine. Improvements in data processing are covered by the proposed project ZIM3 (Appendix G).

8.3.5 Sediment Monitoring

The importance of sedimentation in the design and viability of the country's thousands of reservoirs means that more research must be done on producing reliable estimates of fluvial sediment yield. Current programmes of data collection need to be considerably expanded, and more intensive monitoring of sediment deposition within reservoirs is required. This will require equipment, transport, laboratory facilities and manpower resources. This item is addressed in the proposed project ZIM4 (Appendix G).

8.3.6 Hydrological Analysis

Following the rehabilitation programme, efforts should be made to use the improved hydrometric database generated to provide more rigorous analysis of the regional variations in:

- the 'natural' flow regimes (allowing for upstream abstractions and artificial storages);

- the patterns of dry season flows;
- flood flows;
- sediment transport.

In addition, improved procedures for the processing of water rights applications and reservoir yield analysis could be developed.

8.4 Groundwater

The major recommendations can be summarised as follows:

- need to increase staff numbers with the minimum aim of at least one senior hydrogeologist (with MSc) in each province;
- need to improve borehole data collection system particularly with regard to private contractors;
- need to improve pumping test procedures;
- set up water level and water quality monitoring networks;
- set up groundwater database utilising all information provided by present records, including strengthening of management of the Water Data office;
- improve and strengthen the present well inventory project;
- carry out annual groundwater balance using simple techniques including abstraction and water level records;
- preparation of hydrogeological and groundwater resources maps at scales of 1 : 50 000 and 1 : 100 000 to provide an aid to rural water supply siting teams.

REFERENCES

CAPCO	1978	'Reappraisal of the power generation potential of the Zambezi River at Kariba'.
Dept Met Services	1981	'Climate Handbook of Zimbabwe'.
Euroconsult	1987	'Study on options and investment priorities in irrigation development, Country Report - Zimbabwe'.
Gilbert/Commonwealth International Inc	1988	'System Development Plan Study. Final Report' for Zimbabwe Electrical Supply Authority.
Interconsult	1985	'National Master Plan for Rural Water Supply and Sanitation'.
Kabell	1984	'An assessment of surface water resources of Zimbabwe and guidelines for Development planning'.
Kabell	1988	'The proposed programme for dam construction in Zimbabwe' Internal Note, MEWRD.
MEWRD	1977	'A guide to the design and construction of medium size earth dams in Rhodesia'.
Mitchell	1974	'A study of Rhodesian floods and proposed flood formula'.
Mitchell	1977	'Reservoir yield using the TPM method'.
Mitchell	1978	'A method of estimating the approximate yield of multiple dams using the Moran model'.
Southern African Economist	1989	Volume 2, Nr 3.
UNESCO/WMO	1988	'Water Resources Assessment Activities - Handbook for National Evaluation'.
Ward	1979	'Seiches, tides and wind set-up on Lake Kariba'.
World Bank	1982	'Zimbabwe - Issues and options in the energy sector'.
World Bank	1983	'Zimbabwe Population, Health and nutrition sector review'.

REFERENCES (cont)

World Bank	1983	'Zimbabwe - Agricultural Sector Review'.
World Bank	1986	'Zimbabwe land subsector study'.
World Bank	1987	'Zimbabwe: A strategy for sustained growth'.
Wurzel, P	1987	'Hydrology in Zimbabwe - the past and the future'.
Wurzel and Ward	1982	'Flood flow gauging with tritium in Southern Africa'.
ZESA	1987	'Annual Report'.

APPENDIX A

PARTICULAR TERMS OF REFERENCE

APPENDIX A

PARTICULAR TERMS OF REFERENCE

A.1 Hydrometeorology, Rainfall and Evaporation

A.1.1 Representativeness of Rainfall Network

The daily rainfall network comprises two sub-sets of stations: those reporting on a daily basis during the rainy season, and those only reporting by mail at the end of the month. The former group comprise about 90 stations, with a distribution shown in Figure 3.4. The density of the full network of daily read raingauges is indicated in Figure 3.5.

'Real time' data are available, in effect, only from those gauges reporting each day. These gauges cover virtually the whole country, with an average density of about one gauge per 4 500 km^2. The density is significantly lower in the catchments above lake Kariba, and in the Northeastern border area, in the lower Zambezi valley.

The need for a denser or more evenly distributed network of gauges will depend upon the use to which the data are put. At present, daily rainfall reports are used to provide an up-to-date estimate of the start date of the rains in various parts of the country, and to provide a guide as to whether the year is drier or wetter than normal. This information is particularly useful for drought monitoring, and providing an early warning of adverse foodgrain production conditions. The present network appears to be adequate for these tasks. Any extension to the current network could not be comfortably handled by the present manual system of making and receiving telephone calls, and an automated or semi-automated system might be required to handle an increased network complexity.

The pan evaporation network presently operated is considered to give a more-than-adequate areal coverage over the entire country.

A.1.2 Rainfall Logging

The provision of rainfall logging gauges may be considered under two headings, the acquisition of data from areas lacking raingauges, and as a research project into the details of the incidence of rainfall.

Installing data logging raingauges in remote areas needs careful study and planning, identifying suitable areas or sites which at the same time would be safe from interference by people or wild animals, and yet have reasonable access. At DMS headquarters the involvement will include equipment to read the logged data presumably on tape cassettes into a computer, suitable programs to analyse the data, trained

staff to maintain the operation and see that the data and analyses are utilised, as well as personnel trained to maintain the logging raingauges and computer services, and funds to cover the increased travelling.

These considerations also apply, to an even greater degree, in the case of a research project based on data logging raingauges. The formulation of the scope and aims of the research project is a vital aspect to be agreed before field installations commence; and it is equally important that staff should be assigned to the project, motivated to keep the project running efficiently, and to study and utilise the data which become available.

The Terms of Reference refers to a network in the intensive farming districts. No indication is given of the size of the network to be established, and this needs to be clarified. If an open mesh is contemplated, no more will be achieved than is available from the existing recording rainguages at about 70 km intervals. Analysis of their records, as published in the Annual Rainfall Reports since 1980/81, indicates that apart from sundry heavy storms which in different years occur in different areas, there is a surprisingly small variation in the average intensity of rainfall between one area and another.

For this reason, it is considered that if a network of logging raingauges is set up, it would be more profitable on the meso scale, perhaps 20 gauges at 1 km intervals, covering an area of 5 x 4 km. Such storms as passed across the network would be probed in detail, and the variations in amounts and intensities of rainfall within each storm would be more enlightening than the singly sampled, unrelated, storms occurring at different times over a widely separated network.

The area chosen for establishing this network could well be in an intensive farming district, since in general these are also areas of high rainfall. A suitable site might be found in the Arcturus district, not far from Harare but with much higher rainfall. If the logging system also includes telephone interrogation, closeness to Harare has cost advantages. As a project for investigating siltation rates, the experimental site will naturally include appropriate hydrological instrumentation to measure runoff rates and accumulation of silt, also included in the data logging technology.

A.1.3 Automatic Rainfall Stations

Granted that the technology for the automatic transmission of rainfall data to a remote, centrally located computer exists, it is not clear that this is a pressing need. Should automatic weather stations be set up, rainfall would naturally be included in the list of parameters observed and recorded. There are several areas of Zimbabwe where such climatological data are needed, but none where rainfall alone would justify a costly installation.

However, if such automated rainfall stations should be installed in remote and presently unrecorded areas, the merit of telemetry is to obviate the inconvenience of frequently visiting the site to collect the data logs, rather than for the real time value of knowing the rainfall itself. Heavy rainfall in an

unpopulated area is unlikely to cause a human crisis, and even if telemetered data gave warning of extreme rainfall, more populated areas would have a higher priority for taking remedial action if this were possible.

A.1.4 Computerisation

This aspect has been discussed in detail in Sections 3.3 and 3.4 of this report. It is understood that the DMS computer facility is undergoing considerable improvement under the FINNIDA/SATCC/ WMO 'CLICOM' project, the UNDP/WMO Project ZIM/86/031 and Danish and Japanese funded projects to improve and extend the regional crop monitoring and early warning centre established in the DMS offices. These projects also contain significant elements of training. Consequently it is felt that a further review of the situation is not needed until these projects mature.

A.2 Surface Water

A.2.1 Staffing Levels

The Hydrological Branch operates and maintains a network of over 400 river gauging stations throughout the country for the collection of data on river levels and discharges. Many of these stations have been in operation for many years and are badly in need of reconstruction. Despite pleas each year by the branch for adequate funds for maintenance and reconstruction, funds for this purpose have been meagrely allocated.

The branch also operates a sparse network of sediment measuring stations covering only a few rivers. There is considerable evidence that the incidence of severe erosion is accelerating in Zimbabwe with consequent deleterious effects on water supply dams and weirs. There have been some cases of dams becoming 100% silted up within a few years of construction in the more badly degraded areas of the country. Strengthening of the sediment transport and sediment deposition capability of the branch is therefore essential for estimating the likely effect of sedimentation in existing and proposed dams.

With regard to water rights which are issued by the Administrative Court after consideration of the technical evidence prepared by the Hydrological Branch, it is apparent that in the more developed area of the country a highly complex water right situation now exists which requires detailed and extensive scrutiny before any meaningful report can be prepared. In some areas no further rights can be issued because there is no more uncommitted water available.

Over the past years a steady decrease in the numbers of established staff of the Hydrological Branch has taken place despite an increase in the network and an increase in the fields of activity such as sedimentation. This is illustrated in Table 4.5. The Acting Chief Hydrological Engineer has reported:

'..the present establishment is totally inadequate to meet the basic objectives of data collection and surface water resource assessment programs required for an efficient and economic planning of water development works. It cannot even cope with the routine work e.g. quality control of data and processing of Water Right applications - at present some 250 applications are pending and some of these go back to 1986. Unless remedial action is taken now the development of the national surface water resources will be based on inadequate hydrological data with all the consequent adverse effects'.

A further area of concern is the doubtful quality of the hydrological data that is presently being processed. The hydrological information is coming from the gauging stations to the processing section with very little scrutiny of its validity by qualified and experienced staff because these staff are not available. There are many things that can go wrong to produce wildly inaccurate results, viz incorrect range settings on the recording machines, incorrect water levels inserted by the observer on the recorder charts, inaccurate compilation of the discharge tables for each station of the discharge tables for each station particularly at high floor level etc. All this requires the attention of special data quality control staff. In this last area much work needs to be done.

In Zimbabwe most of the river gauging structures comprise standard flow measuring devices such as V-notches, combinations of rectangular notch, flumes of various types, etc and while these are accurate at flows within the full supply depth of the device, the flood discharge is more of a guess when the water level is above the device. There are many gauging stations in this category and a systematic programme of rating these stations at high flow by means of radio-isotope methods, conventional current meter methods or hydraulic modelling is a high priority.

It is recommended that the strength of the Hydrological Branch be increased so that its capability can be improved in the following fields:

- preparation of hydrological reports for water right applications;
- quality of data processing;
- determination of gauging station discharge at high flow;
- sediment deposition data collection and research;
- sediment transport monitoring.

To achieve these objectives, the recommended professional and technical staff needed are shown in Table 4.5.

The recommendations of the NMWP consultants on the Hydrological Branch, which have not yet been implemented, are summarised briefly below:

(i) An additional Regional Hydrological Office be established in the Midlands Province to bring the total number of regional offices to five.

(ii) The number of regional hydrological engineers be increased to five.

(iii) All Regional Engineers to be in charge of and deal with both data collection and water rights as well as maintenance and construction in their respective regions.

(iv) Data collection and laboratory services to be removed from the Data Engineer's Office. Data collection to be dealt with by the Regional Engineers and the Laboratory to be headed by a technician under the Deputy Chief Hydrological Engineer.

(v) The Water Rights Office be headed by a Water Rights Engineer under the DCHE. However, most of the water right work would be carried out by the Regional Engineers.

These recommendations have not all been implemented and all are supported apart from (v). The Hydrological Branch used to have an establishment of two Deputy Chief Hydrological Engineers in 1974. There is one DCHE at the moment and the provision of a further DCHE is fully justified in view of the proposed activities of the branch. It is recommended that the one DCHE (A) be responsible for administration, organisation and data collection and the other DCHE (D) be responsible for data processing, co-ordination of water right activities, dam yield estimates, sediment and publications. If the water right work is carried out by the regional engineers then the need for a Water Rights Engineer falls away - the co-ordination would be carried out by the DCHE (D). The staff requirements are included in the proposed hydrological establishment shown in Figure 4.4.

Staff training requirements:

The civil engineers and technicians staffing the Hydrological Branch do not have any formal hydrological training and are posted to the branch as and when required. Such expertise as they acquire is picked up in the branch. It is recommended that they should become hydrological specialists and to this end the engineers could be sent to suitable universities to acquire MSc Hydrology qualifications (these courses are not available at the University of Zimbabwe).

The Hydrological Branch has never been a popular choice for engineers or technicians. On the whole, they prefer to engage in work in the Design Branch which they regard as 'true' engineering. Provincial work is the second choice open to them and their last choice is usually the Hydrological Branch. Working in hydrology, an engineer is less likely to be exposed to all-round civil engineering experience. Neither does a hydrologist rate highly his chances of gaining rapid promotion in other fields of engineering on the merits of his performance in hydrology: any expertise he may acquire in this field will not assist him in gaining promotion in 'main-line' civil engineering.

In order to train hydrological technicians, it would be more sensible to recruit adequately qualified school leavers to attend courses which, at the outset are designed to prepare them exclusively as hydrological technicians, so that the choice of diverting to other civil engineering disciplines is not so easily available to them unless they are prepared to start again at the beginning. This could be achieved if the trainees attended courses run by UNDP/WMO which are two-year junior and senior technician courses at various centres including Nairobi.

It becomes obvious that something has to be done to attract more engineers into hydrology.

In order to provide an inducement for specialisation, in addition to the privilege of training, a specialist allowance, bringing the hydrologists into line with other promotional opportunities within the Hydrological Branch could be considered.

A.2.2 Hydrological Network

There is a good coverage of the country with automatic water level recording stations and as mentioned above first priority should be given to the refurbishing of and the quality control on these existing stations. The construction of additional stations could be considered on smaller catchment areas in the lower rainfall areas in the communal lands such as:

(i) Mudzi River - Hydraulic Zone DR1;
(ii) A representative small river in the Zambezi valley east of Kariba dam - say a tributary of the Musengesi - Hydraulic Zone CUG1;
(iii) Sengwa and/or Ume Rivers - Hydraulic Zones AZ3 and AZ4. This area has large coal deposits and development is taking place. Existing hydrological information is sparse.

The introduction of telemetry systems brings data very rapidly to a central location, giving managers an opportunity to adjust the operation of water development projects in the light of the very latest information.

Telemetering stations are desirable on the two large rivers bordering Zimbabwe namely:

(i) Hydro Station ZGP26: Zambezi River: Victoria Falls Pump Station for up to date information on inflow into Kariba dam.
(ii) Hydro Station B35: Limpopo River: Beit Bridge Pump Station Control Section for early flood warning for Mozambique. There has been serious flooding of the lower Limpopo River in the past.

In addition, telemetering stations are very desirable at two irrigation areas where control of water released from the upstream dams has been deficient in the past because of poor communications. The recommended stations are:

(a) Save River irrigation scheme (Middle Save and Chisumbanje irrigation schemes supplied from Save River flow, from the existing Lesapi and Ruti dams and possibly from the Odzi Osborne dam under construction):

(iii) Hydro Station E149: Save Causeway;
(iv) Hydro Station E130: Odzi River: Odzi Bridge Gauging Weir;
(v) Hydro Station E161: Save River: Nyamasanga;

(vi) Hydro Station E118: Devure River: Chisurgwe Flume;
(vii) Hydro Station E134: Nyazwidzi River: Chirorgwe Flume;
(viii) Hydro Station E141: Lesapi River: Lesapi Dam Downstream Gauging Weir.

(b) Manyame Irrigation Scheme (Darwendale and Mazvikadei dams):

(ix) Hydro Station C89: Manyame River: Darwendale Downstream Gauging Weir;
(x) Hydro Station C61: Manyame River: Chinhoyi Rd, Bridge Gauging Weir;
(xi) Hydro Station C77: Manyame River: Yomba Gauging Weir;
(xii) Hydro Station C75: Mukwadzi River: Mazvikadei Downstream Gauging Weir.

Telemetry stations can also be useful in the operation and maintenance of remote gauging stations - the malfunction of an instrument being rapidly detected, allowing a maintenance team to visit the site with minimum delay and lost data. In these more remote sites, a telemetry system known as 'a data collection platform' can be used, allowing data transmitted over long distances. In Zimbabwe, the collection of such data is not a priority, and so there is no perceived need for the data collection platform technology to be introduced.

A.2.3 Reservoir Sedimentation Monitoring

As part of the National Master Plan, Interconsult carried out a one-off survey of sedimentation in over 30 reservoirs in Zimbabwe. Continuation of this work by re-surveying the reservoir areas using the same survey lines can yield very valuable information on the patterns of sediment deposition, with inferences concerning sediment transport in rivers and land erosion patterns following. Such surveys are important to complement the washload sediment monitoring at selected gauging stations as a means of studying the whole process of sediment movement through the river systems.

It is recommended that the Hydrological Branch procures the necessary modern echo-sounding and navigation equipment, boat and computer facilities so that the original dams used in the NMWP survey can be re-surveyed every five years. The equipment costing approximately US$ 200 000 could probably be obtained with donor aid.

A.2.4 Water Quality Laboratory

With the present and escalating use of water resources, pollution problems will inevitably get worse - as it is becoming clear already, and thus water pollution problems already evident will become more acute.

The legal machinery is already available for the monitoring and control of water pollution, but adequate monitoring facilities are necessary if there is to be effective control.

MEWRD has for some time and for various reasons made representations for the establishment of a water quality laboratory within the ministry. (See 'Assessment of MEWRD's need for a Water Quality Laboratory' by the British Geological Survey, 3 November 1986.)

It is understood that this matter has now been resolved and that Government has approved in principle the establishment of this laboratory with the proviso that only 30% of the technical work (analysis) is carried out by MEWRD laboratory while the remainder is carried out by Ministry of Health personnel. Donor funding is available for the construction of the laboratory and for the provision of the necessary equipment. There are, at present, MEWRD personnel who can be allocated to staff such as laboratory in the immediate and short term. Obviously, in the long term, staff will need to be trained for full-time attention to this project.

APPENDIX B

INVENTORY OF RAINGAUGE STATIONS

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1	20 2001 5689 R	NYAMOMBA	PM 9890	1622	2851	400	MANYAME	OCT. 1967	DEC. 1972	6
2	20 2002 5625 R	CHIRUNDU,POLICE	PN 9826	1603	2851	400	MANYAME	NOV. 1931	JULY 1977	6
3	20 2002 6129 P	CHIRUNDU SUGAR ESTATE	QN 0430	1600	2854	390	MANYAME	MAR. 1957	JUNE 1960	6
4	20 2002 8806 Z	MARONGORA	QN 3106	1613	2910	810	MANYAME	OCT. 1967		7
5	20 2180 7884 P	ATHENS	RL 1784	1718	2958	1160	MANYAME	JULY 1936	JUNE 1944	8
6	20 2180 8189 W	ROMSEY	RL 1990	1716	2959	1120	MANYAME	JULY 1922	JUNE 1929	8
7	20 2180 8192 Z	ORMESTON(CHINHOYI)	SR 8192	1714	3000	1160	MANYAME	JULY 1933		8
8	20 2180 8281 W	NYARORO	SR 8281	1719	3000	1140	MANYAME	DEC. 1920		7
9	20 2180 8389 N	LION'S DEN	SR 0389	1717	3001	1150	MANYAME	JAN. 1974		8
10	20 2180 8390 Y	SHEEPRIDGE	SR 8390	1711	3000	1160	MANYAME	JULY 1931	DEC. 1981	7
11	20 2180 8477 J	FREDA	SR 8477	1722	3001	1160	MANYAME	DEC. 1927	JUNE 1932	8
12	20 2180 0967 R	GOLDEN KOPJE	SR 8967	1728	3004	1200	MANYAME	DEC. 1932	APR. 1942	8
13	20 2180 9178 W	KANAMI	SR 9178	1722	3005	1220	MANYAME	JAN. 1949	JUNE 1974	8
14	20 2180 9273 Z	ARGYLE	SR 9273	1724	3006	1190	MANYAME	AUG. 1915	APR. 1935	8
15	20 2180 9283 K	MANINGWA	SR 9283	1719	3006	1220	MANYAME	JULY 1916	JUNE 1945	8
16	20 2180 9770 P	NATALIA	SR 9770	1726	3008	1220	MANYAME	OCT. 1948	NOV. 1956	8
17	20 2180 9797 T	UMBOE	SR 9797	1713	3009	1170	MANYAME	JULY 1921	FEB. 1952	8
18	20 2180 9864 R	PORTELET ESTATE	SR 9864	1730	3012	1230	MANYAME	JULY 1926		8
19	20 2180 9894 Z	DINGLEY DELL	SR 9894	1714	3010	1220	MANYAME	JULY 1921	JUNE 1951	7
20	20 2181 2474 D	VUTI	QM 6674	1630	2929	1150	MANYAME	MAR. 1964		7
21	20 2181 2571 J	REKOMETJE 1	QM 6072	1630	2930	1180	MANYAME	JAN. 1942	MAR. 1950	8
22	20 2181 3168 H	REKOMETJE 2	QM 7368	1635	2933	1200	MANYAME	JULY 1944	JUNE 1950	8
23	20 2181 3374 G	PENDENNIS FARM	QM 7575	1630	2934	1200	MANYAME	JULY 1928	OCT. 1933	8
24	20 2181 3[illegible]5 V	MANYANGAU	QM 7885	1626	2935	1220	MANYAME	NOV. 1952	SEP. 1965	8
25	20 2181 3[illegible]58 H	MOY	QM 7959	1638	2936	1280	MANYAME	NOV. 1987		8
26	20 2181 3967 B	RIDGES(THE)	QM 0167	1634	2938	1250	MANYAME	OCT. 1951		8
27	20 2181 4085 E	CHUNDU	QM 8285	1624	2939	1230	MANYAME	DEC. 1973	MAY 1975	8
28	20 2181 4439 P	KAROI RURAL COUNCIL	QM 0639	1649	2941	1250	MANYAME	AUG. 1967		8
29	20 2181 4539 Y	ROAD CAMP MSW3(NEW)	QM 8739	1649	2942	1240	MANYAME	AUG. 1979		8
30	20 2181 5015 Q	ROWA NGOMA	QM 0915	1702	2943	1240	MANYAME	NOV. 1952	JUNE 1965	8
31	20 2181 5132 S	CHELVERN	QM 9333	1652	2944	1300	MANYAME	DEC. 1940	AUG. 1967	8
32	20 2181 5455 T	MWANI	QM 9755	1640	2947	1240	MANYAME	OCT. 1925	JAN. 1960	8
33	20 2181 5520 P	MANI FARM	QM 9620	1659	2947	1170	MANYAME	NOV. 1947		8
34	20 2181 5526 W	SHOLAN PARK	QM 9726	1657	2947	1220	MANYAME	NOV. 1947	NOV. 1986	8
35	20 2181 5760 A	CHICANGAS MICA FIELDS	QM 9960	1638	2949	1220	MANYAME	JULY 1922	JUNE 1940	8
36	20 2181 5892 T	MATSIKITE	RM 0193	1620	2949	1180	MANYAME	DEC. 1965	NOV. 1970	8
37	20 2181 6035 Z	ZEBRA DOWNS	RM 0235	1651	2951	1250	MANYAME	NOV. 1952		7
38	20 2181 6440 P	GARAHANGA	RM 0539	1647	2951	1290	MANYAME	DEC. 1948	FEB. 1954	7
39	20 2181 6500 E	KAPIRI FARM	RM 0300	1710	2953	1140	MANYAME	NOV. 1922	JUNE 1967	8
40	20 2181 6559 T	KAPIRI HILL	RM 0059	1638	2953	1130	MANYAME	OCT. 1973	FEB. 1978	8
41	20 2181 6637 D	MOYALE	RM 0037	1650	2953	1200	MANYAME	NOV. 1979		7
42	20 2181 6714 M	ROAD CAMP MSW3(OLD)	RM 0516	1702	2953	1100	MANYAME	MAY 1973	JULY 1979	7
43	20 2181 7015 P	MUKWE RIVER RANCH	RM 0915	1702	2956	1100	MANYAME	DEC. 1917	NOV. 1933	7
44	20 2181 7235 D	MWALA	RM 1135	1652	2958	1090	MANYAME	NOV. 1947	JUNE 1969	7
45	20 2181 7340 S	ASHTON	RM 1540	1640	2957	1160	MANYAME	SEP. 1970	JULY 1979	7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
46	20 2181 7574 X	KAZANGARARA	RM 1774	1630	2958	640	MANYAME	JUNE 1974	AUG. 1974	0
47	20 2181 7500 D	ROAD CAMP MSW 6	RM 1600	1626	2958	870	MANYAME	SEP. 1973	JULY 1978	0
48	20 2181 7901 C	MONTROSE	RM 1802	1700	2959	1140	MANYAME	JULY 1921	APR. 1947	8
49	20 2181 8081 Y	SHAMROCKE MINE	SS 8081	1626	3000	740	MANYAME	OCT. 1969	AUG. 1970	7
50	20 2181 8107 B	YEANLING	SS 8107	1706	3000	1220	MANYAME	OCT. 1921		7
51	20 2181 8002 G	TEMPERLY	SS 8002	1709	3004	1140	MANYAME	DEC. 1939	JUNE 1966	0
52	20 2181 8812 S	ZEBRA VLEI	SS 8012	1704	3003	1100	MANYAME	JULY 1922	AUG. 1938	9
53	20 2181 8832 P	REDWING-GLADSTONE	SS 8032	1652	3004	1080	MANYAME	NOV. 1904		0
54	20 2181 8910 Z	LONG VALLEY	SS 8910	1706	3003	1130	MANYAME	NOV. 1930		9
55	20 2181 9015 N	DUXBURY	SS 9015	1702	3006	1110	MANYAME	JULY 1912	JUNE 1921	0
56	20 2181 9104 K	PALMTREE	SS 9104	1708	3006	1160	MANYAME	JUNE 1912	JUNE 1981	0
57	20 2181 9426 K	ROBBSDALE	SS 9426	1656	3008	1170	MANYAME	DEC. 1923	JUNE 1934	0
58	20 2181 9438 Y	VICTORY(MHANGURA)	SS 9430	1649	3008	1120	MANYAME	JULY 1946	SEP. 1955	0
59	20 2181 9725 K	NORAH	SS 9725	1655	3009	1160	MANYAME	JULY 1951	JUNE 1958	8
60	20 2181 9731 R	MHANGURA(MOLLY)	SS 9731	1653	3010	1140	MANYAME	FEB. 1958		0
61	20 2181 9908 J	DEDSI	SS 9908	1708	3010	1200	MANYAME	JULY 1913	FEB. 1959	0
62	20 2181 9912 N	TALFOURD	SS 9912	1704	3010	1170	MANYAME	JULY 1920	JUNE 1923	8
63	20 2182 1050 J	MANA POOLS(ZAMBEZI)	QN 5361	1543	2922	360	MANYAME	JULY 1967		6
64	20 2182 1414 W	RUKOMECHI	QN 5715	1608	2924	500	MANYAME	JULY 1959		7
65	20 2182 7468 B	MUTINI CAMP	RN 1968	1539	2959	0360	MANYAME	NOV. 1985		6
66	20 2182 9003 V	MANA POOLS(ANGWA)	ST 9003	1613	3006	460	MANYAME	NOV. 1960	SEP. 1973	7
67	20 2280 81 F	CHINHOYI,CITRUS ESTATE	TR 0081	1719	3012	1190	MANYAME	SEP. 1922	OCT. 1932	0
68	20 2280 178 V	CHINHOYI RAIL	TR 0178	1722	3012	1160	MANYAME	OCT. 1915		8
69	20 2280 254 C	NYAMASANGA AGRIC	TR 0254	1733	3011	1200	MANYAME	JAN. 1904		7
70	20 2280 259 H	CHITOMBORGWEZI SCHOOL	TR 0259	1733	3011	1200	MANYAME	OCT. 1964	DEC. 1983	7
71	20 2280 278 D	CHINHOYI AGRIC	TR 0279	1722	3013	1140	MANYAME	JULY 1904		0
72	20 2280 279 E	CHINHOYI,POLICE	TR 0279	1722	3012	1160	MANYAME	OCT. 1901	FEB. 1976	0
73	20 2280 340 W	NURONBEDZI	TR 0340	1742	3012	1330	MANYAME	AUG. 1901		0
74	20 2280 370 N	CHINHOYI	TR 0370	1722	3012	1140	MANYAME	DEC. 1956		0
75	20 2280 386 W	BAGUTA	TR 0386	1710	3013	1170	MANYAME	OCT. 1922	JUNE 1930	0
76	20 2280 752 T	RIVERSIDE	TR 0752	1736	3015	1220	MANYAME	OCT. 1969		7
77	20 2280 769 M	HILLMORTON	TR 0769	1727	3014	1190	MANYAME	DEC. 1935	JUNE 1952	7
78	20 2280 781 A	ELDORADO,RAIL	TR 0781	1720	3015	1160	MANYAME	JAN. 1909	APR. 1920	0
79	20 2280 782 B	ELDORADO MINE	TR 0782	1720	3015	1130	MANYAME	OCT. 1913	MAY 1919	8
80	20 2280 1065 J	ANNANDALE	TR 1065	1729	3016	1190	MANYAME	JULY 1964		7
81	20 2280 1082 C	MUNYANI FARM	TR 1082	1715	3017	1170	MANYAME	JULY 1964		0
82	20 2280 1086 G	NYAPI	TR 1086	1718	3016	1100	MANYAME	JULY 1922	JUNE 1938	8
83	20 2280 1190 V	MSENGI	TR 1190	1715	3017	1130	MANYAME	OCT. 1926	APR. 1977	0
84	20 2280 1275 M	DOONDO	TR 1275	1723	3017	1220	MANYAME	SEP. 1969	JULY 1979	8
85	20 2280 1332 Z	MADZIMA	TR 1332	1747	3018	1330	MANYAME	JAN. 1949		0
86	20 2280 1398 W	MONTGOMERY ESTATE	TR 1398	1711	3018	1110	MANYAME	NOV. 1940	JAN. 1951	0
87	20 2280 1455 H	MACHITI	TR 1455	1735	3018	1250	MANYAME	OCT. 1927	AUG. 1975	0
88	20 2280 1549 K	MTEMWA	TR 1549	1730	3019	1330	MANYAME	OCT. 1969	OCT. 1978	8
89	20 2280 1572 K	BICKLEIGHVALE	TR 1572	1726	3020	1280	MANYAME	OCT. 1969		0
90	20 2280 1596 L	CUTKEYA	TR 1596	1713	3020	1130	MANYAME	JULY 1964	SEP. 1982	9

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
91	20 2280 1601 D	GLENLUCE	TR 1601	1715	3020	1190	MANYAME	OCT. 1969		8
92	20 2280 1742 V	CYRENAICA	TR 1742	1741	3020	1310	MANYAME	SEP. 1969	MAR. 1980	8
93	20 2280 1754 H	TRELAWNEY RES.STN.	TR 1754	1735	3020	1330	MANYAME	NOV. 1934	MAR. 1979	8
94	20 2280 1764 T	KENIDIA	TR 1764	1729	3020	1270	MANYAME	MAR. 1927	MAR. 1953	8
95	20 2280 1866 E	PRESTON	TR 1866	1729	3021	1270	MANYAME	NOV. 1964		8
96	20 2280 1961 H	SUNDOWN	TR 1961	1731	3021	1450	MANYAME	OCT. 1948	JULY 1977	8
97	20 2280 2058 N	WEST ENTON	TR 2058	1733	3022	1310	MANYAME	JULY 1979		8
98	20 2280 2094 C	AYRSHIRE FARM	TR 2094	1713	3022	1190	MANYAME	OCT. 1969		8
99	20 2280 2199 R	AYRESHIRE MINE	TR 2199	1711	3023	1110	MANYAME	JULY 1901	DEC. 1907	8
100	20 2280 2241 H	KAZANZI	TR 2241	1743	3022	1370	MANYAME	JAN. 1961	AUG. 1982	8
101	20 2280 2243 P	DEBERA	TR 2243	1741	3023	1400	MANYAME	NOV. 1922	APR. 1956	8
102	20 2280 2250 X	TREFONEN	TR 2250	1737	3025	1370	MANYAME	JULY 1964		8
103	20 2280 2280 E	LEVERDALE FARM	TR 2280	1721	3023	1250	MANYAME	OCT. 1942		8
104	20 2280 2329 H	KUTAMA MISSION	TR 2329	1748	3023	1280	MANYAME	MAR. 1931		8
105	20 2280 2375 H	BANKET RAIL	TR 2375	1724	3023	1300	MANYAME	JAN. 1910		8
106	20 2280 2467 H	GREYCOURT	TR 2467	1728	3024	1300	MANYAME	JULY 1964		8
107	20 2280 2483 A	BANKET RES.STN.	TR 2483	1719	3024	1240	MANYAME	OCT. 1967		8
108	20 2280 2637 S	KUTAMA FARM	TR 2637	1744	3025	1360	MANYAME	SEP. 1969	SEP. 1975	8
109	20 2280 2672 F	WOODLEIGH	TR 2672	1726	3025	1280	MANYAME	DEC. 1922		8
110	20 2280 2736 A	BOWDEN	TR 2736	1745	3026	1360	MANYAME	SEP. 1969	FEB. 1977	8
111	20 2280 2828 A	BELMONT	TR 2828	1749	3026	1300	MANYAME	JULY 1927	OCT. 1937	8
112	20 2280 2893 N	MBIDZI	TR 2893	1714	3027	1200	MANYAME	SEP. 1969	NOV. 1973	8
113	20 2280 2955 N	STROUD	TR 2955	1734	3027	1390	MANYAME	NOV. 1937	APR. 1983	8
114	20 2280 2964 Y	TRELAWNEY ESTATE	TR 2964	1730	3027	1320	MANYAME	OCT. 1969		8
115	20 2280 2972 G	MUNENI	TR 2972	1725	3025	1250	MANYAME	OCT. 1969	AUG. 1977	8
116	20 2280 3074 S	MPANDAGUTA	TR 3074	1724	3027	1240	MANYAME	SEP. 1920	AUG. 1931	8
117	20 2280 3086 F	BETWEEN RIVERS	TR 3086	1717	3028	1210	MANYAME	MAY 1925	MAY 1981	8
118	20 2280 3128 B	TAUNTON	TR 3128	1749	3028	1330	MANYAME	JULY 1964		8
119	20 2280 3196 A	COMBE	TR 3196	1713	3028	1130	MANYAME	OCT. 1928	AUG. 1975	9
120	20 2280 3241 Z	ROCKLANDS(DARWENDALE)	TR 3241	1742	3028	1400	MANYAME	JULY 1965	JUNE 1970	8
121	20 2280 3299 H	NKUYU FARM	TR 3299	1710	3029	1190	MANYAME	AUG. 1968		8
122	20 2280 3347 P	MNONDO	TR 3347	1738	3029	1450	MANYAME	OCT. 1922	FEB. 1974	8
123	20 2280 3378 Y	LION KOP	TR 3378	1721	3029	1220	MANYAME	DEC. 1927		8
124	20 2280 3463 Q	STOCKSFIELD	TR 3463	1730	3030	1340	MANYAME	NOV. 1927		8
125	20 2280 3504 X	NORTHWOOD(BANKET)	TR 3504	1719	3031	1200	MANYAME	OCT. 1929	SEP. 1936	8
126	20 2280 3592 F	MUSONZOA	TR 3592	1715	3021	1220	MANYAME	SEP. 1969	SEP. 1977	8
127	20 2280 3730 F	DARWENDALE DAM	TR 3730	1748	3031	1340	MANYAME	FEB. 1973		7
128	20 2280 3754 G	EXCELSIOR	TR 3754	1735	3031	1390	MANYAME	SEP. 1969		8
129	20 2280 3784 P	NKARAKATI	TR 3784	1719	3031	1170	MANYAME	JULY 1964	JUNE 1977	8
130	20 2280 3788 T	MUTOMBOIS	TR 3788	1717	3032	1230	MANYAME	DEC. 1936	JULY 1978	8
131	20 2280 3899 P	MUNAKA PARK	TR 3899	1711	3033	1200	MANYAME	NOV. 1945		8
132	20 2280 3941 K	DARWENDALE ESTATES	TR 3941	1742	3033	1370	MANYAME	NOV. 1911	NOV. 1960	7
133	20 2280 3960 F	SUTTON ESTATE	TR 3960	1732	3033	1340	MANYAME	JAN. 1949	MAY 1971	8
134	20 2280 3969 Q	MLENGNE	TR 3969	1727	3033	1280	MANYAME	OCT. 1969		8
135	20 2280 3974 W	WYNHILL	TR 3974	1725	3033	1270	MANYAME	JULY 1907		8

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
136	20 2280 4040 S	DARWENDALE RAIL	TR 4040	1743	3033	1360	MANYAME	JULY 1929		7
137	20 2280 4281 E	RHINO KOP	TR 4281	1715	3035	1260	MANYAME	SEP. 1969	JULY 1977	0
138	20 2280 4297 X	KASHAO	TR 4297	1710	3035	1260	MANYAME	JULY 1926	JUNE 1971	8
139	20 2280 4320 X	LYDIATE HOTEL	TR 4320	1753	3035	1360	MANYAME	NOV. 1935	JUNE 1966	0
140	20 2280 4337 Q	AUDLEY END	TR 4337	1744	3035	1350	MANYAME	AUG. 1950		7
141	20 2280 4348 C	FRANCIS MINE	TR 4348	1739	3035	1390	MANYAME	AUG. 1969	NOV. 1981	0
142	20 2280 4395 D	KASHWAO SOUTH	TR 4395	1712	3035	1230	MANYAME	SEP. 1968	OCT. 1977	8
143	20 2280 4593 T	MURIEL MINE	TR 4593	1714	3037	1270	MANYAME	JULY 1964		8
144	20 2280 4621 Z	TANKATARA	TR 4621	1753	3036	1370	MANYAME	SEP. 1969	JUNE 1979	0
145	20 2280 4736 Z	MEDE FARM	TR 4736	1745	3037	1370	MANYAME	SEP. 1969	SEP. 1981	7
146	20 2280 4749 N	TANA FARM	TR 4749	1738	3037	1370	MANYAME	OCT. 1951	DEC. 1977	8
147	20 2280 4826 X	JOHN O'GROATS	TR 4826	1750	3037	1360	MANYAME	SEP. 1960	JUNE 1986	7
148	20 2280 4846 T	SODBURY	TR 4846	1740	3038	1390	MANYAME	OCT. 1969		8
149	20 2280 4863 M	GREENHITHE	TR 4863	1730	3038	1430	MANYAME	OCT. 1969	OCT. 1984	8
150	20 2280 4938 T	ROCKRIDGE	TR 4938	1744	3037	1400	MANYAME	JULY 1931	JUNE 1956	7
151	20 2280 5016 D	DAISY	TR 5016	1756	3038	1390	MANYAME	JULY 1929	JUNE 1941	8
152	20 2280 5069 L	MOOI RIVER	TR 5069	1727	3039	1390	MANYAME	OCT. 1968	FEB. 1981	8
153	20 2280 5099 T	LONE COW ESTATE	TR 5099	1711	3039	1330	MANYAME	MAY 1910		8
154	20 2280 5241 Y	DELAMORE	TR 5241	1743	3040	1400	MANYAME	SEP. 1936		8
155	20 2280 5265 Z	VOSLOMIA	TR 5265	1730	3038	1433	MANYAME	DEC. 1984	JAN. 1985	0
156	20 2280 5520 B	NORTON RAIL	TR 5520	1753	3041	1370	MANYAME	FEB. 1924		7
157	20 2280 5527 J	GOWRIE	TR 5527	1750	3042	1350	MANYAME	AUG. 1969		7
158	20 2280 5558 S	SANDRINGHAM	TR 5558	1733	3042	1420	MANYAME	JULY 1958		0
159	20 2280 5577 N	ROHNEY	TR 5577	1722	3043	1420	MANYAME	OCT. 1960	FEB. 1980	8
160	20 2280 5582 T	CAIRNSMORE	TR 5582	1720	3042	1500	MANYAME	MAY 1929	JUNE 1982	8
161	20 2280 5587 Z	HOLME EDEN	TR 5587	1717	3042	1480	MANYAME	OCT. 1969		0
162	20 2280 5632 Y	BROOMHILL	TR 5632	1747	3042	1450	MANYAME	OCT. 1958		7
163	20 2280 5739 F	MIZPAH	TR 5739	1743	3043	1400	MANYAME	OCT. 1969		7
164	20 2280 5844 D	INKOMO	TR 5844	1741	3043	1430	MANYAME	NOV. 1969		0
165	20 2280 5929 W	AURORA	TR 5929	1749	3043	1360	MANYAME	DEC. 1939		7
166	20 2280 5981 C	GRUINARD	TR 5981	1721	3044	1460	MANYAME	JUNE 1902		8
167	20 2280 6155 R	BITTON	TR 6155	1735	3044	1400	MANYAME	OCT. 1968	JULY 1977	0
168	20 2280 6322 Y	NUNYANI POORT	TR 6322	1753	3046	1350	NUNYANI	NOV. 1952		7
169	20 2280 6436 X	LILFORDIA	TR 6436	1745	3047	1400	MANYAME	SEP. 1913		7
170	20 2280 6446 H	MOONRAKERS	TR 6446	1740	3047	1450	MANYAME	JULY 1949		7
171	20 2280 6459 X	SANDOWN	TR 6459	1733	3046	1450	MANYAME	SEP. 1962	APR. 1976	0
172	20 2280 6511 D	SHERWOOD(NORTON)	TR 6511	1759	3047	1430	MANYAME	NOV. 1937		8
173	20 2280 6651 F	BALLINEETY	TR 6651	1737	3048	1440	MANYAME	DEC. 1923		0
174	20 2280 6718 D	LAKE MCILWAINE	TR 6718	1755	3048	1370	MANYAME	AUG. 1954		8
175	20 2280 6821 Q	WARWICK	TR 6821	1753	3049	1370	MANYAME	JULY 1926	JUNE 1966	7
176	20 2280 6921 Z	MCILWAINE FISHERIES	TR 6921	1754	3049	1360	MANYAME	JAN. 1984		7
177	20 2280 7130 R	SPITZKOP	TR 7130	1748	3050	1420	MANYAME	NOV. 1960		7
178	20 2280 7222 B	OATLANDS	TR 7222	1753	3051	1420	MANYAME	FEB. 1936	DEC. 1960	7
179	20 2280 7242 Y	GWEBI SOUTH	TR 7242	1742	3051	1450	MANYAME	DEC. 1946		7
			TR 7244	1741	3051	1430	MANYAME	OCT. 1912	JAN. 1965	8

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
181	20 2280 7344 J	CHEBI	TR 7344	1741	3052	1450	MANYAME	SEP. 1954	JUNE 1983	8
182	20 2200 7526 G	MARIMBA	TR 7526	1751	3053	1420	MANYAME	OCT. 1941		8
183	20 2280 7639 E	STAPLEFORD FARM	TR 7639	1744	3053	1470	MANYAME	NOV. 1905		7
184	20 2280 7742 R	ALDAN FARM	TR 7742	1742	3054	1440	MANYAME	DEC. 1903		8
185	20 2280 7845 D	SELBY	TR 7845	1741	3055	1440	MANYAME	NOV. 1913		9
186	20 2280 8137 W	MOUNT HAMPDEN RAIL	TR 8137	1745	3056	1480	MANYAME	NOV. 1956		8
187	20 2280 8226 S	CROWBOROUGH	TR 8226	1751	3057	1430	MANYAME	JAN. 1946	JUNE 1960	8
188	20 2280 8229 W	TYNWALD SOUTH	TR 8229	1749	3057	1470	MANYAME	JULY 1905		8
189	20 2280 8316 Q	THIRLMERE	TR 8316	1756	3057	1390	MANYAME	JAN. 1971	SEP. 1980	7
190	20 2280 8411 T	MANYAME RIVERSIDE PLOT	TR 8411	1759	3058	1370	MANYAME	NOV. 1930	MAR. 1978	7
191	20 2280 8423 G	HARARE,ASPINDALE PARK	TR 8423	1752	3057	1430	MANYAME	NOV. 1927		7
192	20 2280 8523 Q	HARARE,EAGLESVALE	TR 8523	1752	3058	1430	MANYAME	JULY 1949		8
193	20 2280 8617 S	NEWCROFT	TR 8617	1755	3059	1420	MANYAME	NOV. 1949	OCT. 1959	7
194	20 2280 8627 D	HARARE,WARREN HILLS	TR 8627	1750	3059	1450	MANYAME	JULY 1934		8
195	20 2280 8632 J	HARARE,ASHDOWN PARK	TR 8632	1748	3058	1490	MANYAME	JUNE 1974	JAN. 1979	8
196	20 2280 8634 L	HARARE,BLUFF HILL	TR 8634	1746	3059	1510	MANYAME	JULY 1969	NOV. 1982	8
197	20 2280 8722 G	HARARE,MHOFU SCHOOL	TR 8722	1753	3100	1220	MANYAME	MAR. 1959	NOV. 1964	7
198	20 2280 8724 J	HARARE,LOCHINVAR	TR 8724	1752	3059	1450	MANYAME	JULY 1951		7
199	20 2280 8732 S	HARARE,MABELREIGN	TR 8732	1747	3100	1480	MANYAME	NOV. 1973	DEC. 1985	8
200	20 2280 8736 X	HARARE,MARLBOROUGH WEST	TR 8736	1745	3100	1440	MANYAME	NOV. 1903	JUNE 1984	8
201	20 2280 8820 N	HARARE,HIGHFIELD	TR 8820	1754	3100	1430	MANYAME	MAR. 1965		7
202	20 2280 8920 X	HARARE,WATERFALLS WEST	TR 8920	1754	3101	1430	MANYAME	JAN. 1984		7
203	20 2280 8927 E	HARARE,W.COMMONAGE	TR 8927	1749	3101	1450	MANYAME	JULY 1920	AUG. 1935	8
204	20 2280 8930 H	HARARE,MEYRICK PARK	TR 8930	1748	3100	1450	MANYAME	SEP. 1946		8
205	20 2280 8932 K	HARARE,VALANCE DENE	TR 8932	1748	3101	1490	MANYAME	SEP. 1945	NOV. 1954	8
206	20 2280 8934 M	HARARE,GREENCROFT	TR 8934	1746	3100	1490	MANYAME	JULY 1951	NOV. 1963	8
207	20 2280 8937 Q	HARARE,MARLBOROUGH	TR 8937	1745	3101	1480	MANYAME	NOV. 1968		8
208	20 2280 9010 V	STONERIDGE	TR 9010	1759	3102	1400	MANYAME	SEP. 1960	JUNE 1984	7
209	20 2280 9020 F	HARARE,WATERFALLS	TR 9020	1754	3102	1450	MANYAME	JAN. 1969	APR. 1979	7
210	20 2280 9022 H	HARARE,SHANNONVALE	TR 9022	1753	3101	1450	MANYAME	OCT. 1927	APR. 1946	7
211	20 2280 9023 J	HARARE,ARDBENNIE	TR 9023	1753	3101	1450	MANYAME	JULY 1915	MAR. 1943	8
212	20 2200 9020 P	HARARE,BELVEDERE	TR 9020	1750	3101	1470	MANYAME	JULY 1936		8
213	20 2280 9031 S	HARARE,STRATHAVEN	TR 9031	1748	3101	1460	MANYAME	JAN. 1964	JUNE 1975	8
214	20 2280 9034 W	HARARE,AVONLEA	TR 9034	1746	3101	1500	MANYAME	NOV. 1979	JULY 1981	8
215	20 2280 9040 C	UNIVERSITY FARM	TR 9040	1744	3101	1480	MANYAME	OCT. 1985		8
216	20 2280 9111 E	CHIZORORO	TR 9111	1759	3101	1400	MANYAME	DEC. 1950	NOV. 1980	7
217	20 2280 9124 T	HARARE,AFRICAN SCHOOL	TR 9124	1752	3102	1450	MANYAME	FEB. 1950	MAR. 1956	8
218	20 2280 9126 W	HARARE,LION MATCH CO.	TR 9126	1751	3102	1480	MANYAME	OCT. 1947	JUNE 1955	8
219	20 2280 9129 Z	HARARE,MILTON PARK	TR 9129	1749	3101	1460	MANYAME	OCT. 1949	JUNE 1986	8
220	20 2280 9131 B	HARARE,AVONDALE	TR 9131	1747	3102	1490	MANYAME	APR. 1912	MAR. 1927	8
221	20 2280 9132 C	HARARE,PEYTON ROAD	TR 9132	1747	3102	1490	MANYAME	JULY 1950	JUNE 1971	8
222	20 2280 9133 D	HARARE,BROADLANDS	TR 9133	1747	3102	1530	MANYAME	OCT. 1922	MAR. 1953	8
223	20 2280 9134 E	HARARE,ASHBRITTLE	TR 9134	1746	3102	1490	MANYAME	DEC. 1950		8
224	20 2280 9227 F	HARARE,KOPJE	TR 9227	1750	3102	1510	MANYAME	SEP. 1973	JAN. 1976	8
225	20 2280 9228 G	HARARE,CITY	TR 9228	1750	3103	1460	MANYAME	JUNE 1977		9

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
226	20 2280 9229 H	HARARE,WEST RIDGE	TR 9229	1749	3102	1480	MANYAME	JULY 1901	JUNE 1919	0
227	20 2280 9232 L	HARARE,MOUNT VIEW	TR 9232	1747	3102	1510	MANYAME	DEC. 1926	JUNE 1939	0
228	20 2280 9234 N	HARARE,EMERALD HILL	TR 9234	1747	3102	1540	MANYAME	MAR. 1920		0
229	20 2280 9327 P	HARARE,GAOL(OLD)	TR 9327	1750	3103	1460	MANYAME	DEC. 1900	JAN. 1930	0
230	20 2280 9328 Q	HARARE,PUBLIC GARDENS	TR 9328	1749	3103	1480	MANYAME	MAY 1901	SEP. 1950	0
231	20 2280 9329 R	HARARE,CONVENT	TR 9329	1749	3103	1490	MANYAME	FEB. 1962		0
232	20 2280 9330 S	HARARE,ROYAL GOLF CLUB	TR 9330	1749	3103	1490	MANYAME	FEB. 1929		0
233	20 2280 9331 T	HARARE,PHILLIPS AVE.	TR 9331	1748	3103	1480	MANYAME	DEC. 1941	MAR. 1952	0
234	20 2280 9335 Y	HARARE,MOUNT PLEASANT	TR 9335	1746	3103	1500	MANYAME	NOV. 1945	JUNE 1987	0
235	20 2280 9427 Y	HARARE,RAIL	TR 9427	1750	3103	1470	MANYAME	JAN. 1910		0
236	20 2280 9429 A	HARARE,IV STREET	TR 9429	1749	3103	1480	MANYAME	JULY 1896	MAY 1964	0
237	20 2280 9430 B	HARARE,RES.STN.	TR 9430	1748	3103	1510	MANYAME	APR. 1904		0
238	20 2280 9431 C	HARARE,HARTMAN HILL	TR 9431	1748	3103	1530	MANYAME	NOV. 1900	DEC. 1909	0
239	20 2280 9432 D	HARARE,KINROSS RD.	TR 9432	1747	3103	1520	MANYAME	OCT. 1971	NOV. 1976	0
240	20 2280 9435 G	HARARE,PENDENNIS	TR 9435	1745	3103	1510	MANYAME	JULY 1924	JUNE 1961	0
241	20 2280 9436 H	HARARE,MOORGATE	TR 9436	1745	3103	1510	MANYAME	JULY 1904		0
242	20 2280 9437 J	HARARE,NORTHWOOD	TR 9437	1745	3104	1500	MANYAME	FEB. 1959	AUG. 1985	0
243	20 2280 9439 L	HARARE,TEVIOTDALE	TR 9439	1743	3105	1500	MANYAME	JULY 1926	JUNE 1957	0
244	20 2280 9510 N	ST.MARY'S MISSION(HAR.)	TR 9510	1759	3104	1430	MANYAME	JULY 1941	DEC. 1981	7
245	20 2280 9512 Q	PRINCE EDWARD DAM	TR 9512	1758	3103	1430	MANYAME	APR. 1928		7
246	20 2280 9519 Y	HARARE,RETREAT	TR 9519	1754	3194	1480	MANYAME	OCT. 1930	MAR. 1953	7
247	20 2280 9522 B	HARARE,CALEDON AV.	TR 9522	1753	3102	1460	MANYAME	MAY 1972	OCT. 1980	7
248	20 2280 9523 C	HARARE,CALEDON	TR 9523	1753	3104	1460	MANYAME	JULY 1951	JAN. 1968	8
249	20 2280 9525 E	HARARE,CRANBORNE	TR 9525	1751	3104	1460	MANYAME	FEB. 1938	FEB. 1946	8
250	20 2280 9530 K	HARARE,GAOL(NEW)	TR 9530	1749	3104	1490	MANYAME	JULY 1936	JAN. 1960	8
251	20 2280 9531 L	HARARE,POLICE CLUB	TR 9531	1748	3104	1510	MANYAME	DEC. 1968	JUNE 1984	0
252	20 2280 9533 N	HARARE,ALEXANDRA PARK	TR 9533	1747	3104	1520	MANYAME	JAN. 1936		8
253	20 2280 9536 R	HARARE,VAINONA	TR 9536	1745	3104	1540	MANYAME	OCT. 1915	JUNE 1962	8
254	20 2280 9621 J	HARARE,LOGAN PARK	TR 9621	1753	3105	1490	MANYAME	JULY 1986		7
255	20 2280 9623 L	HARARE,ROCKWOOD	TR 9623	1752	3104	1480	MANYAME	JAN. 1942	FEB. 1948	0
256	20 2280 9627 Q	HARARE,HILLSIDE	TR 9627	1750	3105	1480	MANYAME	OCT. 1912	SEP. 1947	0
257	20 2280 9631 V	HARARE,HIGHLANDS	TR 9631	1748	3105	1530	MANYAME	OCT. 1952		0
258	20 2280 9636 A	HARARE,POMONA	TR 9636	1745	3105	1530	MANYAME	SEP. 1972	DEC. 1979	8
259	20 2280 9708 D	SEKE I HIGH SCHOOL	TR 9708	1800	3105	1480	MANYAME	JAN. 1985		7
260	20 2280 9725 X	HARARE,TOB.EXP.STN.	TR 9725	1751	3105	1480	MANYAME	OCT. 1924	JUNE 1947	0
261	20 2280 9727 Z	HARARE,HILLSIDE NURS.	TR 9727	1750	3105	1480	MANYAME	JULY 1959		0
262	20 2280 9731 D	HARARE,FOREST NURS.	TR 9731	1748	3105	1530	MANYAME	JULY 1914		0
263	20 2280 9733 F	HARARE,RACE COURSE	TR 9733	1747	3105	1530	MANYAME	MAR. 1977		0
264	20 2280 9817 X	HARARE,KUTSAGA(OLD)	TR 9817	1758	3105	1480	MANYAME	JAN. 1954	AUG. 1978	0
265	20 2280 9823 D	HARARE,HATFIELD	TR 9823	1753	3106	1490	MANYAME	NOV. 1948		0
266	20 2280 9825 F	HARARE,QUEENSDALE	TR 9825	1751	3105	1490	MANYAME	OCT. 1974	MAY 1976	0
267	20 2280 9829 K	HARARE,ALLENBY ROAD	TR 9829	1749	3107	1530	MANYAME	JAN. 1926	JUNE 1965	0
268	20 2280 9831 M	HARARE,PSC.TR.CTRE.	TR 9831	1748	3105	1520	MANYAME	OCT. 1968		0
269	20 2280 9833 P	HARARE BORROWDALE	TR 9833	1747	3105	1542	MANYAME	JULY 1987		0
			TR 9915	1757	3106	1480	MANYAME	FEB. 1940	JUNE 1951	7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
271	20 2200 9918 G	HARARE,AIRPORT	TR 9918	1755	3106	1500	MANYAME	OCT. 1956		7
272	20 2200 9928 S	HARARE,RHODESVILLE	TR 9928	1749	3106	1530	MANYAME	OCT. 1949	SEP. 1955	8
273	20 2200 9929 T	HARARE,GREENDALE N.	TR 9929	1749	3107	1540	MANYAME	SEP. 1925		8
274	20 2201 22 V	RICHMOND	TS 0022	1658	3011	1200	MANYAME	JULY 1921	OCT. 1934	7
275	20 2201 107 M	DEVONIA	TS 0107	1706	3011	1200	MANYAME	JULY 1923	JUNE 1928	8
276	20 2201 123 E	WHINDALE RANCH	TS 0123	1658	3013	1200	MANYAME	JULY 1934		7
277	20 2201 211 A	LONGMEAD	TS 0211	1704	3012	1200	MANYAME	JUNE 1913	JUNE 1928	8
278	20 2201 442 B	SUMMER HILL	TS 0442	1647	3013	1200	MANYAME	NOV. 1947	FEB. 1969	8
279	20 2201 475 M	CHENANGA CAMP	TS 0475	1629	3014	1120	MANYAME	JAN. 1966	JUNE 1970	7
280	20 2201 627 C	RIETFONTEIN	TS 0627	1655	3015	1250	MANYAME	MAR. 1940	DEC. 1974	8
281	20 2201 645 X	DOMA	TS 0645	1645	3014	1160	MANYAME	NOV. 1964		8
282	20 2201 1115 H	BRONKHORST SPRUIT	TS 1115	1702	3017	1170	MANYAME	FEB. 1941	JUNE 1972	8
283	20 2201 1503 E	TWO RIVERS FARM	TS 1503	1708	3019	1110	MANYAME	OCT. 1921	JUNE 1940	8
284	20 2201 1803 F	KADUNA	TS 1803	1708	3021	1080	MANYAME	JULY 1964	JUNE 1970	8
285	20 2201 1941 F	TREELANDS	TS 1941	1648	3022	1070	MANYAME	AUG. 1951	JUNE 1984	7
286	20 2201 2008 D	KUSKIE	TS 2008	1706	3022	1100	MANYAME	OCT. 1929	OCT. 1935	8
287	20 2201 2223 M	YOMBA FARM	TS 2223	1657	3024	1010	MANYAME	MAY 1966	JUNE 1975	8
288	20 2201 2445 D	MUKAMBA	TS 2445	1646	3025	1070	MANYAME	APR. 1970	JUNE 1984	7
289	20 2201 2531 X	MTUNA	TS 2531	1653	3026	960	MANYAME	SEP. 1976	JAN. 1984	7
290	20 2201 2626 A	MAFOOTA/ALLANGROVE	TS 2626	1656	3025	1040	MANYAME	JULY 1920	JUNE 1934	8
291	20 2201 2702 H	NCHEFU	TS 2702	1709	3026	1110	MANYAME	OCT. 1969		8
292	20 2201 2734 S	CHIWE FARM	TS 2734	1652	3027	960	MANYAME	MAR. 1949	JAN. 1976	8
293	20 2201 2799 N	CHITSUNGO MISSION	TS 2799	1617	3027	380	MANYAME	APR. 1960	JULY 1970	7
294	20 2201 2814 E	RAFFINGORA	TS 2814	1702	3027	1140	MANYAME	DEC. 1937		8
295	20 2201 3210 K	CHINOMWE	TS 3210	1705	3029	1220	MANYAME	JULY 1933		8
296	20 2201 3230 G	SILATER ESTATE	TS 3230	1654	3030	1020	MANYAME	JULY 1922	FEB. 1931	8
297	20 2201 3261 Q	BVOCHURA	TS 3261	1636	3029	1170	MANYAME	DEC. 1964	DEC. 1978	7
298	20 2201 3319 D	INKARI	TS 3319	1700	3030	1100	MANYAME	OCT. 1972	APR. 1979	8
299	20 2201 3322 G	NYABONDA FARM	TS 3322	1658	3029	1120	MANYAME	JULY 1965	JAN. 1972	8
300	20 2201 3471 T	KACHUTA	TS 3471	1631	3030	1080	MANYAME	DEC. 1964		7
301	20 2201 3625 L	WYE FARM	TS 3625	1657	3031	1030	MANYAME	JULY 1979		8
302	20 2201 3806 H	DALSTON ESTATE	TS 3806	1707	3032	1250	MANYAME	OCT. 1969		8
303	20 2201 4127 G	DYFFRYN	TS 4127	1656	3035	1070	MANYAME	NOV. 1947	FEB. 1970	8
304	20 2201 4252 S	MAZURA	TS 4252	1642	3035	1060	MANYAME	OCT. 1963		7
305	20 2201 4371 X	NYABANI FARM	TS 4371	1632	3036	1080	MANYAME	NOV. 1960	MAY 1982	7
306	20 2201 4546 M	ST.LINUS SCHOOL	TS 4546	1646	3037	1180	MANYAME	FEB. 1972		7
307	20 2201 4805 T	UMVUKWES RANCH	TS 4805	1707	3038	1300	MANYAME	OCT. 1913		8
308	20 2201 4934 J	MDINDO	TS 4934	1650	3039	1200	MANYAME	NOV. 1954		7
309	20 2201 5024 G	MOUNT FATIGUE	TS 5024	1657	3040	1190	MANYAME	JULY 1940		7
310	20 2201 5080 S	GOTA FARM 60	TS 5080	1627	3040	1130	MANYAME	MAR. 1984	OCT. 1984	7
311	20 2201 5277 G	JENA FARM 72	TS 5277	1629	3041	1120	MANYAME	NOV. 1984		7
312	20 2201 5302 J	MUTORASHANGA	TS 5302	1709	3040	1420	MANYAME	MAR. 1974		8
313	20 2201 5346 G	SAMENGKA	TS 5346	1645	3041	1170	MANYAME	NOV. 1987		7
314	20 2201 5508 H	ROAD CAMP MSW 7(MUTORAS)	TS 5508	1706	3042	1370	MANYAME	AUG. 1979		8
315	20 2201 5656 T	GURUVE	TS 5656	1639	3042	1180	MANYAME	OCT. 1984		7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	N.A.R.
316	20 2201 5723 R	BIRKDALE FARM	TS 5723	1658	3043	1310	MANYAME	JULY 1947		7
317	20 2201 5767 P	MAKOMBI FARM	TS 5767	1634	3044	1230	MANYAME	NOV. 1968		7
318	20 2201 6036 G	MWEMBEZI	TS 6036	1651	3045	1280	MANYAME	JULY 1984		7
319	20 2201 6188 X	MAHUWE AGRIC	TS 6188	1623	3046	480	MANYAME	JAN. 1984		7
320	20 2201 6237 A	KAZILO SECTION	TS 6237	1651	3046	1300	MANYAME	OCT. 1969		0
321	20 2201 6243 G	SHAYABVUDZI	TS 6243	1647	3045	1330	MANYAME	MAR. 1957		7
322	20 2201 6258 Y	BOME FARM	TS 6258	1639	3046	1220	MANYAME	DEC. 1969	SEP. 1985	7
323	20 2201 6307 B	MONDYNES	TS 6307	1706	3046	1540	MANYAME	JULY 1951	OCT. 1959	8
324	20 2201 6609 E	UMSENGEZI FARM	TS 6609	1705	3048	1520	MANYAME	MAR. 1972	DEC. 1979	8
325	20 2201 6731 M	IMPINGI RANCH	TS 6731	1653	3049	1420	MANYAME	OCT. 1937		0
326	20 2201 7116 F	MVURWI	TS 7116	1702	3051	1480	MANYAME	NOV. 1961		0
327	20 2201 7156 Z	NYAVUTI	TS 7156	1640	3050	1290	MANYAME	OCT. 1948		7
328	20 2201 7344 D	GURUNGWE FARM	TS 7344	1646	3052	1380	MANYAME	JULY 1929	JUNE 1937	8
329	20 2201 7351 L	TIASEKA FARM	TS 7351	1643	3053	1330	MANYAME	NOV. 1968		7
330	20 2201 7394 H	BWAZI AGRIC	TS 7394	1619	3053	410	MANYAME	FEB. 1984		7
331	20 2201 7519 T	PEMBI RANCH	TS 7519	1700	3053	1460	MANYAME	FEB. 1926	MAR. 1955	8
332	20 2201 7796 V	MASOMO KEEP	TS 7796	1618	3055	400	MANYAME	JAN. 1970	DEC. 1978	7
333	20 2201 7044 X	NYAMANECHE	TS 7044	1647	3057	1430	MANYAME	NOV. 1949		0
334	20 2201 8134 M	HOLMHEAD FARM	TS 8134	1652	3056	1360	MANYAME	NOV. 1979		0
335	20 2201 8225 L	DONJE	TS 8225	1656	3057	1430	MANYAME	OCT. 1925	DEC. 1962	9
336	20 2201 8585 C	MUZARABANI COM.L.	TS 8585	1624	3059	410	MANYAME	FEB. 1961	JUNE 1966	7
337	20 2201 8590 H	GUTSA IRRIG.SCHEME	TS 8590	1622	3059	410	MANYAME	NOV. 1966	JUNE 1979	7
338	20 2201 8830 T	ELGIN	TS 8830	1655	3101	1370	MANYAME	NOV. 1932	FEB. 1974	8
339	20 2201 8885 D	MUZARABANI ESTATE	TS 8885	1625	3101	450	MANYAME	NOV. 1976		7
340	20 2201 8931 D	RUNANGORI	TS 8931	1654	3101	1370	MANYAME	SEP. 1936		0
341	20 2201 9156 Y	MOUNT DARNIS	TS 9156	1640	3102	1160	MANYAME	NOV. 1977		7
342	20 2201 9236 K	RUMANJE	TS 9236	1651	3104	1330	MANYAME	OCT. 1937		0
343	20 2201 9243 S	ARANDIRA ESTATES	TS 9243	1646	3103	1220	MANYAME	NOV. 1945		0
344	20 2202 1218 P	ANGWA KEEP	TT 1218	1607	3019	300	MANYAME	JAN. 1978		7
345	20 2202 1066 T	KANYEMBA AGRIC	TT 1066	1540	3022	340	MANYAME	JAN. 1984		6
346	20 2202 2169 Y	KANYEMBA,POLICE	TT 2169	1538	3025	330	MANYAME	OCT. 1965	AUG. 1979	6
347	20 2202 3505 A	TILCOR MUSHUMBI POOLS	TT 3505	1613	3031	390	MANYAME	DEC. 1976	JULY 1978	7
348	20 2202 3811 H	MUSHUMBI AGRIC	TT 3811	1610	3033	380	MANYAME	AUG. 1970	NOV. 1985	7
349	20 2202 3929 L	MANYAME MISSION	TT 3929	1600	3034	350	MANYAME	FEB. 1949	DEC. 1972	6
350	20 2202 4421 W	MUSHUMBI BRIGADE II	TT 4421	1605	3036	360	MANYAME	JULY 1984		7
351	20 2202 6021 E	GONONO AGRIC	TT 6021	1605	3050	410	MANYAME	FEB. 1978		6
352	20 2202 9918 W	MUSENGEZI AGRIC	TT 9918	1607	3100	350	MANYAME	JULY 1951		6
353	20 2379 397 V	CHITSWEDEMO SCHOOL	UQ 0397	1807	3108	1420	MANYAME	JAN. 1972		7
354	20 2379 1983 T	CHISENGENI SCHOOL	UQ 1983	1814	3117	1510	MANYAME	JAN. 1985		7
355	20 2379 3208 H	LARK HILL	UQ 3208	1811	3125	1590	MANYAME	SEP. 1930		0
356	20 2379 3790 H	DIGGLEFOLD	UQ 3790	1810	3127	1600	MANYAME	DEC. 1948	DEC. 1953	0
357	20 2379 3809 R	MARONDERA RES.IRRIG.	UQ 3809	1811	3128	1630	MANYAME	NOV. 1968		0
358	20 2379 4091 K	MARONDERA RES.WINDMILL	UQ 4091	1811	3129	1640	MANYAME	DEC. 1938		0
359	20 2379 4190 S	MARONDERA R.S.,OFFICE	UQ 4190	1810	3129	1640	MANYAME	JULY 1948	JUNE 1958	0
360	20 2379 4191 T	MARONDERA R.S.LYSIMETER	UQ 4191	1810	3130	1650	MANYAME	SEP. 1950	JAN. 1971	8

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
361	20 2380 218 V	HARARE,KUTSAGA T.R.S.	UR 0210	1755	3108	1480	MANYAME	SEP. 1970		7
362	20 2380 222 Z	HARARE,EPWORTH MISSN.	UR 0222	1753	3108	1520	MANYAME	AUG. 1935	MAR. 1960	0
363	20 2380 32· N	HARARE,CLEVELAND DAM	UR 0327	1751	3109	1540	MANYAME	JULY 1912		8
364	20 2380 328 P	HARARE,GREENGROVE	UR 0327	1750	3108	1530	MANYAME	JULY 1904		8
365	20 2380 926 P	DUNNYBROOK	UR 0926	1750	3112	1590	MANYAME	JULY 1926	DEC. 1950	8
366	20 2380 1002 X	DEMA	UR 1002	1804	3112	1500	MANYAME	OCT. 1954		7
367	20 2380 1200 M	SEKE HYDRO	UR 1200	1805	3113	1500	MANYAME	NOV. 1903	JUNE 1904	7
368	20 2380 1208 W	DUNSTAN ESTATE	UR 1208	1800	3114	1500	MANYAME	JULY 1942		7
369	20 2380 1420 B	ATHELNEY	UR 1420	1754	3114	1540	MANYAME	OCT. 1952		8
370	20 2380 1523 N	INVERANGUS FARM	UR 1523	1752	3116	1560	MANYAME	JULY 1904	JUNE 1986	8
371	20 2380 1621 V	ROMANY	UR 1621	1753	3115	1550	MANYAME	NOV. 1953	OCT. 1967	8
372	20 2380 1623 X	GREENSYKE	UR 1623	1752	3116	1560	MANYAME	NOV. 1913	JUNE 1984	8
373	20 2380 1700 F	GLEN AVON	UR 1700	1805	3117	1520	MANYAME	FEB. 1944	MAY 1962	8
374	20 2380 2202 B	BROOKMEAD	UR 2202	1805	3118	1560	MANYAME	MAY 1912	FEB. 1919	8
375	20 2380 2310 T	MELFORT	UR 2310	1759	3120	1520	MANYAME	JULY 1966	OCT. 1971	8
376	20 2380 2404 W	RANDHURST	UR 2404	1803	3121	1550	MANYAME	FEB. 1918	JUNE 1929	9
377	20 2380 2502 C	BROMLEY	UR 2502	1804	3121	1550	MANYAME	MAY 1926		8
378	20 2380 3005 Z	MANOR	UR 3005	1802	3124	1540	MANYAME	JULY 1920	MAR. 1927	9
379	20 2381 1992 S	HOYA AGRIC	US 1992	1622	3118	400	MANYAME	JAN. 1961		7
380	20 2381 4495 N	KAITANO SCHOOL	US 4495	1615	3133	460	MANYAME	NOV. 1972	NOV. 1978	7
381	20 2381 7185 M	MAVURADONHA MISSION	US 7185	1624	3149	760	MANYAME	JULY 1930	MAR. 1974	7
382	20 2382 315 P	CHIMOYO CAMP	UT 0315	1608	3110	340	MANYAME	OCT. 1952	JUNE 1962	6
383	20 2382 5908 T	MUKUMBURA	UT 5908	1612	3141	450	MANYAME	NOV. 1974		6
384	21 2177 1803 K	PIONEER BLOCK	QH 4686	2001	2921	1420	RUNDE	OCT. 1951		6
385	21 2177 2192 W	WALSH BLOCK	RH 0993	1957	2957	1040	RUNDE	APR. 1949	NOV. 1955	6
386	21 2177 2469 X	ALTYRE RANCH	QH 5272	2008	2925	1250	RUNDE	DEC. 1947		6
387	21 2177 2988 L	BRAE VALLEY	QH 5790	1959	2927	1370	RUNDE	OCT. 1926	JUNE 1985	7
388	21 2177 2989 M	PEZULU FARM	QH 5891	1958	2928	1390	RUNDE	OCT. 1960		7
389	21 2177 3371 C	ROODEHEUVEL	QH 6073	2008	2930	1240	RUNDE	NOV. 1951	JULY 1971	6
390	21 2177 3667 Z	GREYSTONE	QH 6469	2009	2932	1220	RUNDE	OCT. 1940	JAN. 1955	6
391	21 2177 3691 A	ARUPANGA	QH 6493	1957	2931	1370	RUNDE	MAY 1929		6
392	21 2177 4165 Q	WAYLAND FARM	QH 6967	2010	2935	1190	RUNDE	NOV. 1980		6
393	21 2177 4189 R	DE BEER'S RANCH	QH 6991	1958	2934	1340	RUNDE	JULY 1930		6
394	21 2177 4261 D	INKUBU FARM	QH 7063	2013	2935	1100	RUNDE	NOV. 1952	OCT. 1980	5
395	21 2177 4371 P	PENTAGON	QH 7173	2008	2936	1220	RUNDE	APR. 1946	SEP. 1981	6
396	21 2177 5097 Y	SUNSET FARM	QH 8698	1955	2944	1280	RUNDE	DEC. 1959	JUNE 1984	6
397	21 2177 6330 C	DORO(THE)	QH 9039	2026	2945	1060	RUNDE	OCT. 1921	MAR. 1932	5
398	21 2177 6599 L	WOODLANDS(GHOKO PLAINS)	QJ 9400	1953	2949	1200	RUNDE	NOV. 1930	OCT. 1946	6
399	21 2177 7260 E	MABGEMATEMA	RH 1060	2014	2958	900	RUNDE	OCT. 1969	JAN. 1978	5
400	21 2177 7330 F	RADWAY FARM	QH 9930	2031	2952	1000	RUNDE	DEC. 1935	JUNE 1960	5
401	21 2177 7354 G	BANNOCKBURN RAIL	RH 0054	2017	2952	990	RUNDE	SEP. 1952		5
402	21 2177 7649 C	DADAYA MISSION	RH 0249	2020	2954	1000	RUNDE	APR. 1955	DEC. 1981	5
403	21 2177 7733 T	MBERENGWA D.A.	RH 0334	2029	2955	1100	RUNDE	SEP. 1899		4
404	21 2177 7827 W	VANGUARD ASBESTOS MINE	RH 0427	2033	2955	1040	RUNDE	JULY 1949	MAR. 1981	5
405	21 2177 7852 Y	DADAYA MISSION(OLD SITE)	RH 0553	2018	2955	1050	RUNDE	NOV. 1936	MAR. 1955	5

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
406	21 2177 0185 K	MAROMO	RH 0985	2000	2957	1060	RUNDE	MAR. 1976	NOV. 1978	6
407	21 2177 0950 R	DELVILLE PARK	SN 0950	2020	3002	920	RUNDE	MAR. 1930	JUNE 1951	5
408	21 2177 0957 Z	MASUNDA	SN 0957	2014	3001	990	RUNDE	JUNE 1952	JAN. 1979	5
409	21 2177 9148 G	ZVISHAVANE RAIL	SN 9148	2020	3002	930	RUNDE	FEB. 1929		5
410	21 2177 9317 Q	MNENE MISSION	SN 9317	2038	3003	1100	RUNDE	NOV. 1938		6
411	21 2177 9350 B	SHABANIE MINE	SN 9350	2020	3002	970	RUNDE	JAN. 1929		5
412	21 2177 9452 M	ZVISHAVANE	SN 9452	2019	3004	980	RUNDE	NOV. 1921		5
413	21 2178 3215 C	DAISYFIELD MISSION	QJ 6218	1944	2930	1370	RUNDE	MAR. 1916	JUNE 1948	6
414	21 2178 3604 A	VERGESIG	QJ 6505	1950	2933	1350	RUNDE	OCT. 1951	FEB. 1974	6
415	21 2178 4007 N	MIDDLEBULT	QJ 6909	1948	2934	1320	RUNDE	AUG. 1950	MAR. 1979	6
416	21 2178 4019 B	SOMABHULA,COUNCIL	QJ 7920	1942	2940	1420	RUNDE	OCT. 1966		6
417	21 2178 4020 C	SOMABHULA,RAIL	QJ 7921	1942	2940	1420	RUNDE	FEB. 1927		6
418	21 2178 5116 T	GLENCOLE	QJ 0117	1944	2941	1360	RUNDE	MAR. 1930	OCT. 1960	6
419	21 2178 5632 E	ROAD CAMP MID 3	QJ 0633	1935	2944	1430	RUNDE	MAR. 1973		6
420	21 2178 7017 K	ABERFOYLE RANCH	QJ 9918	1943	2951	1260	RUNDE	JULY 1917	OCT. 1961	8
421	21 2178 7212 X	GWENORO DAM	RJ 0113	1946	2953	1240	RUNDE	JULY 1967		8
422	21 2178 7839 D	GUINEA FOWL SCHOOL	RJ 0839	1932	2956	1430	RUNDE	FEB. 1949	SEP. 1978	7
423	21 2178 7923 V	IMPALA PARK	RJ 0823	1939	2956	1420	RUNDE	JUNE 1921	APR. 1939	8
424	21 2178 8031 M	HOME FARM	RJ 1031	1935	2957	1460	RUNDE	JUNE 1927	OCT. 1943	7
425	21 2178 8226 Z	SEBANGA POORT	RJ 1126	1938	2958	1460	RUNDE	OCT. 1977	JUNE 1979	8
426	21 2178 8340 Y	OAKLANDS	RJ 1339	1931	2959	1440	RUNDE	JAN. 1948		7
427	21 2178 8423 N	SHURUGWI,RAIL	RJ 1423	1940	2959	1450	RUNDE	JAN. 1910		9
428	21 2178 8437 D	SAFAGO	RJ 1437	1932	2959	1430	RUNDE	DEC. 1922		8
429	21 2178 8523 X	SHURUGWI,TOWN COUNCIL	SP 8523	1940	3000	1480	RUNDE	OCT. 1958		10
430	21 2178 8723 P	SHURUGWI,GAOL	SP 8723	1940	3000	1440	RUNDE	SEP. 1902		10
431	21 2178 0942 C	HIGHLANDS FARM(GWERU)	SP 0942	1930	3002	1400	RUNDE	OCT. 1973		8
432	21 2178 9124 A	UMCIMA	SP 9124	1940	3003	1150	RUNDE	OCT. 1973	OCT. 1977	8
433	21 2178 9311 D	HILLINGDON	SP 9311	1946	3004	1140	RUNDE	JULY 1916	JUNE 1935	8
434	21 2178 9809 V	DONGA	SP 9809	1947	3007	1200	RUNDE	OCT. 1951		6
435	21 2178 9812 Y	DANGA HOMESTEAD	SP 9812	1946	3007	1220	RUNDE	JULY 1924	JUNE 1931	7
436	21 2178 9849 N	GLENCRAIG	SP 9849	1926	3008	1280	RUNDE	JULY 1924	JAN. 1944	8
437	21 2276 3990 M	STERA	TN 3990	2052	3030	690	RUNDE	MAR. 1961		5
438	21 2276 4404 Z	MAKAWIRE SCHOOL	TN 4404	2056	3032	660	RUNDE	JUNE 1968		5
439	21 2276 4577 A	SARAHURU	TN 4577	2059	3033	650	RUNDE	OCT. 1971	DEC. 1978	5
440	21 2276 5290 A	NEGARI	TN 5290	2052	3037	650	RUNDE	JULY 1907		6
441	21 2276 5503 T	NESHURO	TN 5503	2057	3039	600	RUNDE	DEC. 1943		6
442	21 2276 6649 C	RUTENGA RAIL	TN 6649	2113	3045	550	RUNDE	NOV. 1955		4
443	21 2276 6988 W	LUNDI,RHINO HOTEL	TN 6988	2055	3049	500	RUNDE	NOV. 1929	NOV. 1971	6
444	21 2276 7088 E	LUNDI MISSION	TN 7080	2054	3047	500	RUNDE	DEC. 1900		6
445	21 2276 7198 Z	LOWVELDT STORES	TN 7198	2048	3048	550	RUNDE	JULY 1952	JUNE 1967	6
446	21 2276 7394 M	MADZIVIRE	TN 7394	2050	3049	500	RUNDE	APR. 1977	JAN. 1979	7
447	21 2276 7953 V	MKUMI	TN 7953	2112	3045	500	RUNDE	OCT. 1910	JUNE 1935	4
448	21 2276 9198 Y	NYAHOMBE	TN 9190	2049	3059	600	RUNDE	FEB. 1907		8
449	21 2276 9256 L	DUMGA SECTION	TN 9256	2112	3057	520	RUNDE	JULY 1921	JUNE 1936	5
450	21 2277 177 H	SHIKU	TN 0177	2006	3008	980	RUNDE	APR. 1952	OCT. 1977	5

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECURD	LAST RECURD	M.A.R.
451	21 2277 432 P	VUGHE	TN 0432	2030	3009	940	RUNDE	MAR. 1976	JUNE 1978	5
452	21 2277 534 A	VUGHE,RAIL	TN 0534	2027	3008	920	RUNDE	JULY 1956	APR. 1962	5
453	21 2277 1147 R	GUDO	TN 1147	2022	3014	820	RUNDE	MAY 1976		5
454	21 2277 1489 N	TONGOGARA	TN 1489	1958	3016	1080	RUNDE	OCT. 1983		6
455	21 2277 1590 Y	WOODLANDS(MASHAVA)	TN 1590	1958	3017	1080	RUNDE	OCT. 1921	JUNE 1927	6
456	21 2277 1691 H	NEW GATO SCHOOL	TN 1691	1957	3017	1070	RUNDE	JULY 1972	NOV. 1978	6
457	21 2277 1735 F	MUTAMBE	TN 1735	2028	3017	0880	RUNDE	JULY 1906		5
458	21 2277 1760 H	MAKONESE IRRIGATION	TN 1760	2014	3017	860	RUNDE	APR. 1952		5
459	21 2277 1981 Y	MADANGOMBE	TN 2081	2003	3020	1000	RUNDE	NOV. 1958		6
460	21 2277 2042 P	MANIVI	TN 2042	2024	3019	0790	RUNDE	JULY 1986		5
461	21 2277 2218 F	BUCHWA PROJECT	TN 2218	2027	3020	1330	RUNDE	APR. 1974		6
462	21 2277 2323.V	BUCHWA MUKWAKWE	TN 2323	2034	3020	760	RUNDE	DEC. 1975		5
463	21 2277 2411 Q	MASINGO MISSION	TN 2411	2039	3021	840	RUNDE	MAY 1949	MAY 1976	6
464	21 2277 2590 K	GAMWA P.A.	TN 2590	1958	3027	1000	RUNDE	OCT. 1966	NOV. 1978	6
465	21 2277 2820 K	BUCHWA MAIN PLANT	TN 2820	2036	3023	800	RUNDE	NOV. 1975	SEP. 1978	5
466	21 2277 2923 X	NGEZI,RAIL	TN 2923	2035	3024	740	RUNDE	NOV. 1955	MAY 1980	5
467	21 2277 3178 Z	ROAD CAMP VIC 2	TN 3178	2005	3026	930	RUNDE	MAR. 1973		5
468	21 2277 3262 Q	CHOMUVUZHE HILL	TN 3262	2013	3026	900	RUNDE	APR. 1974	APR. 1979	5
469	21 2277 3495 T	ZINYANINGWE P.A.	TN 3495	1955	3028	1000	RUNDE	OCT. 1966	MAR. 1979	6
470	21 2277 3733 C	SIMBITI	TN 3733	2029	3029	840	RUNDE	APR. 1974	FEB. 1978	5
471	21 2277 3779 C	EMPRESS MINE	TN 3779	2004	3029	900	RUNDE	JULY 1912	JUNE 1920	5
472	21 2277 3782 F	MASHAVA	TN 3782	2003	3029	1100	RUNDE	OCT. 1924		5
473	21 2277 3985 B	GATHS MINE	TN 3985	2002	3031	1160	RUNDE	FEB. 1930		5
474	21 2277 4053 A	CHIVI AGRIC	TN 4053	2019	3029	940	RUNDE	DEC. 1912		5
475	21 2277 4155 L	CHIBI BOOSTER	TN 4155	2015	3033	920	RUNDE	DEC. 1964		5
476	21 2277 4277 T	KING MINE	TN 4277	2006	3032	1100	RUNDE	OCT. 1921		7
477	21 2277 4379 E	ALLANVALE	TN 4379	2004	3034	970	RUNDE	JULY 1937	JUNE 1959	6
478	21 2277 4386 H	LOCHINVAR	TN 4386	2000	3033	1080	RUNDE	JULY 1919	JUNE 1929	6
479	21 2277 4449 F	CHIBI MISSION	TN 4449	2021	3032	940	RUNDE	AUG. 1938		5
480	21 2277 4569 L	ERDINGTON	TN 4569	2010	3034	920	RUNDE	JULY 1928	OCT. 1939	7
481	21 2277 4717 X	BEREJENA MISSION	TN 4717	2038	3035	700	RUNDE	MAY 1973		5
482	21 2277 5270 Y	UMSHANDIGE DAM	TN 5270	2009	3038	1000	RUNDE	DEC. 1936		6
483	21 2277 5403 E	UMSHANDIGE CATCHMENT	TN 5403	2003	3039	1020	RUNDE	MAR. 1945		6
484	21 2277 5489 L	KIMBERLEY RANCH	TN 5409	1958	3039	1100	RUNDE	MAY 1926	JUNE 1938	6
485	21 2277 5498 W	MAYO FARM	TN 5498	1954	3038	1100	RUNDE	JULY 1930		6
486	21 2277 5565 T	MILTONIA	TN 5565	2013	3038	920	RUNDE	DEC. 1925	SEP. 1952	5
487	21 2277 5991 G	SUMMERTON	TN 5991	2000	3042	1160	RUNDE	OCT. 1918	JUNE 1925	6
488	21 2277 6058 E	STANHOPE FARM	TN 6058	2016	3043	840	RUNDE	JULY 1938	SEP. 1963	5
489	21 2277 6064 L	MUSHANDIKE	TN 6064	2013	3043	900	RUNDE	OCT. 1944		5
490	21 2277 6315 J	CHENDEBVU DAM	TN 6315	2039	3041	700	RUNDE	APR. 1952		5
491	21 2277 6339 K	NGOMAHURU HOSPITAL	TN 6339	2026	3044	820	RUNDE	APR. 1928		6
492	21 2277 6368 R	COTOPAXI RANCH	TN 6368	2011	3044	970	RUNDE	JULY 1933	OCT. 1978	5
493	21 2277 6400 N	CAMBRIA	TN 6400	2005	3044	1100	RUNDE	OCT. 1921		6
494	21 2277 6556 W	BONDOLFI MISSION	TN 6556	2017	3045	860	RUNDE	OCT. 1953		6
495	21 2277 6792 C	GOKOMERE MISSION	TN 6792	1958	3046	1160	RUNDE	JAN. 1912		6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
496	21 2277 6029 S	MAKORSI R.RANCH,CHITASA	TN 6029	2031	3047	700	RUNDE	JULY 1975	JULY 1977	5
497	21 2277 6911 G	ZIFUNZI SCHOOL	TN 6911	2041	3047	730	RUNDE	DEC. 1902		5
498	21 2277 7173 R	CLIPSHAM	TN 7173	2000	3050	1100	RUNDE	JULY 1911	JUNE 1932	5
499	21 2277 7358 S	TENTERGATE	TN 7358	2016	3050	1120	RUNDE	JULY 1941	JUNE 1949	6
500	21 2277 7301 S	MASVINGO,GAOL	TN 7301	2005	3050	1090	RUNDE	NOV. 1898		6
501	21 2277 7393 F	COPOTA SCHOOL	TN 7393	1957	3051	1130	RUNDE	APR. 1939		5
502	21 2277 7475 V	ROSSLYN	TN 7475	2006	3049	1000	RUNDE	JAN. 1949	JUNE 1966	5
503	21 2277 7479 Z	MASVINGO,RAIL	TN 7479	2005	3051	1070	RUNDE	JULY 1914		6
504	21 2277 7540 Q	MAPANZURE IRRIG.SCHEME	TN 7540	2025	3050	860	RUNDE	JAN. 1972		8
505	21 2277 7567 V	BRUCEHAME	TN 7567	2011	3050	1140	RUNDE	JAN. 1916	SEP. 1986	5
506	21 2277 7577 F	SILVER OAKS	TN 7577	2010	3056	1040	RUNDE	JULY 1911	FEB. 1932	6
507	21 2277 7501 K	MASVINGO,HYDRO	TN 7501	2004	3051	1090	RUNDE	MAR. 1972		6
508	21 2277 7652 M	CHARAMBIRA	TN 7652	2019	3051	1200	RUNDE	JAN. 1940	APR. 1983	8
509	21 2277 7681 T	MASVINGO	TN 7681	2004	3052	1100	RUNDE	JULY 1951		6
510	21 2277 7743 L	MAPANZURE AGRIC	TN 7743	2024	3052	900	RUNDE	OCT. 1902		7
511	21 2277 7916 Z	MAKORSI R.RANCH,CHIMUKU	TN 7916	2039	3053	680	RUNDE	OCT. 1934	FEB. 1977	6
512	21 2277 0039 H	TADZEMBWA SCHOOL	TN 0039	2026	3053	880	RUNDE	NOV. 1903		8
513	21 2277 0120 E	MUKOSI	TN 0120	2032	3054	0760	RUNDE	OCT. 1985		5
514	21 2277 0163 S	SIKATO	TN 0163	2014	3054	1060	RUNDE	JULY 1932	APR. 1960	6
515	21 2277 0243 E	MURAGWE	TN 0243	2025	3055	960	RUNDE	SEP. 1949	SEP. 1979	8
516	21 2277 0257 V	NEMANWA	TN 0257	2017	3055	1100	RUNDE	MAY 1983		7
517	21 2277 0454 J	MORGENSTER MISSION	TN 0454	2018	3056	1180	RUNDE	OCT. 1907		10
518	21 2277 0457 M	GREAT ZIMBABWE	TN 0457	2016	3056	1100	RUNDE	OCT. 1921		8
519	21 2277 0510 V	WOODRIDGE	TN 0510	2043	3056	720	RUNDE	NOV. 1948	MAR. 1956	7
520	21 2277 0577 S	BEAULY	TN 0577	2006	3057	1080	RUNDE	APR. 1936	JUNE 1955	6
521	21 2277 0570 T	CLUNY FARM	TN 0570	2005	3056	1070	RUNDE	NOV. 1959	DEC. 1979	5
522	21 2277 0608 B	HILLANDALE	TN 0608	2044	3101	660	RUNDE	FEB. 1934	JUNE 1970	7
523	21 2277 0625 V	MAKORSI R.RANCH,MARINDA	TN 0625	2033	3058	610	RUNDE	JULY 1913	JULY 1977	5
524	21 2277 0681 F	TESTWOOD	TN 0681	2003	3057	1100	RUNDE	MAY 1936	JUNE 1951	6
525	21 2277 0703 E	ROAD CAMP VIC 5	TN 0703	2046	3057	610	RUNDE	NOV. 1973	JUNE 1978	8
526	21 2277 0740 V	MASVINGO,SOUTH	TN 0740	2026	3057	900	RUNDE	JAN. 1939	JUNE 1986	7
527	21 2277 0935 G	MANDERE	TN 0935	2028	3059	820	RUNDE	JULY 1963		7
528	21 2277 9079 N	BALLINAHONE	TN 9079	2004	3059	1080	RUNDE	JULY 1936	JUNE 1953	6
529	21 2277 9164 F	LAKE KYLE FISHERIES	TN 9164	2013	3100	1080	RUNDE	JAN. 1973		9
530	21 2277 9179 X	RIVERDENE NORTH	TN 9179	2005	3100	1070	RUNDE	JAN. 1920	JUNE 1941	6
531	21 2277 9189 H	SPES BONA	TN 9189	2000	3100	1100	RUNDE	APR. 1936	JAN. 1975	6
532	21 2277 9283 K	WARE'S FARM	TN 9283	2004	3100	1090	RUNDE	JULY 1940		6
533	21 2277 9308 N	NUANETSI RANCH,NGUNDA	TN 9308	2043	3101	660	RUNDE	APR. 1952	NOV. 1970	8
534	21 2277 9476 V	MUTIMUREFU PRISON	TN 9476	2006	3102	1100	RUNDE	APR. 1906		6
535	21 2277 9530 M	SHUMBA(MASVINGO EAST)	TN 9530	2027	3102	800	RUNDE	DEC. 1951	JUNE 1966	7
536	21 2277 9560 L	KYLE DAM	TN 9560	2016	3102	1030	RUNDE	MAY 1959		10
537	21 2277 9596 A	CHIKOMO	TN 9596	1955	3102	1150	RUNDE	SEP. 1985		6
538	21 2277 9676 M	EYTHORNE	TN 9676	2006	3103	1000	RUNDE	JULY 1944	DEC. 1955	7
539	21 2277 9684 W	STANMORE	TN 9684	2002	3101	1080	RUNDE	DEC. 1919	MAR. 1938	6
[illegible]	21 2277 9721 L	CHITAKAYI	TN 9721	2036	3103	800	RUNDE	MAR. 1969		7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
541	21 2277 9753 W	UZEZE	TN 9753	2019	3103	950	RUNDE	FEB. 1971	MAY 1979	10
542	21 2277 9800 X	MTSHINI	TN 9800	2040	3103	570	RUNDE	NOV. 1920	MAR. 1936	8
543	21 2277 9872 A	GLENLIVET	TN 9872	2008	3104	1080	RUNDE	SEP. 1973	APR. 1901	7
544	21 2277 9879 H	MTILIKWE HYDRO	TN 9879	2005	3104	1060	RUNDE	DEC. 1985		6
545	21 2277 9910 R	MUSVOVI BUSINESS CENTRE	TN 9910	2042	3104	660	RUNDE	MAR. 1972		0
546	21 2277 9956 R	DIKITIKI	TN 9956	2017	3104	950	RUNDE	JULY 1983		0
547	21 2278 246 G	HAINAULT	TP 0246	1927	3009	1320	RUNDE	OCT. 1951	NOV. 1960	8
548	21 2278 443 W	HILTON	TP 0443	1930	3011	1380	RUNDE	JULY 1931	JUNE 1951	0
549	21 2278 555 S	PARTRIDGE	TP 0555	1923	3012	1420	RUNDE	JULY 1920	SEP. 1976	7
550	21 2278 629 Y	NHEMA	TP 0629	1939	3011	1220	RUNDE	OCT. 1932	JUNE 1986	7
551	21 2278 717 T	PISIRA	TP 0717	1943	3012	1180	RUNDE	NOV. 1983		6
552	21 2278 1357 P	UPLANDS	TP 1357	1922	3016	1460	RUNDE	JAN. 1920	JUNE 1969	7
553	21 2278 1437 B	SENANGWE	TP 1437	1933	3017	1280	RUNDE	APR. 1949	JAN. 1963	7
554	21 2278 1522 T	JOBOLINKO SCHOOL	TP 1522	1940	3017	1140	RUNDE	NOV. 1969	JAN. 1982	6
555	21 2278 1759 B	DALHAINY	TP 1759	1922	3018	1440	RUNDE	MAR. 1937	MAR. 1944	7
556	21 2278 1805 B	CHIKATO	TP 1805	1950	3018	1080	RUNDE	OCT. 1960		7
557	21 2278 1814 L	ROCKFORD SCHOOL	TP 1814	1945	3018	1120	RUNDE	NOV. 1969	FEB. 1974	6
558	21 2278 1902 G	TANA RANCH(SHURUGWI)	TP 1902	1952	3019	1060	RUNDE	OCT. 1971	SEP. 1977	6
559	21 2278 2128 C	RIO	TP 2128	1937	3020	1190	RUNDE	SEP. 1918	JUNE 1979	7
560	21 2278 2650 V	CHIEFTAIN	TP 2650	1925	3025	1440	RUNDE	JUNE 1930	JUNE 1948	7
561	21 2278 2801 J	TOKWE P.A.	TP 2801	1952	3024	1070	RUNDE	OCT. 1966	NOV. 1978	6
562	21 2278 2955 B	GRANITEVALE	TP 2955	1923	3025	1420	RUNDE	JULY 1951	MAR. 1965	7
563	21 2278 3545 S	MAPIRAVANA	TP 3545	1928	3029	1400	RUNDE	FEB. 1972	JUNE 1979	7
564	21 2278 3749 P	INDUNA	TP 3749	1926	3030	1420	RUNDE	JULY 1914	JUNE 1936	7
565	21 2278 3812 H	MWENDE	TP 3812	1945	3031	1080	RUNDE	APR. 1973		6
566	21 2278 4014 C	CHIRUMANZU COM.L.SOUTH	TP 4014	1945	3031	1090	RUNDE	DEC. 1966	APR. 1973	6
567	21 2278 4219 A	CHIRUMANZU SCHOOL	TP 4219	1943	3032	1120	RUNDE	DEC. 1972	JUNE 1985	6
568	21 2278 4554 P	REQUEZA ESTATE	TP 4554	1924	3034	1480	RUNDE	OCT. 1922	MAR. 1929	7
569	21 2278 4635 C	HOLY CROSS MISSION	TP 4635	1934	3035	1350	RUNDE	MAR. 1951		7
570	21 2278 5218 L	ST.JOSEPH'S NYUMA	TP 5218	1944	3038	1220	RUNDE	SEP. 1938		6
571	21 2278 5639 T	CHAKA	TP 5639	1932	3041	1380	RUNDE	FEB. 1939		7
572	21 2278 5654 K	GROOTFONTEIN	TP 5654	1924	3040	1480	RUNDE	JULY 1911	JUNE 1929	7
573	21 2278 6052 S	DRIEFONTEIN MISSION	TP 6052	1925	3042	1510	RUNDE	OCT. 1906		7
574	21 2278 6327 R	CHIRUMANZU SETTLEMENT	TP 6327	1939	3044	1320	RUNDE	MAR. 1936	JUNE 1941	7
575	21 2278 6334 Z	CHIRUMANZU,POLICE	TP 6334	1936	3044	1360	RUNDE	JULY 1906	JUNE 1968	7
576	21 2278 6337 C	ROAD CAMP VIC 3A	TP 6337	1933	3045	1400	RUNDE	FEB. 1973		7
577	21 2278 6506 L	MAKONOLI,TOBACCO SECT.	TP 6506	1950	3146	1200	RUNDE	SEP. 1966	MAY 1979	6
578	21 2278 6606 V	MAKONOLI	TP 6606	1950	3047	1200	RUNDE	MAR. 1943		6
579	21 2278 7021 W	THORNHILL	TP 7021	1943	3050	1300	RUNDE	OCT. 1924	JUNE 1934	7
580	21 2278 7055 H	NYORORO(FELIXBURG)	TP 7055	1923	3049	1490	RUNDE	FEB. 1962		6
581	21 2278 7128 M	MAKOWRIES	TP 7128	1938	3049	1360	RUNDE	OCT. 1925	NOV. 1943	7
582	21 2278 7229 X	CHATSWORTH,RAIL	TP 7229	1938	3050	1300	RUNDE	FEB. 1937		7
583	21 2278 7248 S	MAXWELL PARK	TP 7248	1926	3049	1400	RUNDE	JAN. 1940	JUNE 1980	6
584	21 2278 7320 E	CHATSWORTH,POLICE	TP 7320	1938	3050	1350	RUNDE	AUG. 1968		7
585	21 2278 7354 H	CULLODEN FARM	TP 7354	1922	3050	1510	RUNDE	JULY 1952	AUG. 1961	6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
586	21 2278 7450 M	FELIXBURG	TP 7450	1927	3051	1490	RUNDE	JAN. 1919	NOV. 1951	7
587	21 2278 7451 N	FELIXBURG FARM	TP 7451	1925	3051	1520	RUNDE	JULY 1980		7
588	21 2278 7544 P	CHILLY FARM	TP 7544	1929	3052	1480	RUNDE	APR. 1936	JAN. 1980	6
589	21 2278 7552 Y	FELIXBURG,WIGEON	TP 7552	1926	3051	1520	RUNDE	DEC. 1951	JUNE 1971	7
590	21 2278 7603 D	ZIMUTU STORE	TP 7603	1951	3052	1220	RUNDE	SEP. 1937	NOV. 1962	6
591	21 2278 7704 N	ZIMUTU TOWNSHIP	TP 7704	1953	3053	1200	RUNDE	NOV. 1932		6
592	21 2278 7841 M	SERIMA MISSION	TP 7841	1931	3053	1470	RUNDE	OCT. 1951		6
593	21 2278 8028 Q	SURAT	TP 8028	1938	3055	1340	RUNDE	AUG. 1936	JUNE 1983	6
594	21 2278 8315 C	GURAJENA	TP 0315	1945	3053	1260	RUNDE	NOV. 1952		6
595	21 2278 0422 T	ROCKLANDS	TP 0422	1940	3056	1320	RUNDE	DEC. 1936	APR. 1952	6
596	21 2278 0630 V	LEYBURN	TP 0630	1937	3058	1340	RUNDE	JULY 1936	NOV. 1967	7
597	21 2278 0634 Z	STRATHSPEY	TP 0634	1935	3057	1400	RUNDE	SEP. 1936	JAN. 1946	7
598	21 2278 9028 C	WRAGLEY FARM	TP 9028	1938	3100	1360	RUNDE	JULY 1936	JUNE 1956	7
599	21 2278 9031 F	LAUDER	TP 9031	1937	3100	1370	RUNDE	JUNE 1946		7
600	21 2278 9145 E	FAIRBURN	TP 9145	1929	3100	1510	RUNDE	JUNE 1933	JUNE 1979	7
601	21 2278 9326 B	GLENARY	TP 9326	1940	3101	1340	RUNDE	JULY 1920	AUG. 1980	6
602	21 2278 9333 J	PASTURES(THE,CHATSWORTH)	TP 9333	1935	3102	1390	RUNDE	JULY 1937	APR. 1954	7
603	21 2278 9609 J	NUKOKO SCHOOL	TP 9609	1948	3103	1260	RUNDE	MAR. 1974	OCT. 1985	6
604	21 2278 9627 D	BERRY SPRINGS	TP 9627	1939	3103	1320	RUNDE	JULY 1946	JUNE 1961	7
605	21 2278 9919 W	BANGALOW	TP 9919	1943	3105	1310	RUNDE	DEC. 1930	NOV. 1944	6
606	21 2376 677 S	NUANETSI RANCH,LUNDI	UM 0677	2100	3108	420	RUNDE	JAN. 1918	SEP. 1983	5
607	21 2376 783 H	NUANETSI RANCH,TOKWE	UM 0783	2057	3109	440	RUNDE	OCT. 1966	DEC. 1976	6
608	21 2376 1145 B	NUANETSI RANCH,CHINGWIZI	UM 1145	2117	3110	440	RUNDE	OCT. 1966		5
609	21 2376 2060 W	NUANETSI RA.,MPAPA SECT.	UM 2060	2108	3115	420	RUNDE	JULY 1921	FEB. 1965	5
610	21 2376 2196 T	ESQUILINGWE WEIR	UM 2196	2050	3116	450	RUNDE	APR. 1963		6
611	21 2376 2372 K	NUANETSI RANCH,NTILIKWE	UM 2372	2103	3118	430	RUNDE	SEP. 1921		5
612	21 2376 3082 G	TRIANGLE,MILL	UM 3082	2057	3122	420	RUNDE	JULY 1930	JUNE 1961	5
613	21 2376 3273 P	NUANETSI RA.NORTHERN HQ.	UM 3273	2102	3122	400	RUNDE	APR. 1966	JUNE 1973	5
614	21 2376 3676 C	TRIANGLE RES.STN.	UM 3676	2101	3125	410	RUNDE	JAN. 1961		5
615	21 2376 3774 J	TRIANGLE,HOMESTEAD	UM 3774	2102	3126	410	RUNDE	OCT. 1921	DEC. 1956	5
616	21 2376 4031 N	BOLI SCHOOL	UM 4031	2124	3127	410	RUNDE	DEC. 1960	SEP. 1976	4
617	21 2376 4319 B	BOLI	UM 4319	2132	3129	470	RUNDE	DEC. 1960		4
618	21 2376 4780 L	CROWN RANCH	UM 4780	2054	3133	480	RUNDE	DEC. 1952		6
619	21 2376 4959 X	HIPPO VALLEY ESTATE	UM 4959	2110	3133	360	RUNDE	JAN. 1959	MAR. 1967	5
620	21 2376 5175 G	CHIREDZI RES.STN.	UM 5175	2101	3134	430	RUNDE	JAN. 1967		5
621	21 2376 5376 A	BUFFALO RANGE	UM 5376	2101	3135	430	RUNDE	DEC. 1965		5
622	21 2376 5753 K	CHILONGA	UM 5753	2113	3137	390	RUNDE	SEP. 1973		5
623	21 2376 5774 H	CHIREDZI Z.S.A.	UM 5774	2102	3137	420	RUNDE	MAY 1970		5
624	21 2376 6031 M	CHINGELE	UM 6031	2125	3139	400	RUNDE	JUNE 1970		5
625	21 2376 6271 Y	CHIREDZI RAIL	UM 6271	2102	3140	410	RUNDE	DEC. 1965		5
626	21 2376 7339 J	CHIKWEDZIVA	UM 7339	2121	3147	340	RUNDE	JAN. 1969		5
627	21 2376 7379 C	NANDI	UM 7379	2059	3147	380	RUNDE	NOV. 1970		5
628	21 2376 7504 A	ESSANBY RANCH	UM 7504	2055	3148	400	RUNDE	NOV. 1947	JUNE 1964	5
629	21 2376 8229 B	LIMVUMA RIVER	UM 8229	2127	3152	350	RUNDE	SEP. 1975		5
630	21 2376 8472 Q	LONE STAR	UM 8472	2103	3153	400	RUNDE	OCT. 1951		5

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
631	21 2376 8747 P	CHIPINDA POOLS	UM 8747	2116	3155	300	RUNDE	MAR. 1961		5
632	21 2376 9007 X	MAWAWE FAN	UM 9007	2130	3156	340	RUNDE	JULY 1903		5
633	21 2376 9381 D	MANYOKA	UM 9381	2058	3158	430	RUNDE	NOV. 1960	APR. 1975	5
69	21 2376 9868 H	CHIZVIRIZVI SOUTH	UM 9868	2106	3201	037.	RUNDE	[illegible]987		5
635	21 2376 9803 Z	CHIZVIRIZVI NORTH	UM 9803	2050	3201	420	RUNDE	NOV. 1905		5
636	21 2377 65 X	ZANO	UN 0065	2012	3105	1060	RUNDE	MAR. 1971		7
637	21 2377 70 C	GLENLIVET HOTEL	UN 0070	2010	3105	1120	RUNDE	JULY 1921	OCT. 1967	9
638	21 2377 266 B	MARTHADALE	UN 0266	2012	3106	1040	RUNDE	DEC. 1911	JUNE 1959	9
639	21 2377 372 F	SALLOW GLEN FARM	UN 0372	2010	3107	1150	RUNDE	JULY 1959	JAN. 1975	8
640	21 2377 301 B	MSALI	UN 0301	2005	3108	1080	RUNDE	NOV. 1922	FEB. 1929	6
641	21 2377 438 C	MUCHEMA	UN 0438	2027	3107	680	RUNDE	DEC. 1951	JUNE 1982	7
642	21 2377 567 S	CHEVEDON	UN 0567	2011	3108	1100	RUNDE	OCT. 1922	APR. 1936	9
643	21 2377 628 J	GARAI SCHOOL	UN 0628	2032	3108	700	RUNDE	MAR. 1972		7
644	21 2377 703 B	MAREGERE DIP	UN 0703	2046	3109	530	RUNDE	MAR. 1972	OCT. 1976	7
645	21 2377 740 F	CHATIKOBO AGRIC	UN 0740	2026	3109	700	RUNDE	SEP. 1982		8
646	21 2377 922 D	MUCHIBWA	UN 0922	2035	3111	640	RUNDE	JAN. 1952		0
647	21 2377 1072 R	HISTONHURST/MENABILLY	UN 1072	2009	3111	1100	RUNDE	DEC. 1911	JAN. 1953	9
648	21 2377 1105 C	NYAMANDE SCHOOL	UN 1105	2045	3111	540	RUNDE	JULY 1904		7
649	21 2377 1149 A	MAFURATIDZE SCHOOL	UN 1149	2021	3111	700	RUNDE	AUG. 1973	OCT. 1983	0
650	21 2377 1197 C	CHITANDO CLINIC	UN 1197	1955	3112	1260	RUNDE	MAR. 1974		6
651	21 2377 1304 F	SALEMORE	UN 1304	2002	3114	1140	RUNDE	JULY 1921	MAR. 1950	7
652	21 2377 1390 W	CHIKWANDA T.T.L.	UN 1398	1955	3112	1220	RUNDE	JULY 1934		6
653	21 2377 1559 W	JICHIDZA MISSION	UN 1559	2017	3114	1050	RUNDE	NOV. 1918	JUNE 1984	8
654	21 2377 1610 B	BANGALA DAM	UN 1610	2041	3114	520	RUNDE	SEP. 1961		7
655	21 2377 1739 R	MUCHOKWA SCHOOL	UN 1739	2026	3115	660	RUNDE	APR. 1976		8
656	21 2377 1881 W	RURGWE FARM	UN 1881	2003	3115	1110	RUNDE	JULY 1931	OCT. 1940	7
657	21 2377 1884 Z	DOORNFONTEIN	UN 1884	2002	3116	1120	RUNDE	FEB. 1920	NOV. 1969	7
658	21 2377 1880 D	RIET VLEI FARM	UN 1880	2000	3115	1160	RUNDE	JULY 1945	JUNE 1969	7
659	21 2377 1905 X	BANGALA RANCH	UN 1905	2044	3117	480	RUNDE	OCT. 1924		6
660	21 2377 2077 J	IRAM	UN 2077	2007	3117	1160	RUNDE	MAY 1920	JUNE 1940	8
661	21 2377 2083 Q	LEMOENFONTEIN	UN 2083	2002	3117	1100	RUNDE	DEC. 1969	MAR. 1979	7
662	21 2377 2221 Q	ZINGWENA	UN 2021	2036	3116	600	RUNDE	OCT. 1953		8
663	21 2377 2543 Q	NYAKUNUWA	UN 2543	2025	3119	740	RUNDE	JULY 1951		8
664	21 2377 2568 S	NDANGA HOSPITAL	UN 2568	2011	3119	1020	RUNDE	DEC. 1933	JUNE 1981	10
665	21 2377 2080 Q	RIPPLING WATERS	UN 2080	2001	3121	1100	RUNDE	APR. 1926	JAN. 1982	7
666	21 2377 2908 N	FAVERSHAM	UN 2908	2043	3122	500	RUNDE	JAN. 1952		7
667	21 2377 3456 H	CHINYARADZA	UN 3456	2016	3124	830	RUNDE	NOV. 1955		8
668	21 2377 3745 X	ST.ANTHONY'S MISSION	UN 3745	2024	3126	740	RUNDE	DEC. 1952		7
669	21 2377 3073 L	BVUKURURU	UN 3080	2023	3119	1040	RUNDE	DEC. 1953		8
670	21 2377 3951 W	ZAKA	UN 3951	2020	3128	770	RUNDE	JULY 1929		7
671	21 2377 4027 Y	SVUURE	UN 4027	2033	3132	600	RUNDE	NOV. 1950		0
672	21 2377 4039 L	GADHAZISO	UN 4039	2026	3132	680	RUNDE	JAN. 1955		7
673	21 2377 5414 L	CHIREDZI RANCH	UN 5414	2041	3136	500	RUNDE	JULY 1912	MAR. 1920	7
674	21 2377 5510 Z	MANJIRENJI DAM	UN 5510	2038	3137	520	RUNDE	MAR. 1964		8
675	21 2377 5611 A	GLENDEVON	UN 5611	2047	3137	460	RUNDE	JULY 1931	OCT. 1959	7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
676	21 2377 5814 W	NGWANE RANCH	UN 5814	2040	3138	480	RUNDE	OCT. 1939	JUNE 1951	7
677	21 2377 5904 T	RUWARE RANCH	UN 5904	2045	3139	440	RUNDE	JAN. 1930		6
678	21 2377 5926 S	MATARA SCHOOL	UN 5926	2034	3139	580	RUNDE	JAN. 1982	SEP. 1984	8
679	21 2377 7022 J	MATUTUSA	UN 7022	2036	3145	680	RUNDE	SEP. 1969	OCT. 1978	8
680	21 2378 134 R	MAZONGORORO	UP 0134	1935	3106	1420	RUNDE	MAY 1942	FEB. 1949	7
681	21 2378 616 Q	MUKARO MISSION	UP 0616	1945	3108	1330	RUNDE	OCT. 1947		6
682	21 2378 718 B	MARAKEB	UP 0718	1943	3110	1360	RUNDE	OCT. 1948	MAR. 1961	6
683	21 2378 1011 V	FUNGIDZA HILL	UP 1011	1948	3111	1340	RUNDE	DEC. 1947		6
684	21 2476 249 J	MASIKONDORO POOL	VM 0249	2115	3204	400	RUNDE	JULY 1903		5
685	21 2476 728 E	CHILOJO CLIFFS	VM 0728	2127	3206	370	RUNDE	SEP. 1975		5
686	21 2476 2224 F	BORDER B	VM 2224	2128	3214	340	RUNDE	OCT. 1969	MAR. 1976	5
687	21 2476 3441 D	MARHUMBINI MISSION	VM 3441	2120	3222	180	RUNDE	APR. 1955	JUNE 1966	5
688	22 2278 8163 P	ALANBERRY	TP 8163	1919	3055	1460	SAVE	MAR. 1922	JAN. 1936	7
689	22 2278 8253 M	EASTDALE RANCH	TP 8253	1925	3056	1520	SAVE	NOV. 1952		7
690	22 2278 8573 K	GELUK FARM	TP 8573	1914	3057	1460	SAVE	JULY 1946	FEB. 1955	7
691	22 2278 9157 V	EASTDALE RANCH WINDMILL	TP 9157	1922	3101	1450	SAVE	DEC. 1979		7
692	22 2278 9297 X	RANGE(THE)	TP 9297	1900	3102	1490	SAVE	NOV. 1903		7
693	22 2278 9543 P	DONNACHAID	TP 9543	1930	3103	1480	SAVE	SEP. 1979		7
694	22 2278 9961 T	EASTDALE ESTATE EAST	TP 9961	1920	3105	1370	SAVE	JULY 1925	JULY 1979	7
695	22 2279 9517 F	K FARM	TQ 9517	1850	3103	1520	SAVE	DEC. 1952	JAN. 1967	6
696	22 2279 9815 E	MTORO	TQ 9815	1851	3105	1540	SAVE	JULY 1972		6
697	22 2376 0497 V	MKWASINE MAIN OFFICE	UM 0497	2050	3153	460	SAVE	AUG. 1970		5
698	22 2377 2794 Q	MARAH RANCH	UN 2794	1957	3122	1120	SAVE	JULY 1914	MAY 1970	6
699	22 2377 3792 A	GLENCLOVA	UN 3792	1958	3126	1220	SAVE	DEC. 1966		6
700	22 2377 4307 X	PAMUSHANA MISSION	UN 4307	2001	3131	1190	SAVE	JULY 1910		7
701	22 2377 4590 B	MUNGEZI	UN 4590	1955	3131	1080	SAVE	JAN. 1901		6
702	22 2377 4750 A	NYAGAMBO	UN 4750	2016	3132	800	SAVE	JULY 1951	OCT. 1980	7
703	22 2377 4854 E	CHINYAGAKO	UN 4854	2018	3133	760	SAVE	JULY 1984		7
704	22 2377 5558 V	SIYA DAM	UN 5558	2016	3137	720	SAVE	APR. 1974		7
705	22 2377 5559 W	SIYA DAM(OLD SITE)	UN 5559	2016	3137	720	SAVE	MAY 1974	JUNE 1977	7
706	22 2377 5562 Z	MUZI STORE	UN 5562	2016	3137	760	SAVE	AUG. 1930	DEC. 1976	7
707	22 2377 5573 L	BIKITA,MUSHANDURE	UN 5573	2011	3138	840	SAVE	OCT. 1950		11
708	22 2377 5579 S	BIKITA,POLICE	UN 5579	2005	3137	970	SAVE	JULY 1923		11
709	22 2377 5679 B	BIKITA,AGRICULTURAL STN.	UN 5679	2005	3137	970	SAVE	NOV. 1974		10
710	22 2377 6133 V	CHIREDZANA	UN 6133	2030	3140	800	SAVE	OCT. 1953	JAN. 1979	8
711	22 2377 6159 Y	NYAHUNDA NGORIMA	UN 6357	2017	3141	700	SAVE	JULY 1974		8
712	22 2377 6245 R	PANGANAYI	UN 6245	2023	3141	670	SAVE	SEP. 1953		6
713	22 2377 6386 V	SILVEIRA MISSION	UN 6306	2002	3142	1100	SAVE	JAN. 1935		8
714	22 2377 6550 Y	TURGWI	UN 6550	2021	3141	640	SAVE	JULY 1987		6
715	22 2377 6582 H	BIKITA(OLD)	UN 6582	2005	3143	1000	SAVE	JAN. 1914	JUNE 1923	10
716	22 2377 6659 R	NYAHUNDA	UN 6659	2016	3143	680	SAVE	OCT. 1953	JUNE 1974	6
717	22 2377 6935 R	MASHOKO	UN 6935	2029	3145	700	SAVE	OCT. 1950		8
718	22 2377 7191 V	CHIWAKA STORE	UN 7191	1958	3146	090	SAVE	DEC. 1967	AUG. 1977	6
719	22 2377 7420 T	ANGUS RANCH,MKWASINE	UN 7420	2037	3147	520	SAVE	JAN. 1971	MAR. 1977	7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
721	22 2377 7874 M	BIKITA,MAKORE	UN 7874	2008	3150	710	SAVE	OCT. 1950		7
722	22 2377 7956 B	CHECHENI	UN 7956	2018	3150	650	SAVE	MAR. 1975		6
723	22 2377 8139 A	CHIREMHAREMHA	UN 8139	2027	3151	600	SAVE	JULY 1953		7
724	22 2377 8365 H	DEVULI RANCH,MARI B'HOLE	UN 8365	2013	3153	920	SAVE	DEC. 1970	APR. 1974	6
725	22 2377 0430 R	ANGUS RANCH,MKAZI	UN 0430	2032	3153	540	SAVE	JAN. 1971	MAR. 1977	7
726	22 2377 0591 R	MUSHUKU HALT	UN 0591	1959	3154	850	SAVE	MAR. 1974		5
727	22 2377 8955 M	DEVULI RANCH,CHARUMA	UN 8955	2018	3156	620	SAVE	SEP. 1968	OCT. 1976	5
728	22 2377 9061 C	DEVULI VILLAGE 23	UN 9061	2015	3157	630	SAVE	NOV. 1987		5
729	22 2377 9241 Y	ANGUS RANCH H.Q.	UN 9241	2025	3158	520	SAVE	OCT. 1920	MAR. 1977	6
730	22 2377 9281 R	DEVULI RANCH C	UN 9281	2003	3213	700	SAVE	FEB. 1968	JAN. 1977	5
731	22 2377 9793 Y	DEHURE	UN 9793	1957	3201	0795	SAVE	OCT. 1985		5
732	22 2378 40 A	ATHOL	UP 0048	1927	3106	1310	SAVE	OCT. 1939	OCT. 1957	7
733	22 2378 257 C	EAGLE'S NEST RANCH	UP 0257	1922	3107	1460	SAVE	AUG. 1915	JUNE 1925	7
734	22 2378 294 S	HOKONYA	UP 0294	1903	3107	1450	SAVE	DEC. 1977		7
735	22 2378 442 D	NOELDALE	UP 0442	1931	3100	1300	SAVE	JULY 1912	NOV. 1923	7
736	22 2378 720 P	GUTU	UP 0720	1938	3109	1390	SAVE	DEC. 1904		7
737	22 2378 767 G	DENHERE	UP 0767	1917	3110	1330	SAVE	MAR. 1974		7
738	22 2378 884 J	LOURDES MISSION	UP 0884	1908	3110	1280	SAVE	OCT. 1948	JUNE 1959	7
739	22 2378 1249 F	SOTI SOURCE,TONGOGARA	UP 1249	1927	3113	1305	SAVE	JAN. 1985		7
740	22 2378 1327 Q	GUTU MISSION	UP 1327	1939	3113	1300	SAVE	JULY 1930		5
741	22 2378 1447 W	SOTI SOURCE	UP 1447	1928	3113	1330	SAVE	FEB. 1938	APR. 1979	7
742	22 2378 1581 R	BVUMBURA	UP 1581	1910	3115	1300	SAVE	JAN. 1972		7
743	22 2378 1593 E	SACHIPIRI	UP 1593	1903	3115	1440	SAVE	MAY 1903		7
744	22 2378 1599 L	HAZARENHAKA	UP 1599	1900	3114	1460	SAVE	DEC. 1966	JUNE 1970	7
745	22 2378 1840 Y	MAISAI FARM	UP 1840	1934	3116	1240	SAVE	SEP. 1942	AUG. 1957	7
746	22 2378 1961 E	VIMVI RANCH	UP 1961	1921	3115	1280	SAVE	MAR. 1935	JUNE 1954	7
747	22 2378 2049 A	CHAKATA FARM	UP 2049	1920	3117	1280	SAVE	MAR. 1945	FEB. 1979	7
748	22 2378 2246 P	ZINYEMBA FARM	UP 2246	1928	3110	1240	SAVE	OCT. 1939	JUNE 1966	7
749	22 2378 2280 K	DARAMOMBE MISSION	UP 2280	1906	3118	1280	SAVE	JUNE 1939	JAN. 1979	7
750	22 2378 2654 H	CHINANAIRA	UP 2654	1923	3121	1175	SAVE	JAN. 1985		7
751	22 2378 2737 Y	ZVAVAHERA BUS.CENTRE	UP 2737	1933	3121	1180	SAVE	MAR. 1974		6
752	22 2378 2801 S	VUMBA HILL	UP 2801	1953	3122	1230	SAVE	DEC. 1975		6
753	22 2378 3222 A	DEVULI STORE	UP 3222	1938	3124	1100	SAVE	OCT. 1928	AUG. 1937	5
754	22 2378 3274 G	GWEBU SCHOOL	UP 3274	1914	3124	1300	SAVE	MAR. 1971	AUG. 1978	7
755	22 2378 3503 F	CHITORIDO HILL	UP 3503	1952	3125	1140	SAVE	MAR. 1974	NOV. 1975	6
756	22 2378 3524 D	GONYE	UP 3524	1941	3127	1100	SAVE	FEB. 1956		5
757	22 2378 3663 E	BUHERA,D.A.	UP 3663	1919	3126	1190	SAVE	JAN. 1914	JUNE 1982	7
758	22 2378 3664 F	BUHERA	UP 3664	1919	3126	1190	SAVE	AUG. 1951		7
759	22 2378 3895 G	MUPATSI	UP 3895	1902	3128	1240	SAVE	MAY 1983		7
760	22 2378 3943 J	CHINYIKA(GUTU)	UP 3943	1931	3120	1100	SAVE	OCT. 1973		6
761	22 2378 3995 Q	MPATSI TOWNSHIP	UP 3995	1902	3128	1260	SAVE	DEC. 1966	JULY 1978	7
762	22 2378 4311 J	DEHENDE	UP 4311	1940	3130	1000	SAVE	FEB. 1978		6
763	22 2378 4461 X	MUNYIRA SCHOOL	UP 4461	1920	3131	1000	SAVE	FEB. 1972	JAN. 1983	7
764	22 2378 4642 T	CHITSA M.P.SCHOOL	UP 4642	1932	3133	1100	SAVE	NOV. 1960		6
765	22 2378 4670 Z	MAKUMBE-BUHERA	UP 4670	1915	3133	1070	SAVE	JUNE 1937		7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
766	22 2378 5207 H	ZINHATA	UP 5207	1947	3135	980	SAVE	DEC. 1964	SEP. 1977	6
767	22 2370 5435 F	DOPOTA	UP 5435	1934	3137	1020	SAVE	SEP. 1981	SEP. 1984	6
768	22 2378 5620 G	ALHEIT MISSION	UP 5620	1943	3138	1020	SAVE	JULY 1912		5
769	22 2370 5691 J	ST.BERNARD'S SCHOOL	UP 5691	1904	3138	1075	SAVE	JULY 1985		7
770	22 2378 5838 T	MAFUSIRE	UP 5838	1933	3139	1000	SAVE	JULY 1984		5
771	22 2378 5970 H	MURAMBINDA HIGH SCHOOL	UP 5970	1916	3139	955	SAVE	DEC. 1984		6
772	22 2378 6067 S	MURAMBINDA	UP 6067	1917	3140	960	SAVE	NOV. 1969	FEB. 1979	6
773	22 2370 6657 J	MUDANDA	UP 6657	1927	3145	1020	SAVE	OCT. 1963	JULY 1976	6
774	22 2370 6818 J	NANJARE	UP 6818	1948	3156	940	SAVE	APR. 1961	JUNE 1979	5
775	22 2370 6034 B	RUTI DAM	UP 6835	1934	3145	960	SAVE	JAN. 1908		5
776	22 2378 6881 C	ST.JOHN'S SCHOOL	UP 6881	1910	3145	960	SAVE	JULY 1985		6
777	22 2370 7017 A	MUNYIKWA SCHOOL	UP 7017	1944	3146	930	SAVE	MAR. 1961		5
778	22 2378 7031 Q	MATARUSE	UP 7031	1938	3151	910	SAVE	APR. 1961	JAN. 1979	5
779	22 2378 7040 A	BANGURE SCHOOL	UP 7040	1932	3145	900	SAVE	JAN. 1972	MAY 1977	5
780	22 2378 7192 Q	DOROWA MINE	UP 7192	1903	3146	900	SAVE	NOV. 1964		6
781	22 2378 7959 Z	CHADZIRE	UP 7959	1921	3151	910	SAVE	NOV. 1946	JUNE 1953	5
782	22 2378 8046 T	GOTORA	UP 8046	1929	3151	1000	SAVE	JULY 1985		6
783	22 2370 0168 B	NYASHANU MISSION	UP 0168	1918	3152	850	SAVE	SEP. 1956		5
784	22 2378 8694 Y	CHIKURAMADZIWA	UP 8694	1903	3157	870	SAVE	MAR. 1960		6
785	22 2378 8744 C	MSASA(BUHERA)	UP 8744	1930	3155	1050	SAVE	DEC. 1945	SEP. 1959	5
786	22 2378 8745 D	ZVONOYA	UP 8745	1929	3155	1010	SAVE	FEB. 1972	JAN. 1977	5
787	22 2378 9040 Z	MAFURUSE	UP 9040	1931	3157	1000	SAVE	NOV. 1959	MAR. 1976	5
788	22 2370 9081 T	RIVER JUNCT./MAWANGWE ST	UP 9081	1910	3157	840	SAVE	NOV. 1948	NOV. 1965	6
789	22 2370 9135 C	MUZOKOMBA	UP 9135	1935	3158	900	SAVE	JULY 1985		5
790	22 2378 9397 H	ROMSLEY EST.,GATU SECT.	UP 9397	1901	3159	850	SAVE	DEC. 1945	SEP. 1950	6
791	22 2378 9558 M	GETERA	UP 9558	1922	3200	850	SAVE	JULY 1985		6
792	22 2378 9913 Y	MUCHUWA	UP 9913	1943	3208	690	SAVE	MAR. 1960	AUG. 1976	5
793	22 2370 9992 J	ROMSLEY,CATTLE SECTION	UP 9992	1904	3202	850	SAVE	OCT. 1970	AUG. 1977	6
794	22 2379 3 W	GAMANYA(CHIVHU)	UQ 0003	1857	3107	1480	SAVE	JULY 1972		7
795	22 2379 43 P	MOORLAND MUNGWE	UQ 0043	1836	3106	1460	SAVE	JUNE 1987		7
796	22 2379 149 E	CHITOMBO	UQ 0149	1832	3107	1460	SAVE	OCT. 1949		7
797	22 2379 713 S	WILTSHIRE H.Q.	UQ 0713	1852	3110	1500	SAVE	NOV. 1966	OCT. 1978	7
798	22 2379 1014 V	WILTSHIRE	UQ 1014	1851	3112	1500	SAVE	OCT. 1981		7
799	22 2379 1029 L	MAJUMBA	UQ 1029	1843	3112	1420	SAVE	NOV. 1966		7
800	22 2379 1257 J	SALTASH	UQ 1257	1828	3113	1450	SAVE	DEC. 1947	FEB. 1985	7
801	22 2379 1542 T	BOW FARM	UQ 1542	1837	3117	1390	SAVE	OCT. 1964		7
802	22 2379 1719 L	MAGANGARA	UQ 1719	1849	3116	1420	SAVE	JULY 1972	DEC. 1978	7
803	22 2379 2104 E	UNYETU	UQ 2104	1857	3118	1480	SAVE	MAY 1983		7
804	22 2379 2243 F	LELIEFONTEIN	UQ 2243	1836	3119	1340	SAVE	JULY 1944	JUNE 1959	7
805	22 2379 2360 H	MOUNT ARTHUR	UQ 2360	1827	3120	1460	SAVE	JULY 1929	MAY 1954	8
806	22 2379 2570 L	POLTIMORE ESTATE	UQ 2570	1821	3121	1550	SAVE	JULY 1930		8
807	22 2379 2576 S	MENDANU	UQ 2576	1817	3122	1560	SAVE	NOV. 1930	AUG. 1977	8
808	22 2379 2649 X	COLLACE	UQ 2649	1834	3121	1360	SAVE	JAN. 1946	MAR. 1954	7
809	22 2379 2659 H	LUSHINGTON	UQ 2659	1828	3121	1400	SAVE	OCT. 1924		7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
011	22 2379 2981 H	WADDILOVE MISSION	UQ 2981	1815	3123	1550	SAVE	MAY 1938	MAR. 1980	7
012	22 2379 3218 Q	ZVAMATOBWE	UQ 3210	1050	3124	1370	SAVE	MAY 1983		7
013	22 2379 3233 G	BITA	UQ 3233	1041	3123	1370	SAVE	JAN. 1928		7
014	22 2379 3348 G	BATH	UQ 3348	1033	3126	1380	SAVE	JAN. 1937	APR. 1944	7
015	22 2379 3618 A	KWENDA MISSION	UQ 3610	1050	3127	1370	SAVE	APR. 1935	JAN. 1979	7
016	22 2379 3663 Z	HUISH	UQ 3663	1025	3126	1490	SAVE	JULY 1912	FEB. 1922	7
017	22 2379 4042 L	NELSON	UQ 4042	1036	3129	1350	SAVE	NOV. 1915		7
018	22 2379 4080 C	LENDY ESTATES	UQ 4080	1016	3129	1540	SAVE	SEP. 1920	FEB. 1927	8
019	22 2379 4784 S	RUZAWI SCHOOL	UQ 4784	1014	3133	1630	SAVE	JULY 1930		8
020	22 2379 4815 B	MAWARE	UQ 4815	1051	3133	1300	SAVE	APR. 1903		7
021	22 2379 4853 S	SCORROR ESTATE	UQ 4853	1032	3132	1360	SAVE	MAY 1911	MAY 1985	7
022	22 2379 4940 M	WEDZA	UQ 4940	1037	3134	1380	SAVE	NOV. 1926		7
023	22 2379 4960 J	IGUDU ESTATE	UQ 4960	1027	3135	1360	SAVE	JULY 1920	JUNE 1943	7
024	22 2379 5000 L	SHUMBA(CHIVHU)	UQ 5008	1056	3135	1180	SAVE	NOV. 1964	MAR. 1977	7
025	22 2379 5165 G	MUNEMO	UQ 5165	1024	3135	1400	SAVE	DEC. 1947		8
026	22 2379 5388 Z	TIPPERARY	UQ 5388	1012	3137	1640	SAVE	DEC. 1940	MAY 1949	8
027	22 2379 5558 J	IGAVA	UQ 5558	1028	3140	1370	SAVE	OCT. 1964		7
028	22 2379 5580 H	WENIMBI	UQ 5580	1016	3139	1500	SAVE	JULY 1924	JUNE 1930	8
029	22 2379 5845 W	DENDENDE	UQ 5845	1035	3140	1320	SAVE	NOV. 1947	OCT. 1956	7
030	22 2379 5891 W	MONTCLAIR	UQ 5891	1011	3139	1640	SAVE	NOV. 1945	JAN. 1974	8
031	22 2379 6133 J	DENDENYORE	UQ 6133	1041	3141	1380	SAVE	MAR. 1951	JUNE 1983	8
032	22 2379 6171 A	DIRIHORI	UQ 6171	1021	3141	1560	SAVE	DEC. 1940		8
033	22 2379 6289 D	TARARA	UQ 6289	1011	3141	1560	SAVE	MAY 1929	OCT. 1955	8
034	22 2379 6315 G	CHIGADORA	UQ 6315	1052	3143	1360	SAVE	DEC. 1954	SEP. 1977	8
035	22 2379 6554 R	ELANDSLAAGTE	UQ 6554	1030	3144	1370	SAVE	OCT. 1923	APR. 1930	7
036	22 2379 6591 G	MOUNT VIEW	UQ 6591	1010	3143	1660	SAVE	JULY 1984		9
037	22 2379 6639 J	WYE VALLEY	UQ 6639	1038	3144	1320	SAVE	JULY 1946	JAN. 1954	8
038	22 2379 6663 K	DELTA	UQ 6663	1025	3144	1500	SAVE	JULY 1916	JUNE 1946	8
039	22 2379 6690 P	HOME PARK	UQ 6690	1011	3144	1600	SAVE	OCT. 1933		8
040	22 2379 6744 Y	MOUNT RUUNDZI	UQ 6744	1036	3144	1320	SAVE	SEP. 1964	JAN. 1982	7
041	22 2379 6749 D	TWEEJAN	UQ 6749	1033	3144	1340	SAVE	JULY 1911	JUNE 1927	7
042	22 2379 6962 K	CAVE	UQ 6962	1026	3146	1460	SAVE	JULY 1946	JUNE 1956	8
043	22 2379 7065 X	WILTON	UQ 7065	1025	3147	1440	SAVE	DEC. 1941	APR. 1951	8
044	22 2379 7231 C	GOTO	UQ 7231	1042	3147	1240	SAVE	DEC. 1954		8
045	22 2379 7452 S	DOWA DIVISION	UQ 7452	1031	3148	1400	SAVE	NOV. 1951		7
046	22 2379 7774 S	ELDORADO FARM	UQ 7774	1019	3150	1440	SAVE	SEP. 1935	JAN. 1955	8
047	22 2379 7794 P	MACHEKE RAIL	UQ 7794	1009	3150	1540	SAVE	JAN. 1910		8
048	22 2379 7934 H	MASOSWA	UQ 7834	1041	3151	1200	SAVE	JUNE 1973	NOV. 1978	8
049	22 2379 7949 H	NDEWEDZA	UQ 7949	1033	3151	1500	SAVE	AUG. 1962	SEP. 1977	7
050	22 2379 8049 R	DEWEDZO	UQ 8049	1033	3152	1490	SAVE	JAN. 1905		7
051	22 2379 8171 Z	NYAMERA FARM	UQ 8171	1021	3152	1430	SAVE	OCT. 1965	OCT. 1982	7
052	22 2379 8205 L	ZVIYAMBE SCHOOL	UQ 8205	1057	3152	900	SAVE	OCT. 1951		6
053	22 2379 8209 C	MONTE CASSINO MISSION	UQ 8289	1011	3153	1500	SAVE	MAY 1904		8
054	22 2379 8472 B	ALVESTON	UQ 8472	1020	3154	1440	SAVE	DEC. 1943	FEB. 1965	7
055	22 2379 8646 Q	ST.THERESA'S MISSION	UQ 8646	1035	3135	1350	SAVE	MAR. 1976	SEP. 1977	8

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
856	22 2379 8719 V	CHINJANJA	UQ 8719	1845	3157	1000	SAVE	JUNE 1973	OCT. 1976	7
857	22 2379 8755 J	LESBURY	UQ 8755	1830	3156	1360	SAVE	MAY 1949		8
858	22 2379 8809 S	CONDO DAM(MACHEKE)	UQ 8809	1855	3157	900	SAVE	DEC. 1964		6
859	22 2379 8874 N	MOPOPI FALLS FARM	UQ 8874	1819	3156	1480	SAVE	NOV. 1902		7
860	22 2379 8933 C	MATSIKA	UQ 8933	1841	3157	1200	SAVE	JUNE 1973	OCT. 1976	8
861	22 2379 8960 G	SPRINGS(RUSAPE)	UQ 8960	1827	3157	1400	SAVE	JULY 1913	JUNE 1966	8
862	22 2379 9103 M	ROAD CAMP MAN 28	UQ 9103	1850	3150	850	SAVE	FEB. 1973	OCT. 1977	6
863	22 2379 9148 L	CHITSWA	UQ 9148	1833	3158	1300	SAVE	JUNE 1973	MAY 1979	8
864	22 2379 9203 W	ROMSLEY,MAIN HOMESTEAD	UQ 9203	1857	3159	830	SAVE	OCT. 1970	AUG. 1977	6
865	22 2379 9630 K	RUFFUNDE	UQ 9630	1843	3201	1080	SAVE	JUNE 1959	JUNE 1979	7
866	22 2379 9837 K	ST.BARTHOLOMEW CHIWARE	UQ 9837	1840	3202	1260	SAVE	JUNE 1963		7
867	22 2379 9913 S	CHIFUNZA	UQ 9913	1852	3203	1040	SAVE	JUNE 1973	APR. 1979	7
868	22 2476 409 X	MAREYA	VM 0489	2054	3205	420	SAVE	JUNE 1978	JAN. 1981	5
869	22 2476 1064 X	CHITSA I	VM 1064	2107	3208	380	SAVE	JUNE 1978		5
870	22 2476 1172 P	SABI	VM 1172	2103	3208	380	SAVE	JUNE 1978		5
871	22 2476 1178 W	RUPANGWANA	VM 1178	2100	3209	380	SAVE	SEP. 1976		5
872	22 2476 1185 D	MKWASINE CLINIC	VM 1185	2056	3209	380	SAVE	JAN. 1954	AUG. 1976	5
873	22 2476 1497 S	ST.JOSEPH'S SANGWE	VM 1497	2049	3211	400	SAVE	JUNE 1978		5
874	22 2476 2370 R	HIPPO MINE	VM 2370	2104	3215	370	SAVE	NOV. 1945	JULY 1969	5
875	22 2476 2569 H	MAPARADZE SCHOOL	VM 2569	2105	3217	340	SAVE	DEC. 1969	FEB. 1980	5
876	22 2476 3450 Q	SABI-LUNDI BASE CAMP	VM 3450	2115	3222	175	SAVE	MAY 1905		5
877	22 2477 552 K	DEVULI RANCH B	VN 0552	2018	3205	510	SAVE	OCT. 1934	AUG. 1977	4
878	22 2477 643 J	MSHALABATA	VN 0643	2024	3206	460	SAVE	SEP. 1973	MAR. 1979	5
879	22 2477 674 S	DEVULI RANCH H.R.	VN 0674	2000	3206	600	SAVE	NOV. 1921		5
880	22 2477 795 Z	DEVULI HALT	VN 0795	1957	3207	700	SAVE	FEB. 1972	OCT. 1977	5
881	22 2477 1153 N	UNKONDO MINE	VN 1153	2021	3200	510	SAVE	JUNE 1952	OCT. 1972	4
882	22 2477 1407 P	GUDO'S DIP	VN 1407	2047	3208	420	SAVE	FEB. 1959	FEB. 1965	5
883	22 2477 1739 A	HUMANI RANCH	VN 1739	2027	3213	450	SAVE	MAY 1930		4
884	22 2477 1798 P	TUTURUKU	VN 1798	1955	3212	560	SAVE	OCT. 1951	AUG. 1976	4
885	22 2477 1880 D	DEVULI RANCH,RST.	VN 1880	2005	3213	560	SAVE	JULY 1972	SEP. 1976	4
886	22 2477 2001 K	CHISUMBANJE	VN 2001	2048	3214	420	SAVE	APR. 1954		5
887	22 2477 2025 L	DEVULI RANCH,NASAPAS	VN 2025	2034	3214	410	SAVE	JULY 1972	JAN. 1985	5
888	22 2477 2100 S	BLACK BASALT	VN 2100	2049	3215	410	SAVE	DEC. 1952	MAY 1961	5
889	22 2477 2651 R	DEVULI RANCH,IRRIG.FARM	VN 2651	2020	3217	440	SAVE	JAN. 1960	AUG. 1979	4
890	22 2477 2730 L	CHIBUWE IRRIG.SCHEME	VN 2730	2020	3218	430	SAVE	NOV. 1932		4
891	22 2477 2862 W	DEVULI RANCH A	VN 2862	2014	3218	460	SAVE	OCT. 1967	NOV. 1970	4
892	22 2477 2993 N	BIRCHENOUGH BRIDGE	VN 2993	1958	3220	500	SAVE	DEC. 1935		4
893	22 2477 3049 Z	SAVE VALLEY EXP.STN.	VN 3049	2021	3220	450	SAVE	MAY 1951	JUNE 1977	4
894	22 2477 3050 A	SAVE,OVERH'D IRRIG.	VN 3050	2021	3220	440	SAVE	FEB. 1972	JUNE 1977	4
895	22 2477 3059 K	SAVE TANGANDA 2	VN 3059	2016	3219	450	SAVE	JAN. 1952	NOV. 1962	4
896	22 2477 3341 R	MWACHETA	VN 3341	2025	3223	440	SAVE	FEB. 1961	NOV. 1976	5
897	22 2477 3365 S	MIDDLE SAVE MET.	VN 3365	2013	3221	470	SAVE	AUG. 1977	MAY 1982	4
898	22 2477 3564 J	MIDDLE SAVE (WORKSHOP)	VN 3564	2013	3223	400	SAVE	JUNE 1902		4
899	22 2477 3565 K	MIDDLE SAVE	VN 3565	2013	3223	400	SAVE	APR. 1927	AUG. 1982	4
900	22 2477 3629 E	CHIBUNGE	VN 3629	2033	3224	440	SAVE	OCT. 1960	DEC. 1974	6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
946	22 2478 5524 J	CHIAMITI	VP 5524	1941	3232	1160	SAVE	JULY 1962		5
947	22 2478 5807 R	CHIKWAKWA	VP 5807	1950	3236	1130	SAVE	FEB. 1966	NOV. 1969	5
948	22 2478 5887 D	ROWA	VP 5887	1906	3235	1130	SAVE	OCT. 1950	NOV. 1978	7
949	22 2478 5938 J	CHIRAMBA	VP 5938	1935	3237	1070	SAVE	MAY 1963		5
950	22 2478 5955 C	KINGSBROOK	VP 5955	1925	3236	910	SAVE	MAR. 1974	APR. 1978	6
951	22 2478 6033 M	LINECLIFFS	VP 6033	1936	3237	930	SAVE	DEC. 1954	NOV. 1978	5
952	22 2478 6210 E	MHAKWE	VP 6210	1948	3238	1010	SAVE	MAY 1964	OCT. 1978	6
953	22 2478 6328 H	PASTURE FARM(MUTAMBARA)	VP 6328	1938	3239	1070	SAVE	SEP. 1913	FEB. 1919	5
954	22 2478 6496 Q	FERN VALLEY	VP 6496	1902	3238	1100	SAVE	OCT. 1923	DEC. 1938	8
955	22 2478 6514 K	BIRIWIRI	VP 6514	1946	3240	950	SAVE	OCT. 1950	JAN. 1964	6
956	22 2478 6599 C	MUTARE,TIMBER DEPOT	VP 6599	1859	3241	1100	SAVE	DEC. 1961		7
957	22 2478 6739 E	MUTAMBARA IRRIG.SCHEME	VP 6739	1933	3241	1020	SAVE	JAN. 1973		6
958	22 2478 6741 G	MUTAMBARA MISSION	VP 6741	1932	3242	900	SAVE	JULY 1911	JUNE 1977	5
959	22 2478 6750 R	WHIP'S CROSS	VP 6750	1927	3241	1220	SAVE	SEP. 1950	FEB. 1974	7
960	22 2478 6785 E	NYACHOWA IRRIG.PROJECT	VP 6785	1908	3241	1210	SAVE	NOV. 1950		9
961	22 2478 6800 W	ERASMUS	VP 6800	1954	3242	1630	SAVE	OCT. 1948	JAN. 1970	8
962	22 2478 6911 R	BIRIIRI	VP 6911	1948	3242	1040	SAVE	FEB. 1968		6
963	22 2478 6993 F	PARK	VP 6993	1904	3242	1270	SAVE	JAN. 1936	FEB. 1970	9
964	22 2478 7005 T	ROAD CAMP MAN 9	VP 7005	1951	3243	1250	SAVE	MAR. 1973	FEB. 1978	7
965	22 2478 7153 E	BEAVER DAM	VP 7153	1925	3144	1400	SAVE	JULY 1975	MAY 1978	9
966	22 2478 7461 P	BUTLER SOUTH	VP 7461	1921	3245	1590	SAVE	JAN. 1948	OCT. 1978	9
967	22 2478 7548 J	NYANGENA	VP 7548	1929	3246	1300	SAVE	JAN. 1945	JUNE 1972	8
968	22 2478 7640 J	CASHEL P.O.O.	VP 7640	1932	3245	1170	SAVE	JULY 1965	MAR. 1971	8
969	22 2478 7740 S	CASHEL FOREST	VP 7040	1932	3247	1200	SAVE	NOV. 1983		9
970	22 2478 7815 Z	NYASHAMA	VP 7015	1946	3247	1520	SAVE	JAN. 1949	DEC. 1974	10
971	22 2478 7839 A	CASHEL POLICE	VP 7839	1933	3247	1190	SAVE	JULY 1930		8
972	22 2478 7840 B	MUDIMA	VP 7840	1932	3248	1160	SAVE	NOV. 1934	AUG. 1941	10
973	22 2478 8015 R	SAWEROMBI WEST	VP 8015	1946	3248	1570	SAVE	JUNE 1975	APR. 1978	10
974	22 2478 8034 M	ATHENE	VP 8034	1935	3248	1370	SAVE	OCT. 1940	JUNE 1980	8
975	22 2478 8140 C	STEYNSTROOM	VP 8140	1932	3249	1300	SAVE	APR. 1936	APR. 1952	10
976	22 2478 8439 C	TOM'S HOPE WEST	VP 8439	1934	3250	1280	SAVE	JULY 1911	JUNE 1926	10
977	22 2479 79 K	HEADLANDS,POLICE	VQ 0079	1817	3203	1560	SAVE	JAN. 1951		8
978	22 2479 179 T	HEADLANDS,RAIL	VQ 0179	1817	3203	1570	SAVE	OCT. 1916		8
979	22 2479 243 N	TANDI	VQ 0243	1836	3204	1340	SAVE	JUNE 1973	NOV. 1980	7
980	22 2479 329 G	MUDZILMUKUNZE	VQ 0329	1843	3205	1220	SAVE	JULY 1973	JULY 1976	7
981	22 2479 407 R	NYANGOMBE	VQ 0407	1856	3205	970	SAVE	JUNE 1959	DEC. 1976	6
982	22 2479 560 H	VALHALLA	VQ 0560	1827	3206	1410	SAVE	DEC. 1935		7
983	22 2479 751 Q	RUSAPE,RAIL	VQ 0751	1832	3207	1400	SAVE	JAN. 1910		7
984	22 2479 820 Q	VERGENOEG	VQ 0820	1850	3208	1180	SAVE	JULY 1958	SEP. 1978	7
985	22 2479 851 Z	RUSAPE,GAOL	VQ 0851	1832	3208	1420	SAVE	OCT. 1969		7
986	22 2479 852 A	RUSAPE,SCHOOL	VQ 0852	1832	3208	1400	SAVE	JUNE 1941		7
987	22 2479 863 M	MONA	VQ 0863	1825	3208	1500	SAVE	SEP. 1913		8
988	22 2479 950 G	RUSAPE	VQ 0950	1832	3208	1430	SAVE	JUNE 1903		8
989	22 2479 971 E	CHIGWANI	VQ 0771	1821	3208	1560	SAVE	OCT. 1924	FEB. 1955	8
990	22 2479 1030 T	MAVHUDZI	VQ 1030	1844	3209	1200	SAVE	SEP. 1907		7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
901	22 2477 3748 J	RUPISI	VN 3748	2022	3223	480	SAVE	OCT. 1940	DEC. 1960	5
902	22 2477 4085 A	MUSANI	VN 4085	2002	3227	750	SAVE	JULY 1962	SEP. 1976	4
903	22 2477 5578 Y	NEW YEAR'S GIFT	VN 5578	2006	3234	790	SAVE	OCT. 1925		7
904	22 2477 5690 V	MUTEMA HIGHLANDS	VN 5690	1959	3234	1570	SAVE	JULY 1962		8
905	22 2477 5893 Q	BRACKENBURY	VN 5893	1958	3236	1530	SAVE	MAR. 1915	JUNE 1941	8
906	22 2477 6386 B	HIGHLANDS ESTATE	VN 6386	2003	3238	1360	SAVE	OCT. 1940		10
907	22 2477 6497 X	GWENDINGWE ESTATE	VN 6497	1957	3239	1770	SAVE	MAR. 1954		10
908	22 2478 2 G	CHATIKOBO	VP 0002	1943	3205	680	SAVE	NOV. 1946	NOV. 1959	5
909	22 2478 422 N	BARURA SCHOOL	VP 0422	1942	3205	820	SAVE	MAR. 1972	MAY 1977	5
910	22 2478 630 Y	ZANGAMA	VP 0630	1933	3207	780	SAVE	JAN. 1972	DEC. 1976	4
911	22 2478 649 K	CHIROZVA SCHOOL	VP 0649	1926	3204	760	SAVE	AUG. 1972	MAR. 1977	4
912	22 2478 771 S	MUKUNGUMA	VP 0771	1916	3206	1140	SAVE	NOV. 1962		6
913	22 2478 2271 Y	MARANGE TRAINING CENTRE	VP 2271	1915	3215	0945	SAVE	JULY 1986		7
914	22 2478 793 R	CONDO DAM(TSUNGWESI)	VP 0793	1905	3207	870	SAVE	DEC. 1964	MAR. 1979	6
915	22 2478 796 V	CHIRUMBWE	VP 0796	1907	3205	900	SAVE	SEP. 1925	APR. 1936	6
916	22 2478 980 D	MONTEZUMA	VP 0980	1906	3208	900	SAVE	JULY 1951	MAY 1978	7
917	22 2478 1178 K	ZIMBARI	VP 1178	1913	3208	840	SAVE	NOV. 1955	JUNE 1983	6
918	22 2478 1290 Q	ALPHA	VP 1290	1901	3210	950	SAVE	MAR. 1945	JUNE 1982	6
919	22 2478 1359 G	MAFARARIKWA	VP 1359	1922	3210	810	SAVE	MAR. 1962	JULY 1977	6
920	22 2478 1893 M	ACHNASHEE	VP 1893	1904	3213	1000	SAVE	OCT. 1946	JUNE 1966	7
921	22 2478 2271 Y	MARANKE TRAINING CENTRE	VP 2271	1915	3215	950	SAVE	NOV. 1950	JAN. 1978	7
922	22 2478 2296 A	CRAIGENDORAN	VP 2296	1902	3215	1040	SAVE	JULY 1918	JUNE 1946	7
923	22 2478 2387 Z	PULPIT ROCK	VP 2387	1907	3215	1010	SAVE	JULY 1927	OCT. 1944	7
924	22 2478 2430 W	CHIWADSHA	VP 2430	1930	3217	610	SAVE	JULY 1962	JAN. 1978	5
925	22 2478 2748 R	MUTSAGO	VP 2850	1928	3219	860	SAVE	JAN. 1951		5
926	22 2478 2781 V	CHIPFATSURA	VP 2901	1910	3219	900	SAVE	OCT. 1955	AUG. 1977	7
927	22 2478 3187 T	HELENA VALLEY	VP 3187	1907	3221	1070	SAVE	JAN. 1944	MAR. 1950	7
928	22 2478 3242 D	MUKWADA	VP 3242	1931	3221	1140	SAVE	OCT. 1955	JUNE 1976	5
929	22 2478 3287 C	GWA WA WA	VP 3287	1907	3222	1070	SAVE	MAY 1945	NOV. 1956	7
930	22 2478 3458 N	MASHAURE	VP 3458	1923	3223	800	SAVE	NOV. 1961	NOV. 1977	6
931	22 2478 3771 D	MATANDA DIP	VP 3771	1915	3224	900	SAVE	DEC. 1972	JAN. 1978	7
932	22 2478 3805 Q	GURIANGA	VP 3704	1952	3224	520	SAVE	NOV. 1964		4
933	22 2478 3916 L	NYANYADZI	VP 3916	1945	3225	530	SAVE	JAN. 1984		4
934	22 2478 4014 S	NYANYADZI IRRIG.	VP 4014	1946	3225	540	SAVE	OCT. 1941		4
935	22 2478 4107 F	WILD PARK	VP 4107	1907	3227	910	SAVE	JULY 1941	MAR. 1956	7
936	22 2478 4427 R	HOT SPRINGS RESORT	VP 4528	1939	3229	620	SAVE	AUG. 1932		5
937	22 2478 4436 B	KUSENA SCHOOL	VP 4436	1934	3228	660	SAVE	JAN. 1985		5
938	22 2478 4530 D	HOT SPRINGS HYDRO.	VP 4530	1938	3224	560	SAVE	JAN. 1948	SEP. 1971	5
939	22 2478 4895 A	MATIKA	VP 4895	1902	3230	1040	SAVE	OCT. 1945		7
940	22 2478 5039 G	UNYUNYUNYU	VP 5039	1933	3230	640	SAVE	DEC. 1952		5
941	22 2478 5083 E	CHISAMBA	VP 5083	1909	3232	1500	SAVE	FEB. 1975	SEP. 1978	7
942	22 2478 5150 L	NUROMO	VP 5150	1923	3232	730	SAVE	NOV. 1950		6
943	22 2478 5305 W	CHIKWAKWA SCHOOL	VP 5305	1951	3233	1250	SAVE	JULY 1982		6
944	22 2478 5343 N	CHIMANIMANI JUNCTION	VP 5343	1931	3233	670	SAVE	OCT. 1948	NOV. 1976	5
945	22 2478 5471 B	MUNYARARI	VP 5471	1915	3233	960	SAVE	AUG. 1961		7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1036	22 2479 4205 V	TRANSSAU	VQ 4205	1057	3220	1100	SAVE	NOV. 1923	SEP. 1981	7
1037	22 2479 4362 Q	TRIASHILL	VQ 4362	1026	3227	1780	SAVE	JULY 1913		8
1038	22 2479 4421 E	SIMONDALE	VQ 4421	1047	3228	1040	SAVE	JULY 1951	MAR. 1977	7
1039	22 2479 4455 R	ST.BARBARA'S MISSION	VQ 4455	1030	3220	1520	SAVE	JULY 1930	MAR. 1975	8
1040	22 2479 4514 F	PEPLOW/DICE BOX	VQ 4514	1052	3229	1040	SAVE	OCT. 1943	AUG. 1976	6
1041	22 2479 4610 K	CHICONGAS	VQ 4610	1054	3223	1060	SAVE	JULY 1910	MAY 1921	6
1042	22 2479 4828 X	JENYA	VQ 4828	1045	3230	1140	SAVE	JUNE 1965	FEB. 1977	7
1043	22 2479 4908 J	BATTERY SPRUIT	VQ 4900	1056	3231	1090	SAVE	JULY 1928		7
1044	22 2479 5139 K	SHERUKURU	VQ 5139	1038	3232	1120	SAVE	JULY 1951		7
1045	22 2479 5210 H	PREMIER ESTATE	VQ 5210	1054	3233	1070	SAVE	NOV. 1911		7
1046	22 2479 5316 C	SARUM	VQ 5316	1051	3233	1130	SAVE	FEB. 1916	MAY 1979	7
1047	22 2479 5355 V	BANNOCKBURN AGRIC	VQ 5355	1034	3236	1600	SAVE	NOV. 1952		8
1048	22 2479 5415 K	MAZANI	VQ 5415	1051	3234	1150	SAVE	OCT. 1920	FEB. 1958	7
1049	22 2479 5422 S	OLIPHANTS HOEK	VQ 5422	1048	3234	1140	SAVE	NOV. 1950		7
1050	22 2479 5612 Z	HARTZELL MISSION	VQ 5612	1053	3235	1090	SAVE	MAY 1930		7
1051	22 2479 5860 T	ST.DAVID'S MISSION	VQ 5860	1027	3236	1660	SAVE	APR. 1938		8
1052	22 2479 6013 K	FAIRVIEW(MUTARE)	VQ 6013	1052	3237	1150	SAVE	DEC. 1923	JUNE 1939	8
1053	22 2479 6107 H	TORONTO	VQ 6107	1056	3239	1190	SAVE	JULY 1903		7
1054	22 2479 6109 P	FERNDALE(MUTARE)	VQ 6109	1055	3230	1140	SAVE	MAY 1929		7
1055	22 2479 6131 N	WATSOMBA	VQ 6131	1043	3238	1400	SAVE	NOV. 1950		7
1056	22 2479 6135 S	TSONZO P.A.	VQ 6135	1041	3238	1400	SAVE	APR. 1960		7
1057	22 2479 6138 W	STRALSUND	VQ 6130	1037	3237	1400	SAVE	DEC. 1913	JUNE 1921	7
1058	22 2479 6200 N	SAKUBVA SCHOOL	VQ 6200	1059	3238	1080	SAVE	JULY 1952	OCT. 1964	7
1059	22 2479 6300 F	MUTARE HILLCREST	VQ 6300	1055	3200	1160	SAVE	FEB. 1980		7
1060	22 2479 6333 H	WATSOMBA EAST	VQ 6333	1042	3239	1400	SAVE	OCT. 1904		8
1061	22 2479 6401 G	MUTARE,RAIL	VQ 6401	1059	3240	1140	SAVE	FEB. 1910		7
1062	22 2479 6403 J	MUTARE,GAOL	VQ 6403	1058	3240	1120	SAVE	APR. 1897		7
1063	22 2479 6415 X	ST.AUGUSTINE'S MISSION	VQ 6415	1051	3239	1300	SAVE	NOV. 1910		9
1064	22 2479 6422 E	ODZANI POWER STATION	VQ 6422	1048	3239	1240	SAVE	JULY 1913	JUNE 1956	9
1065	22 2479 6432 Q	JERAIN	VQ 6432	1041	3238	1420	SAVE	JULY 1921	JUNE 1951	8
1066	22 2479 6502 R	MUTARE PARK/SCHOOL	VQ 6502	1059	3240	1100	SAVE	MAY 1898	JUNE 1918	7
1067	22 2479 6503 S	MUTARE,FIRE STATION	VQ 6503	1058	3240	1110	SAVE	SEP. 1965		7
1068	22 2479 6512 C	PENHALONGA POLICE	VQ 6512	1053	3240	1160	SAVE	FEB. 1950		9
1069	22 2479 6604 C	UTOPIA	VQ 6604	1058	3240	1200	SAVE	JULY 1900	JUNE 1926	7
1070	22 2479 6613 H	REZENDE MINE	VQ 6613	1053	3240	1200	SAVE	OCT. 1913	JUNE 1971	10
1071	22 2479 6614 N	REDWING MINE	VQ 6614	1052	3241	1200	SAVE	MAR. 1901		12
1072	22 2479 6752 N	SELBORNE ESTATE	VQ 6752	1032	3241	1700	SAVE	JAN. 1948	MAY 1970	9
1073	22 2479 6806 X	MUTARE,FORESTRY	VQ 6806	1057	3242	1220	SAVE	JULY 1937	JUNE 1961	9
1074	22 2479 6810 B	NYAGARA	VQ 6810	1054	3242	1210	SAVE	JAN. 1970		10
1075	22 2479 6817 J	MOUNTAIN HOME(PENHAL.)	VQ 6817	1050	3242	1500	SAVE	APR. 1926		14
1076	22 2479 6826 T	CHODZANA	VQ 6826	1045	3242	1500	SAVE	MAR. 1949	AUG. 1954	10
1077	22 2479 6827 V	INYASHUUTI	VQ 6827	1045	3242	1600	SAVE	JULY 1952	JULY 1981	10
1078	22 2479 6860 P	ERIN FOREST H.O.	VQ 6860	1023	3242	1800	SAVE	DEC. 1969		10
1079	22 2479 6927 D	SADDLEBACK	VQ 6927	1045	3242	1600	SAVE	OCT. 1954	JUNE 1978	10
1080	22 2479 7108 A	IMBEZA	VQ 7108	1056	3243	1470	SAVE	OCT. 1925		14

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
991	22 2479 1109 E	CHINOTA	VQ 1109	1855	3209	1040	SAVE	JAN. 1930	OCT. 1952	6
992	22 2479 1215 V	KAIRIDZI	VQ 1215	1852	3208	1120	SAVE	OCT. 1926	APR. 1939	7
993	22 2479 1231 M	NYAZURA RAIL	VQ 1231	1843	3210	1200	SAVE	JAN. 1914		7
994	22 2479 1236 S	FOLKINGTON	VQ 1236	1840	3210	1300	SAVE	NOV. 1940		7
995	22 2479 1307 V	SHERWOOD(NYAZURA)	VQ 1307	1856	3210	1000	SAVE	OCT. 1945		6
996	22 2479 1343 J	MANDA	VQ 1343	1837	3210	1340	SAVE	NOV. 1922		0
997	22 2479 1408 E	WATERFALL	VQ 1408	1855	3211	1000	SAVE	DEC. 1929	JUNE 1952	6
998	22 2479 1614 D	MWENJI FARM	VQ 1614	1852	3212	1100	SAVE	JUNE 1974		7
999	22 2479 1761 N	HARLEIGH	VQ 1761	1826	3214	1550	SAVE	JAN. 1929		7
1000	22 2479 1835 T	GORUBI SPRINGS	VQ 1835	1843	3214	1200	SAVE	JULY 1914	DEC. 1920	7
1001	22 2479 1850 K	NYAMASANGA	VQ 1850	1834	3214	1550	SAVE	JULY 1929	MAY 1937	8
1002	22 2479 1856 R	ST.FAITH'S MISSION	VQ 1856	1829	3213	1500	SAVE	JULY 1938		7
1003	22 2479 1949 S	GAVENNY	VQ 1949	1833	3214	1560	SAVE	NOV. 1942		8
1004	22 2479 1968 N	CHITORA	VQ 1968	1823	3214	1500	SAVE	JULY 1920		8
1005	22 2479 2028 D	TSUNGWESI SOURCE	VQ 2020	1845	3215	1240	SAVE	NOV. 1936	MAY 1949	7
1006	22 2479 2156 S	MAKONI KOP	VQ 2156	1829	3215	1540	SAVE	NOV. 1922	JAN. 1928	7
1007	22 2479 2269 Q	CHIMBI SOURCE	VQ 2269	1821	3216	1620	SAVE	JULY 1913	JUNE 1920	8
1008	22 2479 2311 L	WHITGIFT	VQ 2311	1854	3216	1100	SAVE	SEP. 1925	JUNE 1934	7
1009	22 2479 2329 F	TABLELANDS	VQ 2329	1844	3216	1480	SAVE	OCT. 1923	NOV. 1928	7
1010	22 2479 2341 T	MOUNT ZONGA	VQ 2341	1837	3216	1400	SAVE	SEP. 1965	JUNE 1982	8
1011	22 2479 2370 A	SCHOOMBIE	VQ 2370	1822	3217	1680	SAVE	FEB. 1939	JUNE 1966	8
1012	22 2479 2415 Z	CLARE ESTATE	VQ 2415	1852	3218	1150	SAVE	OCT. 1924	NOV. 1941	7
1013	22 2479 2830 A	ZUNIDZA	VQ 2830	1843	3219	1220	SAVE	OCT. 1937	JUNE 1985	7
1014	22 2479 2901 C	STONEDALE	VQ 2901	1859	3219	1100	SAVE	NOV. 1944		6
1015	22 2479 2938 S	ZURURA	VQ 2938	1839	3220	1220	SAVE	MAR. 1986		7
1016	22 2479 2954 K	FOREST HILL	VQ 2954	1830	3220	1460	SAVE	SEP. 1918	JUNE 1966	8
1017	22 2479 3031 T	RUATI	VQ 3031	1843	3220	1200	SAVE	OCT. 1925	JUNE 1956	7
1018	22 2479 3037 A	NGORIMA	VQ 3037	1838	3219	1180	SAVE	JULY 1965	JULY 1970	0
1019	22 2479 3062 C	SWEETWATERS	VQ 3062	1826	3220	1600	SAVE	MAR. 1940	FEB. 1972	8
1020	22 2479 3070 L	TANIII	VQ 3070	1822	3220	1640	SAVE	NOV. 1983		0
1021	22 2479 3102 W	BUDE	VQ 3102	1859	3220	1060	SAVE	JULY 1927	JUNE 1933	6
1022	22 2479 3463 N	TINARU	VQ 3463	1826	3223	1700	SAVE	MAR. 1973		0
1023	22 2479 3503 G	ODZI POLICE	VQ 3503	1858	3224	960	SAVE	FEB. 1965		7
1024	22 2479 3543 A	RUGOYI	VQ 3543	1836	3223	1270	SAVE	JULY 1986		7
1025	22 2479 3504 H	ODZI,RAIL	VQ 3504	1850	3224	960	SAVE	MAR. 1913	NOV. 1983	7
1026	22 2479 3618 G	INYANAZURA	VQ 3618	1849	3224	1040	SAVE	FEB. 1938		7
1027	22 2479 3723 W	GANE VALLEY	VQ 3723	1847	3225	1130	SAVE	OCT. 1940	JAN. 1979	7
1028	22 2479 3840 Y	MAKONI T.T.L.	VQ 3840	1838	3225	1200	SAVE	APR. 1932	JAN. 1973	7
1029	22 2479 3842 A	ST.KILIAN'S MISSION	VQ 3842	1836	3225	1300	SAVE	JULY 1951	JUNE 1977	7
1030	22 2479 3933 Z	GANDANZARA	VQ 3933	1840	3226	1200	SAVE	FEB. 1973	OCT. 1978	7
1031	22 2479 4007 E	ARGYLL	VQ 4007	1856	3226	990	SAVE	FEB. 1922	APR. 1976	6
1032	22 2479 4032 G	DZIRUNI	VQ 4032	1842	3226	1160	SAVE	JULY 1986		7
1033	22 2479 4066 T	KRISTE MANGO MISSION	VQ 4066	1824	3226	1700	SAVE	JUNE 1967	AUG. 1977	8
1034	22 2479 4131 P	DOPE	VQ 4131	1842	3226	1170	SAVE	JULY 1903	AUG. 1905	7
1035	22 2479 4202 R	GRAND REEF	VQ 4202	1859	3227	1020	SAVE	DEC. 1947	SEP. 1983	7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1126	23 2081 7029 E	MAKANDE	QM 1230	1655	2859	0825	SANYATI	OCT. 1905		6
1127	23 2081 7713 Y	DEVE CAMP	QM 1617	1701	2901	860	SANYATI	OCT. 1952	JUNE 1969	6
1128	23 2081 0152 A	NZOE MICA MINE	QM 2252	1645	2902	900	SANYATI	FEB. 1945	AUG. 1950	7
1129	23 2081 9421 E	ZVIPANI	QM 3521	1659	2913	1040	SANYATI	FEB. 1903		7
1130	23 2081 9602 B	CHIDAMOYO	QM 3405	1700	2912	920	SANYATI	FEB. 1903		7
1131	23 2081 9720 E	ZHIPANI	QM 3921	1700	2906	1050	SANYATI	NOV. 1954	JULY 1978	7
1132	23 2081 9907 H	ZEMAIWE	QM 3710	1707	2912	960	SANYATI	FEB. 1956	JUNE 1978	7
1133	23 2081 9995 D	MAKUTI POLICE	QM 4195	1619	2915	1190	SANYATI	NOV. 1977		8
1134	23 2178 3797 P	ARGYLE(KWEKWE)	QJ 6999	1900	2933	1420	SANYATI	SEP. 1951	DEC. 1973	6
1135	23 2178 4590 B	LANNES	QJ 7793	1903	2938	1240	SANYATI	NOV. 1926	JUNE 1934	6
1136	23 2178 5079 H	LIMERIDGE	QJ 8201	1909	2940	1300	SANYATI	NOV. 1945	MAR. 1974	6
1137	23 2178 5003 M	ZOE FARM	QJ 8204	1907	2940	1300	SANYATI	OCT. 1969	MAY 1973	6
1138	23 2178 5472 K	HARSTON	QJ 8574	1913	2943	1350	SANYATI	JULY 1932	OCT. 1974	6
1139	23 2178 6001 X	GLORYANNA	QJ 9203	1908	2946	1280	SANYATI	JULY 1920	JAN. 1939	6
1140	23 2178 6094 L	REDCLIFF	QJ 9295	1901	2946	1200	SANYATI	AUG. 1977		6
1141	23 2178 6265 X	ROCK VALLEY	QJ 9365	1917	2947	1380	SANYATI	APR. 1975	MAR. 1984	6
1142	23 2178 6279 H	HUNTERS ROAD	QJ 9380	1909	2947	1290	SANYATI	JULY 1920		6
1143	23 2178 6473 Y	BARKLY FARM	QJ 9574	1913	2949	1300	SANYATI	NOV. 1935	JUNE 1942	6
1144	23 2178 6577 L	CROSS ROADS	QJ 9660	1909	2949	1290	SANYATI	JULY 1916	JUNE 1966	6
1145	23 2178 7060 V	GOKOMERA P.A.	RJ 0269	1915	2952	1300	SANYATI	NOV. 1969		6
1146	23 2178 7354 F	MARJORIBANKS	RJ 0454	1922	2954	1300	SANYATI	NOV. 1929	JUNE 1979	6
1147	23 2178 7447 G	BALMORAL	RJ 0447	1927	2954	1440	SANYATI	DEC. 1937	MAR. 1950	6
1148	23 2178 7471 H	ST.PATRICK'S SCHOOL	RJ 0572	1914	2954	1200	SANYATI	JULY 1926		6
1149	23 2178 7406 Z	BEACON FARM	RJ 0607	1905	2955	1280	SANYATI	NOV. 1972	MAR. 1974	6
1150	23 2178 7647 Z	LYNDENE	RJ 0648	1927	2955	1440	SANYATI	JULY 1922		6
1151	23 2178 7749 K	GREENVALE	RJ 0750	1925	2955	1420	SANYATI	JULY 1941	DEC. 1961	6
1152	23 2178 7870 R	MUCHAKATA (GWERU)	RJ 0971	1913	2957	1300	SANYATI	JAN. 1963		6
1153	23 2178 8167 P	UMILALI	RJ 1360	1916	2959	1370	SANYATI	OCT. 1931		6
1154	23 2178 0657 X	WHA WHA	SP 0657	1921	3002	1370	SANYATI	APR. 1965		7
1155	23 2178 0794 W	KUTANGA	SP 0794	1902	3002	1240	SANYATI	FEB. 1960		6
1156	23 2178 0951 R	INDIVA	SP 0951	1925	3003	1400	SANYATI	JULY 1921	JUNE 1951	7
1157	23 2178 9368 V	HOLD FARM	SP 9368	1916	3005	1380	SANYATI	JULY 1926	JUNE 1966	6
1158	23 2178 9762 Y	WOODENHOVE	SP 9762	1918	3000	1480	SANYATI	MAY 1912	JUNE 1936	7
1159	23 2179 507 V	MUTANGE	QK 4009	1810	2916	800	SANYATI	JULY 1962		7
1160	23 2179 599 H	CIRCLE K RANCH	QL 4001	1804	2916	900	SANYATI	NOV. 1962	FEB. 1972	7
1161	23 2179 777 B	NGWENYA	QK 4279	1817	2917	920	SANYATI	JULY 1962		7
1162	23 2179 1383 K	SANYATI RANCH	QK 4805	1813	2911	880	SANYATI	NOV. 1964	MAR. 1980	7
1163	23 2179 1432 N	ZHOMBE CENTRAL	QK 4734	1841	2921	1160	SANYATI	DEC. 1966		6
1164	23 2179 1859 C	BLUE GUMS	QK 5261	1826	2923	1030	SANYATI	NOV. 1965		6
1165	23 2179 1954 F	NGONDOMO STORE	QK 5355	1829	2924	1200	SANYATI	MAR. 1935	DEC. 1966	6
1166	23 2179 2276 F	KUDU RIVER RANCH NO.2	QK 5770	1817	2926	920	SANYATI	OCT. 1966	FEB. 1974	6
1167	23 2179 2458 D	EMPRESS WATER SUPPLY	QK 5758	1827	2926	1040	SANYATI	OCT. 1969	closed 1987	6
1168	23 2179 2817 T	DUBLIN	QK 6219	1847	2929	1140	SANYATI	JAN. 1945	JUNE 1952	6
1169	23 2179 2853 H	TOTORORO	QK 6254	1828	2929	1040	SANYATI	DEC. 1966		6
1170	23 2179 2887 V	WITPENSKRAAL	QK 6389	1812	2929	1000	SANYATI	NOV. 1903		7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1081	22 2479 7112 E	MONARCH MINE	VQ 7112	1854	3244	1530	SAVE	FEB. 1938	FEB. 1957	10
1082	22 2479 7125 T	ODZANI DAM	VQ 7125	1846	3244	1520	SAVE	AUG. 1964		12
1083	22 2479 7153 Z	CHINGAMWE II	VQ 7153	1829	3244	1600	SAVE	APR. 1949	FEB. 1975	11
1084	22 2479 7166 N	ERIN FOR.RES.NO.3	VQ 7166	1822	3243	1860	SAVE	APR. 1952	JULY 1962	12
1085	22 2479 7167 P	ERIN FOR.RES.NO.2	VQ 7167	1824	3244	1900	SAVE	APR. 1952	JULY 1962	12
1086	22 2479 7169 R	ERIN FOR.RES.NO.1	VQ 7169	1822	3244	1940	SAVE	APR. 1952	NOV. 1969	11
1087	22 2479 7321 G	EPSOM,HOUSE	VQ 7321	1848	3245	1750	SAVE	DEC. 1961		12
1088	22 2479 7322 H	EPSOM,COMPOUND	VQ 7322	1848	3245	1580	SAVE	DEC. 1961		12
1089	22 2479 7331 S	SIMLA	VQ 7331	1843	3245	1620	SAVE	OCT. 1948	NOV. 1905	11
1090	22 2479 7363 C	SANYANGA'S GARDEN	VQ 7363	1825	3245	1640	SAVE	JAN. 1968		12
1091	22 2479 7459 G	CHINGAMWE	VQ 7459	1828	3245	1760	SAVE	MAR. 1953		12
1092	22 2479 7624 L	SHEBA	VQ 7624	1848	3246	1690	SAVE	JULY 1924		17
1093	22 2479 0032 E	STAPLEFORD FOREST C.P.	VQ 8032	1841	3249	1740	SAVE	NOV. 1929		10
1094	22 2479 8129 K	STAPLEFORD FOREST	VQ 8129	1844	3249	1610	SAVE	OCT. 1918		10
1095	22 2479 8131 M	MOUNT NUZA	VQ 8131	1843	3249	2030	SAVE	DEC. 1931	JAN. 1947	12
1096	23 2078 6891 W	NHONGO	QK 0395	1807	2855	1160	SANYATI	OCT. 1983		7
1097	23 2079 8454 P	NGONDONA RANCH	QK 1758	1826	2906	1220	SANYATI	OCT. 1948	SEP. 1975	7
1098	23 2079 8749 K	WOLVERLEY	QK 2152	1831	2906	1180	SANYATI	MAR. 1923	OCT. 1940	7
1099	23 2079 8796 L	NYAROPAKWE	QK 2290	1806	2905	910	SANYATI	NOV. 1965	APR. 1979	7
1100	23 2079 8849 T	CHEHAGORA	QK 2252	1831	2907	1190	SANYATI	MAR. 1973	JUNE 1983	6
1101	23 2079 9259 P	SIKOMBELA	QK 2561	1826	2908	1160	SANYATI	NOV. 1913	JUNE 1966	7
1102	23 2079 9063 W	GWANYIKA	QK 3266	1824	2912	1240	SANYATI	NOV. 1965	APR. 1979	7
1103	23 2080 5098 L	MSANPAKARUMA	PM 8903	1709	2846	600	SANYATI	JAN. 1903		6
1104	23 2080 5389 C	MASHANE SCHOOL	PL 9193	1715	2848	660	SANYATI	FEB. 1976	JAN. 1978	6
1105	23 2080 5065 V	CHOTA	PL 9669	1727	2850	770	SANYATI	JULY 1984		6
1106	23 2080 6472 E	CHIMORONGWE DAM	QL 0277	1723	2854	790	SANYATI	DEC. 1975	OCT. 1978	6
1107	23 2080 7378 P	MUNYATI PANS	QL 1171	1726	2859	790	SANYATI	NOV. 1976	AUG. 1978	6
1108	23 2080 7607 N	JAMANA	QL 0707	1801	2857	1150	SANYATI	FEB. 1969	SEP. 1983	6
1109	23 2080 7724 Q	NYATSO TOWNSHIP	QL 1328	1750	2901	930	SANYATI	NOV. 1973		7
1110	23 2080 7841 S	NEMBUDZIA	QL 1444	1741	2901	860	SANYATI	AUG. 1975		6
1111	23 2080 8214 Y	CHINYENYETU	QL 1718	1755	2903	910	SANYATI	APR. 1972	FEB. 1979	7
1112	23 2080 8836 Z	NYAMWEMBI	QL 2539	1746	2906	900	SANYATI	OCT. 1965	JAN. 1974	6
1113	23 2080 8884 B	GANDEROWE FALLS	QL 2687	1717	2908	700	SANYATI	OCT. 1965	NOV. 1971	6
1114	23 2080 8997 Z	RENGWE	QM 2700	1711	2908	870	SANYATI	FEB. 1950	AUG. 1978	6
1115	23 2080 9204 Z	NYAMGIRA	QL 2807	1800	2908	870	SANYATI	JUNE 1962	APR. 1979	7
1116	23 2080 9316 W	UNGWE RIVER	QL 2919	1750	2911	850	SANYATI	MAR. 1966		7
1117	23 2080 9629 L	MARONA	QL 3232	1747	2912	860	SANYATI	JAN. 1967		7
1118	23 2080 9908 P	CHANGWA POOLS	QL 3511	1759	2913	840	SANYATI	NOV. 1974		7
1119	23 2081 4539 Y	SANYATI GORGE	PM 8740	1649	2845	500	SANYATI	JUNE 1971	APR. 1974	6
1120	23 2081 4672 S	KARIBA,GORGE	PM 8873	1631	2846	600	SANYATI	JULY 1952		6
1121	23 2081 4871 J	KARIBA,L.S.O.	PM 9172	1632	2848	530	SANYATI	OCT. 1971		6
1122	23 2081 4971 S	KARIBA,HEIGHTS	PM 9273	1631	2848	830	SANYATI	DEC. 1963		6
1123	23 2081 5072 X	KARIBA,AIRPORT	QM 0173	1631	2853	520	SANYATI	MAY 1963		6
1124	23 2081 6049 P	GATSHE GATSHE	QM 0150	1643	2853	490	SANYATI	SEP. 1972		6
1125	23 2081 6669 N	KARIBA,TSETSE CAMP	QM 0869	1633	2857	490	SANYATI	NOV. 1960	JUNE 1967	6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1216	23 2179 7697 Y	BALWEARIE	RK 1297	1806	2957	1100	SANYATI	OCT. 1922	FEB. 1930	7
1217	23 2179 7701 C	FORESTVALE	RK 0901	1858	2956	1190	SANYATI	JULY 1926	JUNE 1941	6
1218	23 2179 7908 C	BRANDFOLD	RK 1308	1854	2957	1190	SANYATI	JAN. 1930	DEC. 1953	6
1219	23 2179 7971 W	EIFFEL RIO TINTO	RK 1572	1819	2950	1200	SANYATI	JULY 1906		7
1220	23 2179 8061 T	DEVON FARM	RK 1461	1825	2958	1120	SANYATI	JULY 1929	APR. 1936	7
1221	23 2179 8276 C	EIFFEL BLUE	RK 1775	1817	2959	1200	SANYATI	JULY 1923		7
1222	23 2179 8305 J	OLIPHANT POULTRY FARM	RK 1505	1855	3000	1200	SANYATI	OCT. 1922	DEC. 1978	6
1223	23 2179 8337 T	ELEPHANT HILL	SQ 8337	1838	3000	1200	SANYATI	JAN. 1955	SEP. 1974	6
1224	23 2179 8395 G	DRUMMOND FARM	SQ 8395	1807	3000	1150	SANYATI	NOV. 1952		7
1225	23 2179 8623 E	MUNYATI SECTION	SQ 8623	1846	3002	1170	SANYATI	NOV. 1915	JUNE 1946	6
1226	23 2179 8704 S	UMLALA PARK	SQ 8704	1856	3002	1160	SANYATI	JAN. 1954		6
1227	23 2179 8907 N	LOOZANI	SQ 8907	1855	3003	1210	SANYATI	JULY 1956		6
1228	23 2179 8919 B	SULTANA RANCH	SQ 8919	1848	3003	1200	SANYATI	NOV. 1966		6
1229	23 2179 9197 D	AMEVA EXTENSION	SQ 9197	1806	3004	1150	SANYATI	OCT. 1948	MAR. 1960	7
1230	23 2179 9287 B	THORNBY	SQ 9287	1811	3005	1180	SANYATI	OCT. 1944	OCT. 1979	7
1231	23 2179 9500 H	RHODESDALE ESTATES	SQ 9500	1858	3007	1220	SANYATI	MAY 1911	JUNE 1953	6
1232	23 2179 9793 B	CHEGUTU,RAIL	SQ 9793	1808	3008	1190	SANYATI	FEB. 1910		7
1233	23 2179 9835 X	DIAMOND A RANCH	SQ 9835	1841	3011	1190	SANYATI	FEB. 1955		6
1234	23 2179 9884 A	ARDLUI	SQ 9884	1812	3009	1220	SANYATI	JULY 1930		7
1235	23 2179 9891 H	CHEGUTU,POLICE	SQ 9891	1809	3009	1190	SANYATI	SEP. 1967		7
1236	23 2179 9892 J	CHEGUTU,SCHOOL	SQ 9892	1808	3009	1190	SANYATI	OCT. 1964	NOV. 1980	7
1237	23 2179 9894 L	CHEGUTU,GAOL	SQ 9894	1808	3009	1180	SANYATI	JULY 1901	JULY 1964	7
1238	23 2180 112 Y	SANYATI REST CAMP	QL 3615	1756	2912	840	SANYATI	JULY 1951		7
1239	23 2180 713 B	SANYATI B	QL 4316	1755	2917	860	SANYATI	DEC. 1955	FEB. 1963	7
1240	23 2180 911 R	SANYATI BAPTIST MSSN.	QL 4414	1757	2918	860	SANYATI	APR. 1955	MAR. 1978	7
1241	23 2180 959 T	COPPER QUEEN MINE	QL 4762	1731	2920	900	SANYATI	NOV. 1953	DEC. 1961	7
1242	23 2180 1123 X	CHENJIRI P.A.LOWER	QL 4726	1750	2921	850	SANYATI	MAY 1963	APR. 1979	7
1243	23 2180 1391 N	CHIPUTI	QL 5193	1714	2922	980	SANYATI	FEB. 1983		7
1244	23 2180 1396 T	TENGWE WEST	QL 5298	1711	3022	1020	SANYATI	OCT. 1966	MAY 1978	7
1245	23 2180 1609 A	NYIMO BUSINESS CENTRE	QL 5212	1758	2923	900	SANYATI	MAR. 1963	JULY 1979	7
1246	23 2180 1761 Q	SANYATI JUNCTION	QL 5464	1730	2924	780	SANYATI	OCT. 1948	APR. 1965	7
1247	23 2180 2118 D	CHENJIRI P.A.UPPER	QL 5721	1753	2927	860	SANYATI	APR. 1963	JAN. 1979	7
1248	23 2180 2455 V	MASONA	QL 6257	1734	2928	820	SANYATI	OCT. 1976		7
1249	23 2180 4542 N	RUNENE	QL 8242	1741	2939	920	SANYATI	DEC. 1983		7
1250	23 2180 4932 M	ST.RUPERT'S MISSION	QL 8533	1746	2941	880	SANYATI	OCT. 1964		7
1251	23 2180 4964 X	KENZAMBA	QL 7766	1729	2936	960	SANYATI	SEP. 1981		7
1252	23 2180 5603 R	CHERONGAS	QL 9104	1802	2945	1060	SANYATI	JULY 1927	JUNE 1947	7
1253	23 2180 5741 R	MOMBWE	QL 9442	1742	2947	940	SANYATI	NOV. 1976		7
1254	23 2180 5807 N	SAVANNAH	QL 9408	1800	2947	1070	SANYATI	JULY 1947	FEB. 1954	7
1255	23 2180 6170 H	NYATI	QL 9871	1725	2948	1100	SANYATI	OCT. 1921	OCT. 1974	8
1256	23 2180 6209 A	DEWERAS	QL 9910	1759	2949	1030	SANYATI	JULY 1925	MAY 1960	7
1257	23 2180 6503 V	CHEVY CHASE	RL 0004	1803	2950	1070	SANYATI	JUNE 1912	JUNE 1920	7
1258	23 2180 6680 M	GAMBULI	RL 0301	1721	2952	1120	SANYATI	OCT. 1954	JUNE 1984	8
1259	23 2180 6864 M	TSANUNU	RL 0664	1729	2953	1100	SANYATI	DEC. 1926	JUNE 1933	7
1260	23 2180 6944 Z	ZIMBARI MAGONDI	RL 0644	1740	2953	1040	SANYATI	MAR. 1965		7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1171	23 2179 2981 X	KUDU RIVER RANCH	QK 6482	1814	2930	1000	SANYATI	FEB. 1965	DEC. 1969	7
1172	23 2179 3685 H	LAZY Y RANCH	QK 7107	1813	2937	1040	SANYATI	FEB. 1965	SEP. 1981	7
1173	23 2179 3908 E	DRYFORD FARM	QK 7109	1854	2935	1200	SANYATI	AUG. 1952	JUNE 1987	6
1174	23 2179 4021 C	MAYORCA RANCH	QK 7322	1846	2936	1120	SANYATI	NOV. 1966	APR. 1982	6
1175	23 2179 4256 H	UMSHESHE RANCH	QK 7657	1828	2937	1060	SANYATI	FEB. 1956	JAN. 1961	6
1176	23 2179 4271 Z	BROUGHTON GROUNDS	QK 8672	1819	2943	1080	SANYATI	OCT. 1972	DEC. 1983	6
1177	23 2179 4996 M	CARFAX	QK 8398	1806	2941	1050	SANYATI	JAN. 1926		7
1178	23 2179 5053 Z	LALELE	QK 0254	1826	2941	1080	SANYATI	FEB. 1960	DEC. 1971	6
1179	23 2179 5059 F	LEOPARD RANCH(KADOMA)	QK 8460	1827	2940	1040	SANYATI	SEP. 1972	MAY 1985	6
1180	23 2179 5240 L	GRANGE RANCH(THE)	QK 8649	1832	2942	1100	SANYATI	NOV. 1949	JUNE 1955	6
1181	23 2179 5309 C	TIGER REEF MINE	QK 8611	1852	2943	1140	SANYATI	NOV. 1901		6
1182	23 2179 5352 Z	QUEST FARM	QK 8652	1830	2942	1080	SANYATI	MAR. 1949	OCT. 1954	6
1183	23 2179 5395 W	VOLCANIC	QK 8995	1807	2945	1050	SANYATI	JULY 1927	JUNE 1935	7
1184	23 2179 5482 Q	SUNNY BANK	QK 8983	1814	2944	1100	SANYATI	JULY 1926	JUNE 1933	7
1185	23 2179 5727 G	BELGRAVE FARM	QK 9028	1843	2945	1140	SANYATI	SEP. 1982		6
1186	23 2179 5737 S	LORRAINE	QK 9038	1837	2945	1080	SANYATI	APR. 1949	JUNE 1966	7
1187	23 2179 5937 K	GLOVER'S FARM	QK 9337	1839	2946	1100	SANYATI	MAR. 1949	JUNE 1964	7
1188	23 2179 5989 R	MONTANA	QK 9490	1810	2947	1080	SANYATI	JULY 1929	JUNE 1941	7
1189	23 2179 5991 T	EASTERLEA	QK 9492	1809	2946	1080	SANYATI	SEP. 1927	DEC. 1974	7
1190	23 2179 5995 Y	EASTERN SECTION	QK 9594	1807	2947	1090	SANYATI	SEP. 1927	NOV. 1947	7
1191	23 2179 6035 R	MUNYATI,RAIL	QK 9435	1839	2947	1100	SANYATI	JAN. 1944	JUNE 1969	7
1192	23 2179 6123 H	SHERWOOD(KWEKWE)	QK 9324	1845	2947	1170	SANYATI	NOV. 1962		6
1193	23 2179 6205 B	KWEKWE,GLOBE & PHOENIX	QK 9405	1856	2948	1220	SANYATI	JULY 1900		6
1194	23 2179 6210 Q	SABLE CHEMICAL INDUST.	QK 9519	1848	2940	1200	SANYATI	JULY 1975		6
1195	23 2179 6283 L	GOLDEN VALLEY MINE	QK 9684	1814	2948	1100	SANYATI	JULY 1944		7
1196	23 2179 6303 H	KWEKWE,TOWN	QK 9504	1855	2949	1220	SANYATI	OCT. 1930		6
1197	23 2179 6404 S	KWEKWE,RAIL	QK 9605	1856	2949	1210	SANYATI	FEB. 1910		6
1198	23 2179 6441 H	BATTLEFIELDS POLICE	QK 9842	1836	2949	1120	SANYATI	JAN. 1960		7
1199	23 2179 6457 A	UMSHESHE HOTEL	QK 9858	1827	2950	1170	SANYATI	JULY 1921	JUNE 1966	7
1200	23 2179 6478 Y	WESTGROVE	QK 9978	1816	2950	1100	SANYATI	DEC. 1948	MAR. 1959	7
1201	23 2179 6604 K	KWEKWE	QK 9805	1856	2950	1220	SANYATI	MAR. 1951		6
1202	23 2179 6699 N	DALNY MINE	RK 0199	1804	2951	1080	SANYATI	FEB. 1948		7
1203	23 2179 6712 C	DUTCHMAN'S POOL	RK 0012	1852	2951	1160	SANYATI	SEP. 1972		6
1204	23 2179 6950 V	CLAW DAM	RK 0350	1827	2952	1080	SANYATI	DEC. 1973		7
1205	23 2179 6987 B	KADOMA,TOBACCO SECTION	RK 0300	1812	2955	1130	SANYATI	NOV. 1937	APR. 1951	7
1206	23 2179 7045 L	KADOMA,PRISON FARM	RK 0465	1823	2953	1120	SANYATI	NOV. 1965		7
1207	23 2179 7103 P	ALABAMA	RK 0504	1813	2953	1140	SANYATI	JULY 1920		7
1208	23 2179 7254 R	TRY ME MINE	RK 0654	1829	2954	1080	SANYATI	OCT. 1924	JUNE 1942	7
1209	23 2179 7270 J	KADOMA,GAOL	RK 0770	1821	2954	1210	SANYATI	JULY 1948		7
1210	23 2179 7272 L	KADOMA,COTTON RES.INST.	RK 0673	1819	2953	1150	SANYATI	FEB. 1925		7
1211	23 2179 7279 T	MAIDAVALE	RK 0679	1815	2955	1140	SANYATI	NOV. 1923		7
1212	23 2179 7372 V	KADOMA,OBSERVATORY	RK 0871	1820	2954	1170	SANYATI	JAN. 1940	FEB. 1946	7
1213	23 2179 7471 C	KADOMA,RAIL	RK 0070	1820	2955	1160	SANYATI	OCT. 1911		7
1214	23 2179 7472 D	KADOMA,PITT	RK 0771	1820	2954	1170	SANYATI	JULY 1908	JUNE 1945	7
1215	23 2179 7506 C	GEORGIA	RK 0905	1812	2956	1160	SANYATI	DEC. 1935	JUNE 1986	7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1306	23 2278 1561 Q	IRON MINE HILL	TP 1561	1919	3017	1450	SANYATI	JULY 1954	NOV. 1972	7
1307	23 2278 2070 C	CHEWODZA	TP 2070	1909	3019	1320	SANYATI	NOV. 1956		6
1308	23 2278 2089 P	SEBAKWE PIETERDALE	TP 2089	1905	3020	1280	SANYATI	JAN. 1906		6
1309	23 2278 2462 V	BEACON HILL	TP 2462	1919	3022	1400	SANYATI	DEC. 1922		6
1310	23 2278 2592 L	SEBAKWE ESTATE	TP 2592	1903	3023	1300	SANYATI	NOV. 1915	FEB. 1983	6
1311	23 2278 2596 Q	BUSHY PARK II	TP 2596	1901	3023	1300	SANYATI	JULY 1944		6
1312	23 2278 3373 K	CENTRAL ESTATES	TP 3373	1913	3028	1340	SANYATI	OCT. 1915		6
1313	23 2278 3967 F	MVUMA	TP 3967	1916	3031	1300	SANYATI	AUG. 1948	SEP. 1950	6
1314	23 2278 3984 Z	SEBAKWE POST	TP 3984	1907	3033	1320	SANYATI	JAN. 1923		6
1315	23 2278 4067 P	MVUMA,RAIL	TP 4067	1917	3031	1300	SANYATI	DEC. 1910		6
1316	23 2278 4166 X	MVUMA,ATHENS MINE	TP 4166	1917	3032	1400	SANYATI	NOV. 1903		6
1317	23 2278 4167 Y	MVUMA,POLICE	TP 4167	1917	3032	1300	SANYATI	MAR. 1927		6
1318	23 2278 4296 N	BARU POST	TP 4296	1902	3037	1320	SANYATI	DEC. 1922		6
1319	23 2278 4463 V	ELAND'S VALLEY	TP 4463	1919	3 34	1440	SANYATI	JAN. 1945	JUNE 1966	6
1320	23 2278 4556 W	MTAO FOREST	TP 4556	1923	3034	1480	SANYATI	DEC. 1922		7
1321	23 2278 5059 S	MTAO FOREST II	TP 5059	1921	3036	1460	SANYATI	FEB. 1920		6
1322	23 2278 5201 J	ORTON'S DRIFT	TP 5201	1909	3039	1330	SANYATI	NOV. 1915		6
1323	23 2278 5469 F	WYLDE GROVE	TP 5669	1915	3039	1400	SANYATI	SEP. 1915	MAR. 1922	6
1324	23 2278 6471 C	SCOTLAND HALT	TP 6471	1913	3045	1420	SANYATI	OCT. 1948		6
1325	23 2278 6690 Q	BELVOIR SPINNEY	TP 6690	1904	3048	1430	SANYATI	JULY 1920	JUNE 1986	6
1326	23 2278 7780 A	LANDSKROON	TP 7780	1911	3054	1440	SANYATI	JULY 1936	JUNE 1947	7
1327	23 2278 7794 Q	CHIVHU	TP 7794	1902	3053	1460	SANYATI	OCT. 1957		7
1328	23 2278 7996 K	CHIVHU P.O.	TP 7996	1901	3054	1460	SANYATI	JAN. 1905		7
1329	23 2278 9190 R	SEBAKWE RANGE	TP 9190	1900	3101	1470	SANYATI	DEC. 1905		7
1330	23 2278 0301 D	LANDSDOWNE	TP 0381	1910	3057	1440	SANYATI	JUNE 1929	JUNE 1946	7
1331	23 2279 3 R	DUNLOP RANCH	TQ 0003	1856	3008	1200	SANYATI	OCT. 1951		6
1332	23 2279 161 N	WHALLEY RANGE	TQ 0161	1025	3010	1160	SANYATI	NOV. 1956	JAN. 1975	6
1333	23 2279 263 Z	AVALON	TQ 0263	1824	3011	1140	SANYATI	JULY 1940	JUNE 1953	7
1334	23 2279 375 W	RANWICK	TQ 0375	1810	3011	1180	SANYATI	JULY 1917	MAY 1942	7
1335	23 2279 405 D	SEBAKWE SECT.RHODESDALE	TQ 0405	1854	3011	1260	SANYATI	MAR. 1935	JAN. 1943	6
1336	23 2279 497 D	MUPFURE	TQ 0497	1812	3104	1420	SANYATI	JULY 1987		6
1337	23 2279 830 R	WANGANUI	TQ 0830	1842	3014	1200	SANYATI	OCT. 1906		7
1338	23 2279 890 F	STANLEY FARM	TQ 0890	1810	3015	1200	SANYATI	OCT. 1968		7
1339	23 2279 976 Z	STONEYGATE	TQ 0976	1817	3015	1200	SANYATI	OCT. 1911	JUNE 1917	7
1340	23 2279 1014 Q	CIRCLE C RANCH	TQ 1014	1851	3015	1240	SANYATI	NOV. 1966		6
1341	23 2279 1303 E	VREDE	TQ 1303	1856	3016	1300	SANYATI	SEP. 1915	JUNE 1946	7
1342	23 2279 1389 Y	POOLE DAM	TQ 1389	1810	3017	1180	SANYATI	JAN. 1970		7
1343	23 2279 1390 Z	POOLE FARM	TQ 1390	1809	3017	1190	SANYATI	JULY 1927	APR. 1941	7
1344	23 2279 1664 X	MOFANI	TQ 1664	1824	3019	1190	SANYATI	NOV. 1947	FEB. 1975	7
1345	23 2279 1697 H	NYAMCHECHA	TQ 1697	1806	3020	1210	SANYATI	OCT. 1969	APR. 1975	7
1346	23 2279 1738 C	MLOTA RANCH	TQ 1738	1838	3005	1220	SANYATI	NOV. 1966	AUG. 1982	7
1347	23 2279 1884 L	BURNBANK	TQ 1884	1813	3019	1200	SANYATI	OCT. 1940		7
1348	23 2279 1966 A	REDERNA	TQ 1966	1823	3021	1200	SANYATI	OCT. 1952	NOV. 1969	7
1349	23 2279 2109 F	MOREENA	TQ 2109	1854	3022	1260	SANYATI	NOV. 1947	JUNE 1956	7
1350	23 2279 2130 D	SPITZKOP(NGESI)	TQ 2130	1841	3021	1260	SANYATI	JAN. 1915	FEB. 1922	7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1261	23 2180 7000 K	HANDLEY CROSS	RL 0601	1804	2954	1100	SANYATI	JUNE 1912	AUG. 1984	7
1262	23 2180 7426 Y	DZINGWE	RL 1027	1749	2957	1050	SANYATI	OCT. 1964		7
1263	23 2180 7621 K	HAMILTON HILLS	RL 1222	1753	2951	1000	SANYATI	DEC. 1952	JULY 1965	7
1264	23 2180 7806 L	LISMOR	RL 1405	1801	2958	1090	SANYATI	NOV. 1953	JUNE 1965	7
1265	23 2180 7967 C	LISTONSHIELS	RL 1560	1727	2959	1160	SANYATI	NOV. 1945	JUNE 1953	7
1266	23 2180 7931 X	BARAMASIMBE	RL 1531	1747	2959	1080	SANYATI	OCT. 1964		7
1267	23 2180 0051 C	MBURUNGWE	RL 1751	1737	2959	1160	SANYATI	OCT. 1964		7
1268	23 2180 8465 C	CLIFTON ESTATE	SR 8465	1729	3002	1200	SANYATI	JAN. 1960	JULY 1985	8
1269	23 2180 8544 N	CHIVERE	SR 8544	1740	3002	1120	SANYATI	NOV. 1983		8
1270	23 2180 8729 P	MARAVENANI	SR 8729	1740	3003	1110	SANYATI	OCT. 1964		7
1271	23 2180 8761 Z	NYAKARANGA	SR 8761	1731	3003	1230	SANYATI	MAY 1929	DEC. 1959	8
1272	23 2180 9003 M	LANGFORD/RED HAT MINE	SR 9003	1803	3005	1140	SANYATI	JULY 1920	JUNE 1935	7
1273	23 2180 9021 G	HIGH BARBAREE	SR 9021	1753	3005	1070	SANYATI	NOV. 1951	JUNE 1956	7
1274	23 2180 9203 E	RED HAT MINE	SR 9203	1803	3005	1160	SANYATI	JULY 1928	SEP. 1946	7
1275	23 2180 9356 W	MATORANGERA	SR 9356	1734	3006	1220	SANYATI	OCT. 1964		8
1276	23 2180 9416 L	MOLWENI	SR 9416	1756	3007	1160	SANYATI	JULY 1956	JUNE 1981	7
127?	23 2180 9523 C	MURRA PURRA	SR 9523	1751	3007	1110	SANYATI	NOV. 1946	JUNE 1986	7
127?	23 2180 9528 H	MARAWA	SR 9528	1749	3008	1130	SANYATI	OCT. 1940	JUNE 1983	8
1279	23 2180 9025 F	RENARDIA	SR 9025	1750	3009	1160	SANYATI	OCT. 1924	JAN. 1931	7
1280	23 2180 9902 P	GADZEMA,RAIL	SR 9902	1803	3009	1160	SANYATI	JULY 1914	AUG. 1920	7
1281	23 2180 9903 Q	ROAD CAMP MSW 14	SR 9903	1803	3009	1160	SANYATI	MAR. 1973	AUG. 1980	7
1282	23 2180 9905 S	GIANT MINE	SR 9905	1802	3009	1170	SANYATI	OCT. 1941	JULY 1971	7
1283	23 2181 95 Z	MAKUTI TSETSE	QM 4396	1619	2914	1070	SANYATI	NOV. 1952		8
1284	23 2181 737 X	KARERESHI SCHOOL	QM 5038	1650	2921	1130	SANYATI	JAN. 1963	FEB. 1978	7
1285	23 2181 805 W	CHIVA	QM 5126	1656	2921	1160	SANYATI	SEP. 1907		8
1286	23 2181 1226 D	CHIMBA HILL	QM 5427	1657	2915	1130	SANYATI	NOV. 1954	JULY 1970	8
1287	23 2181 1535 P	NAGUNJE	QM 5836	1651	2925	1150	SANYATI	JULY 1940		8
1288	23 2181 1639 C	NAMATOMBA	QM 5840	1649	2925	1200	SANYATI	OCT. 1927	DEC. 1937	8
1289	23 2181 1809 H	BADZE	QM 5711	1704	2925	1120	SANYATI	JAN. 1983		7
1290	23 2181 2511 A	NYAMTORA	QM 6413	1702	2928	1200	SANYATI	NOV. 1955	JULY 1970	8
1291	23 2181 2632 G	CHISAPI	QM 6833	1652	2931	1230	SANYATI	NOV. 1947		8
1292	23 2181 2924 Z	ORIBI PARK	QM 7124	1657	2933	1300	SANYATI	NOV. 1947	JUNE 1984	8
1293	23 2181 3106 X	TENGWE BLOCK	QM 6908	1713	2919	1140	SANYATI	DEC. 1954	AUG. 1978	8
1294	23 2181 3142 L	ANSDELL	QM 7342	1646	2932	1310	SANYATI	NOV. 1947	NOV. 1983	8
1295	23 2181 3537 Q	KAROI B	QM 7738	1651	2936	1340	SANYATI	DEC. 1951	OCT. 1963	8
1296	23 2181 3552 C	VUKA	QM 7752	1642	2935	1280	SANYATI	OCT. 1952		8
1297	23 2181 3637 Z	KAROI	QM 7938	1650	2937	1340	SANYATI	OCT. 1948		8
1298	23 2181 3706 Z	RUGARE FARM	QM 7607	1706	2935	1200	SANYATI	OCT. 1962		8
1299	23 2181 3910 W	DEANOUR	QM 7813	1703	2937	1200	SANYATI	OCT. 1952	JAN. 1963	8
1300	23 2181 4228 R	FOUR WINDS(KAROI)	QM 8420	1657	2942	1320	SANYATI	OCT. 1952	APR. 1964	8
1301	23 2181 4608 E	THURLSTON	QM 8409	1706	2940	1220	SANYATI	DEC. 1952		8
1302	23 2270 360 K	LALAPANZI,RAIL	TP 0360	1920	3011	1500	SANYATI	JULY 1914	AUG. 1969	8
1303	23 2270 460 T	LALAPANZI POLICE	TP 0460	1920	3011	1500	SANYATI	FEB. 1962		8
1304	23 2270 095 R	SEBAKWE NATIONAL PARK	TP 0095	1901	3014	1240	SANYATI	JAN. 1969		7
1305	23 2270 1361 Y	HEATHFIELD	TP 1361	1920	3016	1440	SANYATI	JULY 1951	APR. 1969	7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1396	23 2279 6038 B	VERWAGTING	TQ 6038	1837	3043	1340	SANYATI	JULY 1943	JUNE 1962	7
1397	23 2279 6482 J	KERRY	TQ 6482	1815	3046	1430	SANYATI	NOV. 1931		7
1398	23 2279 6484 L	STIRLING	TQ 6484	1814	3045	1280	SANYATI	OCT. 1939	JUNE 1971	7
1399	23 2279 6612 A	PENNYFATHER FARM	TQ 6612	1853	3047	1340	SANYATI	NOV. 1956		7
1400	23 2279 6736 K	KNOCKHOLT	TQ 6736	1838	3047	1350	SANYATI	DEC. 1956	NOV. 1961	7
1401	23 2279 6935 B	BASALT	TQ 6935	1840	3049	1360	SANYATI	SEP. 1951	AUG. 1956	7
1402	23 2279 7029 D	FEATHERSTONE,POLICE	TQ 7029	1842	3054	1410	SANYATI	OCT. 1962		7
1403	23 2279 7093 Y	FRESNAYE	TQ 7093	1808	3049	1330	SANYATI	OCT. 1928	JUNE 1951	8
1404	23 2279 7175 M	DRAYTON	TQ 7175	1818	3049	1300	SANYATI	DEC. 1948	JUNE 1969	7
1405	23 2279 7178 Q	INYONDO	TQ 7178	1817	3050	1300	SANYATI	OCT. 1969	MAY 1986	7
1406	23 2279 7200 Y	SEED FARM	TQ 7200	1855	3050	1370	SANYATI	JAN. 1930	OCT. 1967	7
1407	23 2279 7228 V	KOPJE ALLEEN	TQ 7228	1844	3051	1400	SANYATI	FEB. 1943	JUNE 1983	7
1408	23 2279 7379 J	ROAD CAMP MSE4 BEATRICE	TQ 7379	1816	3052	1290	SANYATI	JULY 1950		7
1409	23 2279 7380 K	BEATRICE P.O.	TQ 7380	1816	3051	1300	SANYATI	DEC. 1918		7
1410	23 2279 7381 L	BEATRICE,SCHOOL	TQ 7381	1816	3051	1290	SANYATI	MAR. 1935	MAY 1965	7
1411	23 2279 7401 H	DUNDRY(CHIVHU)	TQ 7401	1858	3051	1400	SANYATI	MAY 1928	AUG. 1939	7
1412	23 2279 7470 H	ELVINGTON	TQ 7470	1821	3051	1320	SANYATI	DEC. 1912	JUNE 1972	7
1413	23 2279 7566 N	ENSLINSDEEL	TQ 7566	1823	3053	1320	SANYATI	SEP. 1935		7
1414	23 2279 7695 C	NYACHIDZE	TQ 7695	1808	3053	1350	SANYATI	OCT. 1937	JUNE 1966	8
1415	23 2279 7878 B	WELCOME HOME FARM	TQ 7878	1817	3054	1300	SANYATI	OCT. 1969		7
1416	23 2279 7885 J	GOWERLANDS	TQ 7885	1812	3053	1290	SANYATI	OCT. 1912	JULY 1976	8
1417	23 2279 8319 F	HAMPSHIRE H.Q.	TQ 8319	1849	3057	1420	SANYATI	JULY 1972		7
1418	23 2279 8334 X	RIVERSDALE SCHOOL	TQ 8334	1840	3056	1420	SANYATI	NOV. 1912	NOV. 1962	7
1419	23 2279 8747 W	MEXICO FARM	TQ 8747	1833	3059	1300	SANYATI	APR. 1943	JUNE 1966	7
1420	23 2279 8793 W	RUSIMBIRO	TQ 8793	1809	3100	1370	SANYATI	NOV. 1927	JUNE 1937	8
1421	23 2279 9031 E	MAJOI	TQ 9031	1843	3101	1410	SANYATI	OCT. 1981		7
1422	23 2279 9077 E	MUDA P.A.	TQ 9077	1817	3102	1300	SANYATI	OCT. 1954	FEB. 1979	7
1423	23 2279 9296 S	DUNOLLY	TQ 9296	1807	3102	1400	SANYATI	JAN. 1942		7
1424	23 2279 9447 G	MARSHBROOK	TQ 9447	1834	3103	1400	SANYATI	JULY 1910	JUNE 1966	7
1425	23 2279 9596 T	WALMER	TQ 9596	1807	3104	1400	SANYATI	OCT. 1933	DEC. 1941	8
1426	23 2280 707 B	ORANGEGROVE	TR 0707	1801	3014	1200	SANYATI	DEC. 1939	FEB. 1955	7
1427	23 2280 1501 P	WAKEFIELD	TR 1501	1804	3019	1220	SANYATI	DEC. 1947		7
1428	23 2280 1714 W	MUSENGEZI EXP.FARM	TR 1714	1757	3019	1230	SANYATI	FEB. 1945		7
1429	23 2280 1810 A	BEDALE FARM	TR 1810	1759	3020	1230	SANYATI	JULY 1951	JUNE 1970	7
1430	23 2280 2020 D	MOLELI	TR 2020	1753	3021	1280	SANYATI	JAN. 1985		8
1431	23 2280 2107 Y	SELOUS TOBACCO ESTATE	TR 2107	1801	3022	1260	SANYATI	JULY 1970		7
1432	23 2280 2608 S	DUNTOCHER	TR 2608	1802	3026	1290	SANYATI	JULY 1927	JUNE 1934	8
1433	23 2280 2620 F	NORTHWOOD(MAKWIRO)	TR 2620	1754	3024	1330	SANYATI	NOV. 1947	JUNE 1957	8
1434	23 2280 2712 F	MAKWIRO,RAIL	TR 2712	1758	3026	1310	SANYATI	OCT. 1910	FEB. 1964	8
1435	23 2280 2812 P	MAKWIRO P.O.	TR 2812	1758	3025	1310	SANYATI	DEC. 1953	FEB. 1980	8
1436	23 2280 2900 K	SELOUS P.O.	TR 2900	1804	3027	1240	SANYATI	OCT. 1967		8
1437	23 2280 3016 L	MEADOWLANDS	TR 3016	1756	3027	1290	SANYATI	NOV. 1926	JUNE 1933	8
1438	23 2280 3309 E	CROMDALE	TR 3309	1758	3029	1290	SANYATI	DEC. 1920	JUNE 1944	8
1439	23 2280 3706 L	JENKINSTOWN	TR 3706	1802	3031	1320	SANYATI	JULY 1987		8
1440	23 2280 3813 C	MAKWIRO SOURCE FARM	TR 3813	1758	3032	1360	SANYATI	JULY 1944	NOV. 1956	8

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1351	23 2279 2199 D	FRENCH HOEK	TQ 2199	1804	3022	1220	SANYATI	MAR. 1946		7
1352	23 2279 2275 L	HORVEN	TQ 2275	1810	3022	1230	SANYATI	JAN. 1930	JUNE 1966	7
1353	23 2279 2276 M	NAEMOOR	TQ 2276	1817	3022	1230	SANYATI	DEC. 1947	NOV. 1977	7
1354	23 2279 2279 Q	SILVER RIGG	TQ 2279	1816	3022	1240	SANYATI	JAN. 1970		7
1355	23 2279 2330 W	NGEZI DAM	TQ 2330	1842	3023	1240	SANYATI	JAN. 1944		7
1356	23 2279 2476 E	ARDGOWAN	TQ 2476	1816	3023	1220	SANYATI	SEP. 1911	JUNE 1947	7
1357	23 2279 2587 A	HILLVIEW	TQ 2587	1811	3024	1200	SANYATI	OCT. 1969	OCT. 1978	7
1358	23 2279 2591 E	FAIRHOLME	TQ 2591	1810	3024	1220	SANYATI	FEB. 1979		7
1359	23 2279 2597 L	KURRAJONG	TQ 2597	1806	3025	1210	SANYATI	OCT. 1971	JULY 1985	8
1360	23 2279 2696 T	THORNDYKE	TQ 2696	1006	3025	1220	SANYATI	OCT. 1923	OCT. 1970	7
1361	23 2279 2743 V	BUMBE SCHOOL	TQ 2743	1836	3025	1300	SANYATI	OCT. 1986		7
1362	23 2279 2847 H	JONDALE RANCH	TQ 2847	1832	3025	1280	SANYATI	JULY 1946	JUNE 1963	7
1363	23 2279 2999 Y	HOPEWELL	TQ 2999	1805	3026	1240	SANYATI	APR. 1916	JUNE 1970	8
1364	23 2279 3082 N	ST.MARK'S CENT.PR.SCH.	TQ 3082	1814	3027	1200	SANYATI	DEC. 1952		7
1365	23 2279 3294 T	CULROY	TQ 3294	1808	3028	1240	SANYATI	DEC. 1987		8
1366	23 2279 3295 V	ZIMBO FARM	TQ 3295	1807	3028	1240	SANYATI	MAR. 1968		0
1367	23 2279 3394 C	COTSWOLD(MAKWIRO)	TQ 3394	1808	3029	1220	SANYATI	NOV. 1929	JUNE 1967	8
1368	23 2279 3531 B	BURURU	TQ 3531	1842	3029	1260	SANYATI	NOV. 1984		7
1369	23 2279 3502 G	ESSEX FARM	TQ 3502	1814	3029	1200	SANYATI	JAN. 1970		7
1370	23 2279 3691 A	MAJUJA KOP	TQ 3691	1810	3030	1280	SANYATI	OCT. 1940		0
1371	23 2279 3818 N	STRATHCLYDE	TQ 3818	1849	3031	1280	SANYATI	OCT. 1972	MAR. 1981	6
1372	23 2279 3865 P	CHANAKIRA B.C.	TQ 3865	1823	3031	1260	SANYATI	JUNE 1962		7
1373	23 2279 3941 X	MANYEWE	TQ 3941	1837	3030	1290	SANYATI	OCT. 1906		7
1374	23 2279 4021 J	WELVERDIEND	TQ 4021	1847	3032	1300	SANYATI	JULY 1939	MAY 1972	6
1375	23 2279 4059 A	PATI VILLAGE	TQ 4059	1827	3032	1290	SANYATI	JULY 1954	DEC. 1960	7
1376	23 2279 4197 A	FARNLEY	TQ 4197	1806	3033	1300	SANYATI	OCT. 1969	MAR. 1984	0
1377	23 2279 4205 J	DANGAREN DOBE	TQ 4205	1856	3033	1280	SANYATI	OCT. 1948	OCT. 1981	6
1378	23 2279 4223 D	ABERCORN RANCH	TQ 4223	1847	3034	1340	SANYATI	DEC. 1935	SEP. 1975	6
1379	23 2279 4303 C	FORT MARTIN	TQ 4303	1813	3035	1300	SANYATI	OCT. 1969	MAR. 1981	7
1380	23 2279 4440 Y	MUZVEZVE CLINIC	TQ 4440	1833	3035	1260	SANYATI	SEP. 1986		7
1381	23 2279 4572 H	MBAYIRA	TQ 4572	1819	3035	1280	SANYATI	NOV. 1930		7
1382	23 2279 4574 K	MHONDORO	TQ 4574	1819	3036	1260	SANYATI	MAY 1953		7
1383	23 2279 4604 S	FRANCEYS FARM	TQ 4604	1802	3037	1350	SANYATI	DEC. 1912	FEB. 1920	6
1384	23 2279 4697 T	BEVERLEY	TQ 4697	1806	3036	1320	SANYATI	NOV. 1970	SEP. 1977	8
1385	23 2279 4707 R	MUZA DIP	TQ 4707	1811	3037	1280	SANYATI	JULY 1954		7
1386	23 2279 4736 D	MAMINA	TQ 4736	1839	3037	1280	SANYATI	DEC. 1904		7
1387	23 2279 5199 P	CHIBERO,IRRIGATION BLOCK	TQ 5199	1805	3039	1340	SANYATI	AUG. 1969		8
1388	23 2279 5299 Y	CHIBERO	TQ 5299	1806	3040	1340	SANYATI	MAR. 1960		8
1389	23 2279 5546 R	ST.MICHAEL'S MISSION	TQ 5546	1833	3041	1340	SANYATI	DEC. 1937		7
1390	23 2279 5719 E	LOUWDIA SCHOOL	TQ 5719	1840	3042	1390	SANYATI	MAR. 1932	MAR. 1949	7
1391	23 2279 5798 Q	ROCK	TQ 5798	1806	3042	1300	SANYATI	NOV. 1930		0
1392	23 2279 5802 V	KLEINFONTEIN	TQ 5802	1858	3042	1330	SANYATI	JULY 1947	APR. 1960	6
1393	23 2279 5891 R	NYAMWEDA BUSINESS CENTRE	TQ 5891	1809	3043	1300	SANYATI	JULY 1954		0
1394	23 2279 5900 B	KANEELLAAGTE	TQ 5900	1859	3043	1360	SANYATI	JULY 1939	JUNE 1946	7
1395	23 2279 5952 H	CHIKONYORA	TQ 5952	1831	3043	1310	SANYATI	JULY 1954		7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1486	24 1479 4170 W	WANKIE NO.2 COLLIERY	MK 4170	1822	2626	750	GWAYI	MAY 1977		5
1487	24 1479 4273 H	THOMSON JUNCTION	MK 4273	1821	2627	720	GWAYI	DEC. 1937		5
1488	24 1479 4656 Z	HWANGE,MBALA LODGE	MK 4656	1829	2629	840	GWAYI	JULY 1983		6
1489	24 1479 4669 N	HWANGE,RAIL	MK 4669	1822	2629	750	GWAYI	NOV. 1905		5
1490	24 1479 4670 P	WANKIE NO.1 TOWNSHIP	MK 4670	1822	2629	750	GWAYI	JULY 1977		5
1491	24 1479 4772 S	HWANGE,POLICE	MK 4972	1821	2631	750	GWAYI	MAY 1911		5
1492	24 1479 5490 F	MWEMBA	MK 5490	1811	2634	620	GWAYI	SEP. 1982		5
1493	24 1479 6069 K	ST.MARY'S MSSN.(HWANGE)	MK 6069	1822	2637	700	GWAYI	JULY 1938		5
1494	24 1479 6468 T	PONGORA	MK 6468	1823	2640	710	GWAYI	SEP. 1902		5
1495	24 1479 7198 M	SIMANGANI	MK 7198	1807	2643	540	GWAYI	OCT. 1978		5
1496	24 1479 8455 D	MAKWANDARA	MK 8455	1830	2651	1030	GWAYI	AUG. 1982		6
1497	24 1479 8541 X	DETE	MK 8541	1837	2651	1100	GWAYI	MAY 1979	JUNE 1980	6
1498	24 1479 8542 Y	ST.FRANCIS XAVIER SCHOOL	MK 8542	1837	2651	1100	GWAYI	JAN. 1969		6
1499	24 1479 8641 F	DETE RAIL	MK 8641	1837	2652	1100	GWAYI	FEB. 1917		6
1500	24 1479 9157 R	DETE CROSSROADS	MK 9157	1829	2655	1020	GWAYI	AUG. 1982		6
1501	24 1480 508 K	JABULA	ML 0508	1801	2606	980	GWAYI	JUNE 1976	FEB. 1978	6
1502	24 1480 1804 T	JAMBESI	ML 1804	1803	2613	920	GWAYI	APR. 1976		6
1503	24 1480 6902 K	DEKA	ML 6702	1804	2642	500	GWAYI	OCT. 1976		5
1504	24 1480 8208 E	MSUNA	ML 8208	1801	2650	490	GWAYI	MAR. 1976		5
1505	24 1577 8397 H	MBAMBA	NH 8397	1955	2748	1170	GWAYI	JUNE 1974	NOV. 1977	5
1506	24 1577 8687 Y	BUBUDE SCHOOL	NH 8687	2001	2749	1190	GWAYI	DEC. 1973	AUG. 1977	5
1507	24 1577 9692 Q	KALAKA	NH 9692	1950	2756	1130	GWAYI	JULY 1911	JUNE 1956	6
1508	24 1578 7068 H	SIPEPA	NJ 7068	1916	2740	1010	GWAYI	NOV. 1952	JAN. 1979	6
1509	24 1578 7083 Z	MLAGISA	NJ 7083	1909	2740	990	GWAYI	JULY 1974	FEB. 1978	6
1510	24 1578 7467 R	GWAYI RAIL	NJ 7467	1917	2742	990	GWAYI	NOV. 1906	OCT. 1957	6
1511	24 1578 7745 T	JINILA	NJ 7745	1929	2744	1020	GWAYI	JULY 1974	JAN. 1978	5
1512	24 1578 7885 W	GWAYI P.A.	NJ 7885	1910	2742	980	GWAYI	DEC. 1953	JAN. 1983	6
1513	24 1578 7915 D	TSHOLOTSHO SCHOOL	NJ 7915	1945	2745	1090	GWAYI	JAN. 1921	NOV. 1944	5
1514	24 1578 8015 H	TSHOLOTSHO	NJ 8015	1945	2746	1100	GWAYI	JAN. 1922		5
1515	24 1579 40 N	HWANGE,N.P.AIRPORT	NK 0040	1838	2700	1080	GWAYI	FEB. 1971		6
1516	24 1579 675 D	KAMATIVI TIN MINE	NK 0675	1819	2703	910	GWAYI	NOV. 1952		6
1517	24 1579 1159 E	GWAYI RIVER MINES	NK 1159	1827	2706	870	GWAYI	FEB. 1969	APR. 1976	7
1518	24 1579 2042 P	DAHLIA FARM	NK 2042	1837	2711	910	GWAYI	FEB. 1946		6
1519	24 1579 2232 W	SUKUMI	NK 2232	1842	2713	1070	GWAYI	JULY 1923	JUNE 1986	6
1520	24 1579 2254 V	SHANGANI FLUMES	NK 2254	1830	2713	890	GWAYI	OCT. 1964	OCT. 1974	6
1521	24 1579 2637 L	CHINWARA RANCH	NK 2637	1838	2714	940	GWAYI	OCT. 1948		6
1522	24 1579 3427 V	LUGO	NK 3427	1845	2719	1010	GWAYI	JAN. 1949		6
1523	24 1579 3929 Q	HALFWAY HOTEL	NK 3929	1844	2723	950	GWAYI	NOV. 1940	DEC. 1953	6
1524	24 1579 4320 Z	FATIMA MISSION	NK 4320	1844	2725	950	GWAYI	MAY 1955		6
1525	24 1579 4446 C	KARNA BLOCK	NK 4446	1835	2725	1100	GWAYI	MAY 1959	APR. 1978	6
1526	24 1579 5749 T	KANA WEIR	NK 5749	1834	2733	1140	GWAYI	OCT. 1964	JAN. 1979	7
1527	24 1579 6034 D	TSHOTSHOLO WEIR	NK 6034	1841	2734	930	GWAYI	JAN. 1974		6
1528	24 1579 6119 W	SOTANE RANCH	NK 6119	1849	2735	960	GWAYI	OCT. 1969	OCT. 1977	6
1529	24 1579 6342 N	TSHONGUKWE	NK 6342	1837	2736	1040	GWAYI	AUG. 1966	NOV. 1977	6
1530	24 1579 6017 E	MASENYANE	NK 6019	1849	2739	900	GWAYI	DEC. 1953		6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1441	23 2280 3817 G	PHILIPHAUGH	TR 3817	1754	3032	1360	SANYATI	SEP. 1915		0
1442	23 2200 4001 G	SHINGWIRI	TR 4001	1804	3033	1300	SANYATI	SEP. 1968	JUNE 1987	0
1443	23 2280 5703 G	NYADGORI	TR 5703	1804	3042	1370	SANYATI	OCT. 1921	JUNE 1941	8
1444	23 2280 6704 V	MARIRANGWE,GVT.EXP.FARM	TR 6704	1803	3048	1380	SANYATI	SEP. 1935	JUNE 1944	8
1445	23 2280 7104 E	MARIRANGWE	TR 7104	1803	3050	1400	SANYATI	NOV. 1933	SEP. 1981	7
1446	23 2280 8206 C	CARNOCK	TR 8206	1801	3056	1400	SANYATI	FEB. 1913		7
1447	23 2379 565 J	CHIMBWANDA WEST	UQ 0565	1823	3109	1400	SANYATI	NOV. 1987		7
1448	23 2379 974 D	MAHUSEKWA	UQ 0974	1818	3107	1460	SANYATI	JAN. 1924		7
1449	23 2379 1365 D	CHIMBGHANDA EAST	UQ 1365	1824	3114	1480	SANYATI	JULY 1964	DEC. 1978	7
1450	24 0 0	LOVERS'WALK				0	GWAYI	JAN. 1916	JUNE 1926	0
1451	24 1379 3800 H	NYANYANI PAN	LK 3800	1812	2528	1080	GWAYI	JAN. 1982		7
1452	24 1379 4560 X	KAZUMA DEPRESSION	LK 4560	1822	2532	1070	GWAYI	DEC. 1982		7
1453	24 1379 5951 A	PANDA-MA-TENGA POLICE	LK 5951	1831	2530	1070	GWAYI	AUG. 1966		7
1454	24 1379 6399 H	CREWE'S SUGAR ESTATE	LK 6399	1806	2543	1010	GWAYI	JULY 1929	JUNE 1939	7
1455	24 1379 7256 T	GUYU	LK 7256	1828	2546	1050	GWAYI	OCT. 1985		7
1456	24 1379 7257 V	GUYO	LK 7257	1820	2546	1050	GWAYI	DEC. 1917	OCT. 1967	7
1457	24 1379 7576 R	TROPHY HUNTERS AFRICA	LK 7576	1818	2549	970	GWAYI	MAY 1983		6
1458	24 1379 7995 X	FULLER FOREST	LK 7995	1808	2552	1050	GWAYI	OCT. 1961		6
1459	24 1379 8089 Z	WATERFORD	LK 8089	1810	2552	960	GWAYI	JULY 1919	JAN. 1927	6
1460	24 1379 8360 T	TSHABALISA	LK 8360	1827	2554	1040	GWAYI	JAN. 1927		6
1461	24 1379 8471 P	HWANGE,MATETSI	LK 8471	1821	2554	1120	GWAYI	JAN. 1977		6
1462	24 1379 8654 N	TSHOWE	LK 8654	1830	2555	1040	GWAYI	NOV. 1957		6
1463	24 1379 8666 B	ROAD CAMP KTN 6A	LK 8666	1824	2555	1020	GWAYI	APR. 1973	JAN. 1979	6
1464	24 1379 8979 R	MATETSI,RAIL(NEW)	LK 8979	1816	2526	880	GWAYI	JULY 1932	DEC. 1963	6
1465	24 1379 9340 J	HWANGE,ROBINS CAMP	LK 9340	1837	2550	960	GWAYI	OCT. 1964		6
1466	24 1379 9367 N	VLAKFONTEIN	LK 9367	1824	2559	1020	GWAYI	FEB. 1983		6
1467	24 1379 9399 Y	NDHLOVU CAMP	LK 9399	1806	2559	980	GWAYI	APR. 1976		6
1468	24 1379 9885 B	MATETSI(OLD)	LK 9885	1813	2502	880	GWAYI	DEC. 1917	JUNE 1932	6
1469	24 1300 2029 G	KAZUNGULA	LL 2029	1749	2518	930	GWAYI	JULY 1966		7
1470	24 1300 2325 D	NAMPINI RANCH	LL 2325	1750	2519	1010	GWAYI	NOV. 1960	OCT. 1973	7
1471	24 1380 2925 F	PARADISE	LL 2925	1751	2523	950	GWAYI	OCT. 1957		7
1472	24 1380 6018 S	CHIMUNZI	LL 6018	1755	2540	1050	GWAYI	OCT. 1981		7
1473	24 1380 6800 S	MASUIE	LL 6800	1805	2545	980	GWAYI	JAN. 1953	JUNE 1963	7
1474	24 1380 7421 S	ZAMBEZI CAMP	LL 7421	1754	2548	900	GWAYI	OCT. 1983		7
1475	24 1380 7521 B	SPENCER'S CREEK	LL 7521	1754	2549	920	GWAYI	NOV. 1978		7
1476	24 1380 7619 H	VICTORIA FALLS,HYDRO	LL 7619	1755	2550	920	GWAYI	AUG. 1972		7
1477	24 1380 7717 P	VICTORIA FALLS,RAIL	LL 7717	1756	2550	910	GWAYI	JAN. 1910		7
1478	24 1380 7718 Q	VICTORIA FALLS,POLICE	LL 7718	1756	2550	930	GWAYI	JULY 1904		7
1479	24 1380 7800 E	VICTORIA FALLS,AIRPORT	LL 7800	1806	2551	1060	GWAYI	JULY 1967		6
1480	24 1380 8907 H	DIBUDIBU	LL 8907	1801	2557	900	GWAYI	JUNE 1974	MAR. 1978	6
1481	24 1479 667 N	SIANKALALI	MK 0667	1823	2606	1020	GWAYI	OCT. 1981		6
1482	24 1479 2339 F	HWANGE,MANDAVU DAM	MK 2339	1839	2616	950	GWAYI	JUNE 1983		6
1483	24 1479 2371 Q	SAMBAHIZI	MK 2371	1821	2616	810	GWAYI	APR. 1960	JUNE 1965	5
1484	24 1479 2745 X	HWANGE,SINAMATELLA CAMP	MK 2745	1835	2619	980	GWAYI	MAY 1936		6
1485	24 1479 3765 F	WANKIE NO.3 COLLIERY	MK 3765	1825	2624	760	GWAYI	MAY 1977		5

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1576	24 1677 6775 B	BULAWAYO,HUGH BEADLE SCH	PH 6775	2007	2836	1300	GWAYI	MAY 1970	OCT. 1979	5
1577	24 1677 6862 W	BULAWAYO,CRITERION	PH 6862	2014	2837	1450	GWAYI	OCT. 1972		6
1578	24 1677 6872 G	BULAWAYO,GOETZ OBS.	PH 6872	2009	2837	1340	GWAYI	JULY 1896		5
1579	24 1677 6875 K	BULAWAYO,T.RUDLAND SCH.	PH 6875	2007	2837	1310	GWAYI	JUNE 1952	NOV. 1977	5
1580	24 1677 6965 H	BULAWAYO,WHITESTONE SCH.	PH 6965	2013	2838	1400	GWAYI	JULY 1943		6
1581	24 1677 6966 J	BULAWAYO,WATERWORKS	PH 6966	2012	2837	1370	GWAYI	JULY 1920		5
1582	24 1677 6986 F	BULAWAYO,AIRPORT	PH 6986	2001	2837	1330	GWAYI	JULY 1957		5
1583	24 1677 7272 R	BULAWAYO,KILLARNEY	PH 7272	2011	2839	1340	GWAYI	NOV. 1970	FEB. 1975	5
1584	24 1677 7365 S	BULAWAYO,FORDOUN	PH 7365	2010	2839	1390	GWAYI	JULY 1937	JUNE 1940	6
1585	24 1677 7468 E	BULAWAYO,SUNNINGHILL	PH 7468	2011	2840	1380	GWAYI	OCT. 1967	NOV. 1970	6
1586	24 1677 7591 N	INBESU KRAAL	PH 7591	1958	2840	1260	GWAYI	JULY 1911	JUNE 1926	5
1587	24 1677 7597 V	KENYANE	PH 7597	1955	2840	1290	GWAYI	JULY 1926	JUNE 1956	5
1588	24 1677 7675 E	BULAWAYO,CEMENT	PH 7675	2007	2841	1340	GWAYI	JAN. 1928		5
1589	24 1677 7677 G	BULAWAYO,FAIRBRIDGE SCH	PH 7677	2007	2841	1360	GWAYI	OCT. 1948		5
1590	24 1677 7862 H	BULAWAYO,TULI HILL RES	PH 7862	2014	2842	1460	GWAYI	JULY 1956		6
1591	24 1677 8273 E	SPRINGS(BULAWAYO)	PH 8273	2009	2844	1360	GWAYI	NOV. 1915	NOV. 1939	6
1592	24 1677 8282 P	MAXIM HILL	PH 8282	2003	2845	1340	GWAYI	MAR. 1910	JAN. 1939	5
1593	24 1677 8779 E	BULAWAYO,HEANY JUNCTION	PH 8779	2005	2847	1350	GWAYI	JAN. 1910		6
1594	24 1677 9305 N	DAVID LIVINGSTONE MSSN.	PH 9305	2002	2851	1400	GWAYI	JULY 1938	SEP. 1973	6
1595	24 1677 9390 T	NTABAZINDUNA	PH 9390	1959	2851	1370	GWAYI	JULY 1944		6
1596	24 1678 50 V	GWAYI FOREST	PJ 0058	1922	2759	990	GWAYI	JULY 1957		6
1597	24 1678 204 D	MELINAKANDA	PJ 0204	1952	2758	1110	GWAYI	JULY 1911	NOV. 1919	6
1598	24 1678 287 T	ST.LUKE'S MISSION	PJ 0287	1904	2754	1020	GWAYI	OCT. 1952		5
1599	24 1678 338 Z	UMGUSA FOREST	PJ 0338	1933	2758	1080	GWAYI	JULY 1958		6
1600	24 1678 402 F	BUBI BLOCK	PJ 0402	1909	2759	1060	GWAYI	JULY 1957		5
1601	24 1678 935 Y	SAWMILLS RAIL	PJ 0935	1935	2802	1060	GWAYI	FEB. 1918		6
1602	24 1678 2597 E	LAKE ALICE	PJ 2597	1901	2811	1070	GWAYI	NOV. 1902	JUNE 1903	5
1603	24 1678 3204 P	NYAMANDHLOVU POLICE	PJ 3204	1952	2816	1200	GWAYI	NOV. 1931		5
1604	24 1678 3303 X	NYAMANDHLOVU,RAIL	PJ 3303	1952	2816	1200	GWAYI	SEP. 1906	JUNE 1977	5
1605	24 1678 3304 Y	NYAMANDHLOVU,D.A.	PJ 3304	1952	2816	1200	GWAYI	NOV. 1936	NOV. 1942	5
1606	24 1678 4307 N	MPANDENI	PJ 4307	1950	2822	1220	GWAYI	JULY 1916	JUNE 1961	5
1607	24 1678 4620 D	EDWALENI	PJ 4620	1943	2823	1130	GWAYI	SEP. 1942		5
1608	24 1678 5248 L	GLENARTON	PJ 5248	1928	2826	1110	GWAYI	JULY 1921	JUNE 1956	5
1609	24 1678 5308 B	HILDA'S KRAAL	PJ 5308	1949	2828	1220	GWAYI	JULY 1899	JUNE 1946	5
1610	24 1678 5395 W	COPLESTON	PJ 5395	1956	2828	1230	GWAYI	JULY 1900	JUNE 1936	5
1611	24 1678 5561 B	NKOSIKASI	PJ 5561	1922	2827	1160	GWAYI	JAN. 1954		5
1612	24 1678 5711 P	GALETA'S KRAAL	PJ 5711	1948	2830	1160	GWAYI	SEP. 1943	JULY 1975	5
1613	24 1678 5997 A	ZWELABO	PJ 5997	1901	2830	1120	GWAYI	JAN. 1904		5
1614	24 1678 6344 C	B AND S MINE	PJ 6344	1929	2833	1140	GWAYI	DEC. 1946	MAR. 1961	5
1615	24 1678 6440 G	SCOTT'S FARM	PJ 6440	1930	2834	1130	GWAYI	OCT. 1959	NOV. 1978	6
1616	24 1678 6009 H	PADDY'S VALLEY	PJ 6009	1949	2836	1220	GWAYI	DEC. 1920	JUNE 1928	5
1617	24 1678 7201 J	RAAF	PJ 7201	1953	2839	1250	GWAYI	OCT. 1951	NOV. 1960	5
1618	24 1678 7281 W	GWAMPA FOREST	PJ 7201	1912	2840	1190	GWAYI	JULY 1950		5
1619	24 1678 7858 Y	UGUIZAAN	PJ 7858	1922	2841	1220	GWAYI	JUNE 1980	JULY 1982	6
1620	24 1678 8342 Z	LONELY MINE	PJ 8342	1930	2845	1270	GWAYI	NOV. 1952	SEP. 1978	6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1531	24 1579 7054 M	MZOLA	NK 7054	1830	2739	1020	GWAYI	JULY 1962	OCT. 1977	7
1532	24 1579 7859 M	CEWALI	NK 7859	1827	2745	1040	GWAYI	APR. 1950	JUNE 1969	7
1533	24 1579 7955 R	SIWALE	NK 7955	1829	2745	1050	GWAYI	JULY 1970	MAY 1977	7
1534	24 1579 7959 W	SIWALE SUB OFFICE	NK 7959	1827	2745	1040	GWAYI	DEC. 1977	JUNE 1986	7
1535	24 1579 8128 E	ZINAPI	NK 8128	1844	2746	990	GWAYI	DEC. 1953		6
1536	24 1579 8506 Q	LUPANE AGRIC	NK 8506	1856	2749	980	GWAYI	FEB. 1983		6
1537	24 1579 8507 R	LUPANE	NK 8507	1856	2748	1010	GWAYI	JAN. 1939	JUNE 1983	6
1538	24 1579 9200 V	MADOJWA	NK 9200	1900	2753	1020	GWAYI	JUNE 1975		6
153·	24 1579 9261 L	DANDANDA	NK 9261	1827	2752	1030	GWAYI	OCT. 1982		7
1540	24 1579 9822 W	LUNKA	NK 9822	1840	2756	980	GWAYI	APR. 1974	AUG. 1974	6
1541	24 1677 470 Y	SAMNENE EXP.PLOT	PH 0470	2010	2759	1330	GWAYI	DEC. 1954		6
1542	24 1677 801 V	RIVERBANK	PH 0801	2005	2801	1200	GWAYI	OCT. 1914	FEB. 1934	6
1543	24 1677 1094 B	ST.JAMES'S SEC.SCH.	PH 1094	1957	2803	1160	GWAYI	JULY 1965	MAY 1970	5
1544	24 1677 2167 S	SOLUSI MISSION	PH 2167	2012	2809	1300	GWAYI	APR. 1910		5
1545	24 1677 2193 W	NYAMANDHLOVU,CHESA	PH 2193	1958	2809	1220	GWAYI	NOV. 1950	NOV. 1964	5
1546	24 1677 2494 Y	NYAMANDHLOVU,TUR.TOB.	PH 2494	1956	2810	1220	GWAYI	NOV. 1963	OCT. 1977	5
1547	24 1677 2577 N	NASEBY	PH 2577	2006	2812	1220	GWAYI	SEP. 1915		5
1548	24 1677 2594 G	NYAMANDHLOVU,EXP.STN.	PH 2594	1957	2811	1220	GWAYI	JULY 1940	JUNE 1970	5
1549	24 1677 2746 X	USHER INSTITUTE	PH 2746	2023	2815	1400	GWAYI	JULY 1930	APR. 1970	5
1550	24 1677 2795 A	BURFORD	PH 2795	1956	2813	1200	GWAYI	JULY 1932	JUNE 1961	5
1551	24 1677 2845 E	WOODLEIGH A	PH 2845	2024	2814	1410	GWAYI	MAR. 1979		5
1552	24 1677 3251 W	CENTENARY	PH 3251	2020	2816	1360	GWAYI	OCT. 1924	JUNE 1946	5
1553	24 1677 3401 W	CHESA FOREST	PH 3401	2002	2816	1320	GWAYI	JULY 1958		6
1554	24 1677 3572 V	BLEW BONNIE	PH 3572	2010	2819	1300	GWAYI	JULY 1942	JUNE 1955	5
1555	24 1677 3948 D	FIGTREE POLICE	PH 3948	2022	2820	1370	GWAYI	NOV. 1926		5
1556	24 1677 4097 Q	REDLEAF	PH 4097	1955	2820	1190	GWAYI	NOV. 1920		5
1557	24 1677 4601 A	KHAMI PRISON FARM	PH 4601	2004	2823	1260	GWAYI	OCT. 1952		5
1558	24 1677 4852 L	CYRENE MISSION	PH 4852	2021	2825	1410	GWAYI	OCT. 1951		5
1559	24 1677 4952 V	MATOPOS TWO TREE KOP	PH 5051	2019	2826	1400	GWAYI	JULY 1940		5
1560	24 1677 4953 W	TWO TREE KOP	PH 4952	2020	2827	1420	GWAYI	JULY 1940	JAN. 1956	5
1561	24 1677 4972 R	KHAMI WATERWORKS	PH 4972	2008	2825	1200	GWAYI	JAN. 1973		5
1562	24 1677 5259 D	KHAMI RAIL	PH 5259	2016	2827	1340	GWAYI	NOV. 1959		5
1563	24 1677 5260 E	KAME RIVER RANCH	PH 5260	2015	2828	1350	GWAYI	JULY 1912	APR. 1961	5
1564	24 1677 5260 N	LOWER RANGEMORE	PH 5260	2011	2828	1320	GWAYI	OCT. 1913	JUNE 1929	5
1565	24 1677 5663 S	RANGEMORE	PH 5663	2013	2829	1360	GWAYI	DEC. 1934	JUNE 1966	5
1566	24 1677 5876 Z	BULAWAYO,LUVEVE	PH 5876	2007	2831	1340	GWAYI	OCT. 1937		5
1567	24 1677 6085 B	UMGUSA	PH 6085	2000	2831	1220	GWAYI	FEB. 1941		5
1568	24 1677 6156 D	MATOPOS MAHIYE DIP	PH 6156	2017	2832	1410	GWAYI	DEC. 1970		5
1569	24 1677 6185 K	KEENDALE	PH 6185	2002	2831	1250	GWAYI	JULY 1913	SEP. 1980	5
1570	24 1677 6470 V	BULAWAYO,RAIL	PH 6470	2010	2834	1360	GWAYI	JAN. 1910		5
1571	24 1677 6564 X	BULAWAYO,FOURWINDS	PH 6564	2013	2835	1420	GWAYI	MAY 1940		5
1572	24 1677 6565 Y	BULAWAYO,HILLSIDE	PH 6565	2012	2837	1410	GWAYI	FEB. 1930		5
1573	24 1677 6568 B	BULAWAYO,INGUTSHENI	PH 6568	2011	2835	1380	GWAYI	AUG. 1922		5
1574	24 1677 6676 T	BULAWAYO,GOVT.HOUSE	PH 6676	2007	2835	1320	GWAYI	JULY 1904	JUNE 1917	5
1575	24 1677 6770 W	BULAWAYO,ST.PETER'S SCH.	PH 6770	2009	2835	1360	GWAYI	OCT. 1924	DEC. 1966	5

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1666	24 1770 4080 G	MDIWENI	QJ 4080	1908	2916	1240	GWAYI	JAN. 1957	JUNE 1965	6
1667	24 1770 4134 G	SHANGANI TIYABENZI DAM	QJ 4134	1935	2918	1270	GWAYI	JAN. 1972		6
1668	24 1770 4299 L	SILOBELA	QJ 4299	1859	2917	1180	GWAYI	OCT. 1964		6
1669	24 1770 4390 T	LORETO MISSION	QJ 4390	1900	2918	1190	GWAYI	SEP. 1947	NOV. 1970	6
1670	24 1770 4414 L	ORMISTON(SHANGANI)	QJ 4414	1945	2918	1400	GWAYI	OCT. 1948		6
167	24 1770 4419 R	SHANGANI RANCH	QJ 4419	1943	2920	1340	GWAYI	SEP. 1915		6
167_	24 1770 4803 J	THORNVILLE	QJ 4803	1950	2922	1400	GWAYI	JULY 1912	OCT. 1978	6
1673	24 1770 4812 T	SHANGANI RAIL	QJ 4812	1947	2921	1370	GWAYI	FEB. 1913		6
1674	24 1770 5167 E	MAKULAMBILA	QJ 5167	1917	2923	1300	GWAYI	MAR. 1963	JUNE 1978	6
1675	24 1770 5169 G	SPARROW	QJ 5169	1915	2923	1310	GWAYI	JAN. 1940		6
1676	24 1770 5442 D	ZENDA	QJ 5442	1930	2925	1380	GWAYI	OCT. 1967	JUNE 1971	6
1677	24 1770 5566 N	MABOLENI SCHOOL	QJ 5566	1917	2925	1300	GWAYI	JULY 1905		6
1678	24 1770 6021 H	ON VER WAGS	QJ 6021	1941	2928	1370	GWAYI	JULY 1951	FEB. 1973	6
1679	24 1770 6152 A	VUNGU P.A.	QJ 6152	1925	2928	1340	GWAYI	SEP. 1965		6
1680	24 1770 6655 X	LOWER GWERU	QJ 6655	1923	2932	1340	GWAYI	SEP. 1927		6
1681	24 1770 6972 R	SOMERSET ESTATE	QJ 6972	1914	2934	1310	GWAYI	MAY 1911	AUG. 1978	5
1682	24 1770 7235 C	MEADOWS(THE),GWERU	QJ 7235	1934	2935	1380	GWAYI	JULY 1940	FEB. 1963	6
1683	24 1770 7240 H	VUNGU NORTH	QJ 7240	1931	2936	1340	GWAYI	OCT. 1926	APR. 1933	6
1684	24 1770 7326 B	DAWN	QJ 7326	1940	2936	1420	GWAYI	DEC. 1915	JUNE 1948	6
1685	24 1770 7440 J	SANDVLEI	QJ 7440	1926	2937	1330	GWAYI	FEB. 1931	APR. 1939	6
1686	24 1770 7724 J	LEWIS	QJ 7724	1940	2937	1400	GWAYI	MAR. 1936		6
1687	24 1770 8167 Q	RIVERDALE ESTATE	QJ 8167	1916	2942	1360	GWAYI	DEC. 1918	JUNE 1929	5
1688	24 1770 8251 G	KENT FARM	QJ 8251	1925	2941	1380	GWAYI	OCT. 1926	JAN. 1933	6
1689	24 1770 8350 Y	MANDERLAY	QJ 8350	1921	2942	1340	GWAYI	JULY 1936	OCT. 1967	5
1690	24 1770 8561 T	CLIFTON DOWNS	QJ 8561	1919	2943	1380	GWAYI	JULY 1929	FEB. 1952	5
1691	24 1770 8757 G	VIRGINIA VALLEY	QJ 8757	1922	2944	1360	GWAYI	MAR. 1952		6
1692	24 1770 8841 Y	MIMOSA CREEK	QJ 8841	1931	2945	1380	GWAYI	MAY 1932	JUNE 1950	6
1693	24 1770 8855 N	CHESHIRE	QJ 8855	1923	2945	1400	GWAYI	JULY 1943	MAY 1979	6
1694	24 1770 9154 N	BROCKENHURST	QJ 9154	1923	2946	1380	GWAYI	OCT. 1926	JUNE 1943	6
1695	24 1770 9240 G	DABUKA	QJ 9240	1931	2947	1400	GWAYI	FEB. 1976	FEB. 1976	6
1696	24 1770 9547 Q	GWERU,RAIL	QJ 9547	1927	2949	1420	GWAYI	JAN. 1910		6
1697	24 1770 9548 R	GWERU,GAOL	QJ 9548	1927	2949	1410	GWAYI	JULY 1890		6
1698	24 1770 9649 D	GWERU,FOREST NURSERY	QJ 9649	1926	2949	1420	GWAYI	SEP. 1952		6
1699	24 1770 9948 D	GWERU,FROGMORE	QJ 9948	1927	2951	1420	GWAYI	OCT. 1926	OCT. 1931	6
1700	24 1779 124 S	DONSA	QK 0124	1847	2854	1100	GWAYI	JAN. 1957	JAN. 1970	6
1701	24 1779 1621 V	FAIRACRES ESTATE	QK 1621	1848	2903	1140	GWAYI	NOV. 1966	OCT. 1979	6
1702	24 1779 1914 N	EXCHANGE IRRIG.SCHEME	QK 1914	1852	2904	1180	GWAYI	MAR. 1975		6
1703	24 1779 5403 F	DELANO ESTATE	QK 5403	1857	2925	1270	GWAYI	NOV. 1925	APR. 1939	6
1704	24 1870 45 T	GWERU,COOLMOREEN	RJ 0045	1928	2952	1420	GWAYI	DEC. 1929		6
1705	24 1870 47 W	GWERU,GLENGARRY	RJ 0047	1926	2951	1430	GWAYI	OCT. 1926		6
1706	24 1870 50 Z	GWERU,EXPT.STN.	RJ 0050	1926	2951	1440	GWAYI	FEB. 1925	JUNE 1941	6
1707	24 1870 140 F	GWERU,THORNHILL	RJ 0140	1927	2951	1430	GWAYI	JULY 1944		6
1708	25 1576 5360 P	FRANCISTOWN RAIL	NG 5360	2110	2731	1000	LIMPOPO	OCT. 1920		4
1709	25 1576 7470 R	RADITLADI	NG 7470	2101	2743	1040	LIMPOPO	MAY 1959	FEB. 1977	5
1710	25 1576 8075 Q	TSHITSHI	NG 8075	2102	2746	1040	LIMPOPO	JAN. 1982	JUNE 1986	5

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1621	24 1678 0689 B	ZENKA PAN	PJ 0689	1905	2046	1250	GWAYI	NOV. 1902		6
1622	24 1678 0708 X	NDUBA	PJ 0708	1949	2047	1310	GWAYI	JULY 1925	JUNE 1934	6
1623	24 1678 0784 E	ZENKA	PJ 0784	1907	2047	1270	GWAYI	FEB. 1967	FEB. 1978	6
1624	24 1678 0912 T	RIVERSBANK FARM	PJ 0912	1946	2049	1290	GWAYI	JULY 1935	FEB. 1950	6
1625	24 1678 9027 T	ROAD CAMP MTN 2	PJ 9027	1939	2049	1280	GWAYI	APR. 1973		6
1626	24 1678 9105 D	MUCKLENEUK	PJ 9105	1950	2050	1310	GWAYI	NOV. 1922	FEB. 1964	6
1627	24 1678 9211 T	DIGLIS PARK	PJ 9211	1948	2050	1310	GWAYI	APR. 1964	APR. 1978	6
1628	24 1678 9245 F	KENILWORTH,DOLLAR	PJ 9245	1929	2050	1310	GWAYI	JAN. 1978	JAN. 1904	6
1629	24 1678 9324 R	INYATI POLICE	PJ 9324	1941	2051	1330	GWAYI	APR. 1903		6
1630	24 1678 9899 R	NKAYI MISSION	PJ 9099	1900	2054	1130	GWAYI	APR. 1906		6
1631	24 1679 0864 Q	MBUNGU SCHOOL	PK 0864	1825	2002	1080	GWAYI	MAY 1969	JUNE 1976	7
1632	24 1679 1616 H	NDAWANA	PK 1616	1851	2006	990	GWAYI	DEC. 1953		5
1633	24 1679 2025 C	PUPU	PK 2025	1846	2008	1010	GWAYI	DEC. 1953		6
1634	24 1679 2404 P	JIBAJIBA	PK 2404	1856	2012	1050	GWAYI	NOV. 1954	DEC. 1977	5
1635	24 1679 2830 C	GOMOZA	PK 2830	1846	2013	1050	GWAYI	OCT. 1959	AUG. 1977	6
1636	24 1679 5047 M	KANA	PK 5047	1833	2023	1110	GWAYI	JULY 1951	JAN. 1979	7
1637	24 1679 5205 J	MBUMA	PK 5205	1856	2027	1140	GWAYI	NOV. 1902	JUNE 1903	6
1638	24 1679 5246 D	NYAMAZANA	PK 5246	1834	2026	1130	GWAYI	NOV. 1902		7
1639	24 1679 7523 D	DAGAMELA	PK 7523	1840	2040	1040	GWAYI	MAR. 1949	SEP. 1977	6
1640	24 1679 7622 L	DAKAMELA	PK 7622	1846	2040	1050	GWAYI	NOV. 1902		6
1641	24 1679 7936 C	GWELUTSHENA	PK 7936	1839	2042	1070	GWAYI	FEB. 1967		6
1642	24 1679 0411 T	GONYE-NKAYI	PK 0411	1854	2045	1080	GWAYI	NOV. 1902		6
1643	24 1679 9705 A	FANISONI	PK 9705	1856	2052	1110	GWAYI	NOV. 1902		6
1644	24 1777 188 Y	MBEMBESI POLICE	QH 0188	1959	2056	1360	GWAYI	JAN. 1910		6
1645	24 1777 4598 R	ALBANY	QH 4598	1955	2918	1450	GWAYI	FEB. 1914		6
1646	24 1777 5375 L	ORANGEDALE	QH 5375	1954	2924	1460	GWAYI	OCT. 1915	MAR. 1960	6
1647	24 1778 98 V	NKAYI	QJ 0098	1900	2054	1130	GWAYI	FEB. 1930	JUNE 1903	6
1648	24 1778 136 L	DAMBA MINE	QJ 0136	1934	2055	1360	GWAYI	JUNE 1973	NOV. 1976	6
1649	24 1778 198 D	NKAYI AGRIC	QJ 0198	1900	2054	1130	GWAYI	OCT. 1903		6
1650	24 1778 366 L	KENILWORTH,LUKONA	QJ 0366	1918	2056	1240	GWAYI	JAN. 1978	MAR. 1904	6
1651	24 1778 550 L	KENILWORTH,H.Q.	QJ 0550	1926	2057	1280	GWAYI	JAN. 1978	NOV. 1904	6
1652	24 1778 990 P	ZINYANGENI MISSION	QJ 0990	1905	2900	1160	GWAYI	FEB. 1930	JUNE 1973	6
1653	24 1778 991 Q	ZINYANGENI	QJ 0991	1901	2805	1150	GWAYI	OCT. 1907		6
1654	24 1778 1220 P	WESTFIELD FARM	QJ 1220	1942	2901	1370	GWAYI	NOV. 1950	JUNE 1966	6
1655	24 1778 1522 S	JUDSONIA	QJ 1522	1941	2903	1360	GWAYI	OCT. 1924	JUNE 1940	6
1656	24 1778 1563 M	KENILWORTH,SHANGANI	QJ 1563	1919	2903	1210	GWAYI	FEB. 1978	JAN. 1904	6
1657	24 1778 1629 J	SYRINGA	QJ 1629	1937	2903	1330	GWAYI	OCT. 1921	JUNE 1970	6
1658	24 1778 2199 D	SILOBELA B B	QJ 2199	1900	2906	1220	GWAYI	FEB. 1967	APR. 1978	6
1659	24 1778 2556 R	NORTH SHANGANI	QJ 2556	1923	2909	1220	GWAYI	NOV. 1966		6
1660	24 1778 2699 X	JOSEFA	QJ 2699	1859	2909	1240	GWAYI	JAN. 1957	JUNE 1964	6
1661	24 1778 2948 S	ENDURA	QJ 2948	1927	2911	1240	GWAYI	NOV. 1901		6
1662	24 1778 3522 R	SHANGANI MINE	QJ 3522	1941	2915	1340	GWAYI	JAN. 1972		6
1663	24 1778 3622 A	MORGENSON FARM	QJ 3622	1941	2915	1330	GWAYI	JAN. 1957	DEC. 1973	6
1664	24 1778 3789 G	KUMBUZA	QJ 3789	1904	2915	1270	GWAYI	NOV. 1965	NOV. 1902	6
1665	24 1778 4003 B	KUMALO DIP TANK	QJ 4003	1900	2917	1300	GWAYI	FEB. 1965	JULY 1903	6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1756	25 1676 7228 G	LUBANGWE	PG 7228	2126	2840	840	LIMPOPO	JULY 1903		4
1757	25 1676 7499 W	DAMARA	PG 7499	2048	2840	1040	LIMPOPO	OCT. 1972	SEP. 1983	5
1758	25 1676 7624 G	KAFUSI-MATOBO	PG 7624	2129	2841	830	LIMPOPO	JULY 1903		3
1759	25 1676 8197 C	MAYEZANE	PG 8197	2049	2844	950	LIMPOPO	JAN. 1973	JUNE 1978	5
1760	25 1676 8312 E	KAFUSI	PG 8312	2136	2846	760	LIMPOPO	MAR. 1960		3
1761	25 1676 0701 P	THULI MAKWE DAM	PG 0701	2050	2848	1010	LIMPOPO	MAY 1966		4
1762	25 1676 0797 G	WENLOCK	PG 0797	2050	2848	1020	LIMPOPO	OCT. 1921	JUNE 1930	4
1763	25 1676 9052 J	GOBATEMA MISSION	PG 9052	2113	2850	870	LIMPOPO	DEC. 1954	NOV. 1977	4
1764	25 1676 9527 A	GUNGWE EXP.PLOT	PG 9527	2120	2853	810	LIMPOPO	DEC. 1953		4
1765	25 1677 424 A	MANOLI	PH 0424	2035	2800	1340	LIMPOPO	JULY 1913	JUNE 1929	5
1766	25 1677 1011 N	MANGWE POLICE	PH 1011	2041	2805	1200	LIMPOPO	MAY 1929		5
1767	25 1677 1115 B	GARTH	PH 1115	2039	2804	1260	LIMPOPO	APR. 1911	OCT. 1938	5
1768	25 1677 1335 Q	WILFRED'S HOPE	PH 1335	2028	2807	1430	LIMPOPO	MAY 1929		5
1769	25 1677 1405 R	EXMOOR	PH 1405	2046	2804	1200	LIMPOPO	JULY 1956	OCT. 1971	5
1770	25 1677 1927 J	THREE STREAMS(MARULA)	PH 1927	2033	2708	1360	LIMPOPO	NOV. 1930	JUNE 1937	6
1771	25 1677 2141 R	SANDOWN ESTATE	PH 2141	2026	2809	1460	LIMPOPO	JULY 1921	JAN. 1945	5
1772	25 1677 2037 Y	HANNAYVALE	PH 2037	2028	2829	1420	LIMPOPO	JUNE 1976	AUG. 1978	5
1773	25 1677 2039 A	BROOKLANDS	PH 2039	2027	2814	1460	LIMPOPO	MAR. 1932	APR. 1976	5
1774	25 1677 3634 P	D'HOOP FARM	PH 3634	2029	2819	1400	LIMPOPO	DEC. 1944		6
1775	25 1677 3724 M	BAZHA	PH 3724	2035	2819	1340	LIMPOPO	NOV. 1966		6
1776	25 1677 4744 W	LUCYDALE FARM	PH 4744	2024	2824	1360	LIMPOPO	NOV. 1945		6
1777	25 1677 5019 V	BADA AGRIC	PH 5019	2037	2826	1140	LIMPOPO	JULY 1983		6
1778	25 1677 5044 X	LONGSDALE	PH 5044	2024	2826	1360	LIMPOPO	JULY 1924	FEB. 1982	5
1779	25 1677 5119 D	BADA	PH 5119	2038	2827	1190	LIMPOPO	OCT. 1966	JAN. 1979	6
1780	25 1677 5225 T	MATOPOS N.P.WHITEWATERS	PH 5225	2035	2827	1240	LIMPOPO	DEC. 1948		6
1781	25 1677 5250 W	CHESSBOARD	PH 5250	2021	2827	1410	LIMPOPO	JULY 1940	JAN. 1956	5
1782	25 1677 5443 F	TERMINUS	PH 5443	2025	2829	1340	LIMPOPO	JULY 1936		5
1783	25 1677 5444 G	MATOPOS SANDVELD	PH 5444	2024	2828	1340	LIMPOPO	NOV. 1959		5
1784	25 1677 5544 Q	MATOPOS LYSIMETER	PH 5544	2024	2829	1320	LIMPOPO	NOV. 1951	FEB. 1963	5
1785	25 1677 5645 A	MATOPOS NURSERY	PH 5645	2023	2830	1350	LIMPOPO	JULY 1940		5
1786	25 1677 5727 P	MATOPOS N.P.MALENE	PH 5727	2033	2830	1300	LIMPOPO	JULY 1981		6
1787	25 1677 5741 E	MATOPOS PARK	PH 5741	2025	2830	1310	LIMPOPO	JULY 1903		5
1788	25 1677 5746 K	MATOPOS RES.STATION	PH 5746	2023	2831	1340	LIMPOPO	SEP. 1922		5
1789	25 1677 5840 M	SANDVELD	PH 5840	2026	2831	1360	LIMPOPO	JULY 1940	JUNE 1960	5
1790	25 1677 5843 Q	SANDY SPRUIT	PH 5843	2025	2831	1350	LIMPOPO	JULY 1949	JUNE 1960	5
1791	25 1677 5846 T	WESTACRE	PH 5846	2023	2831	1300	LIMPOPO	DEC. 1902	APR. 1909	5
1792	25 1677 5930 T	NTSHELELI	PH 5930	2027	2832	1320	LIMPOPO	JAN. 1948	JAN. 1963	5
1793	25 1677 6109 E	NOLI	PH 6109	2042	2833	1100	LIMPOPO	NOV. 1954	SEP. 1972	5
1794	25 1677 6306 T	BON ACCORD	PH 6306	2043	2834	1080	LIMPOPO	JAN. 1926	OCT. 1954	5
1795	25 1677 6323 M	SILOZWE	PH 6323	2035	2834	1300	LIMPOPO	JULY 1983		6
1796	25 1677 6437 L	NYUMBANI	PH 6437	2020	2834	1460	LIMPOPO	JULY 1983		6
1797	25 1677 6442 J	FORT USHER	PH 6442	2025	2836	1430	LIMPOPO	OCT. 1925	JUNE 1936	5
1798	25 1677 6654 X	UMHLONYANE	PH 6654	2019	2835	1430	LIMPOPO	OCT. 1957		5
1799	25 1677 6747 A	IONBRIDGE FARM	PH 6749	2021	2836	1400	LIMPOPO	MAR. 1944	JUNE 1961	5
1800	25 1677 6828 L	TOGWANA	PH 6828	2032	2836	1300	LIMPOPO	FEB. 1985		6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	N.A.R.
1711	25 1576 9055 F	MPHOENG	NG 9055	2113	2752	950	LIMPOPO	OCT. 1937		4
1712	25 1576 9291 M	FALLOWFIELDS	NG 9291	2053	2752	1100	LIMPOPO	APR. 1927	SEP. 1933	5
1713	25 1576 9476 N	INGWEZI DAM	NG 9476	2101	2754	1040	LIMPOPO	OCT. 1966		5
1714	25 1577 0422 H	WASI DAM	NH 0422	2036	2749	1270	LIMPOPO	OCT. 1966	JUNE 1979	5
1715	25 1577 0502 Z	EMBAKWE MISSION	NH 0502	2046	2748	1130	LIMPOPO	OCT. 1938	MAY 1978	5
1716	25 1577 0601 G	MANIFEST	NH 0601	2048	2750	1140	LIMPOPO	APR. 1949		5
1717	25 1577 0825 A	ZINYANA(FARM180)	NH 0825	2035	2751	1300	LIMPOPO	SEP. 1980		5
1718	25 1577 0921 E	ZINYANA	NH 0921	2037	2751	1260	LIMPOPO	DEC. 1979	JAN. 1980	5
1719	25 1577 9410 L	EMPANDENI MISSION	NH 9410	2043	2754	1200	LIMPOPO	JULY 1899		5
1720	25 1577 9435 N	FERNDALE(BULAWAYO)	NH 9435	2029	2754	1400	LIMPOPO	OCT. 1926	FEB. 1935	5
1721	25 1676 759 V	BRUNAPEG MISSION	PG 0759	2110	2802	960	LIMPOPO	DEC. 1921		4
1722	25 1676 2037 J	MAYOBODO POLICE	PG 2037	2122	2809	940	LIMPOPO	SEP. 1964		3
1723	25 1676 2060 S	BLUMBERG FARM	PG 2060	2106	2809	970	LIMPOPO	NOV. 1945	JUNE 1971	4
1724	25 1676 3174 V	MBEMBESWANA	PG 3174	2101	2816	990	LIMPOPO	NOV. 1956		4
1725	25 1676 3350 L	ST.JOSEPH'S SEMOKWE	PG 3350	2113	2817	960	LIMPOPO	OCT. 1966		3
1726	25 1676 3433 B	ST.SEBASTIAN SCHOOL	PG 3433	2125	2817	870	LIMPOPO	MAY 1966	JAN. 1970	3
1727	25 1676 3434 C	SEMOKWE T.T.L. SOUTH	PG 3434	2124	2818	880	LIMPOPO	OCT. 1952	OCT. 1963	3
1728	25 1676 3482 E	ST.PETER SONTALA	PG 3482	2057	2817	1030	LIMPOPO	FEB. 1966	JUNE 1975	5
1729	25 1676 3856 L	BIDI	PG 3856	2112	2819	960	LIMPOPO	SEP. 1965		4
1730	25 1676 3879 L	MLOYI	PG 3879	2059	2819	1030	LIMPOPO	JAN. 1976		5
1731	25 1676 4034 E	SIGANGATSHA	PG 4034	2124	2821	900	LIMPOPO	JULY 1983		3
1732	25 1676 4096 X	KEZARE	PG 4096	2050	2821	1080	LIMPOPO	JULY 1983		5
1733	25 1676 4147 C	NYASHONGWE SCHOOL	PG 4147	2116	2821	920	LIMPOPO	OCT. 1982		3
1734	25 1676 4148 D	MALABA	PG 4148	2116	2822	940	LIMPOPO	JUNE 1973	AUG. 1983	3
1735	25 1676 4687 P	KEMESI	PG 4687	2055	2825	1040	LIMPOPO	OCT. 1952		5
1736	25 1676 4908 E	MAMBALI IRRIG	PG 4908	2139	2827	780	LIMPOPO	JAN. 1966		3
1737	25 1676 4971 Y	ANTELOPE DAM	PG 4971	2103	2826	960	LIMPOPO	SEP. 1969		4
1738	25 1676 5022 D	BEULA	PG 5022	2130	2827	840	LIMPOPO	OCT. 1976		3
1739	25 1676 5073 J	ANTELOPE SCHOOL	PG 5073	2103	2827	990	LIMPOPO	SEP. 1966	OCT. 1971	4
1740	25 1676 5074 K	ANTELOPE MINE	PG 5074	2102	2827	1000	LIMPOPO	DEC. 1912	FEB. 1927	4
1741	25 1676 5170 P	MINDA MISSION	PG 5170	2104	2827	990	LIMPOPO	NOV. 1971		4
1742	25 1676 5200 S	KEZI	PG 5200	2055	2827	1020	LIMPOPO	OCT. 1930		5
1743	25 1676 5289 T	HOLLY'S HOPE	PG 5289	2054	2828	1010	LIMPOPO	OCT. 1915	JUNE 1930	5
1744	25 1676 5306 Z	KEZI AGRIC	PG 5306	2055	2828	1000	LIMPOPO	JULY 1983		5
1745	25 1676 5393 G	LEOPARD RANCH(KEZI)	PG 5393	2052	2827	1040	LIMPOPO	SEP. 1948	JUNE 1959	5
1746	25 1676 5539 Q	TSHELANYEMBA	PG 5539	2122	2829	870	LIMPOPO	JULY 1951		4
1747	25 1676 5863 S	GOHOLI SCHOOL	PG 5863	2108	2831	940	LIMPOPO	JAN. 1970	DEC. 1975	4
1748	25 1676 5930 Q	LEGION STORE	PG 5930	2124	2832	800	LIMPOPO	AUG. 1950	JAN. 1956	3
1749	25 1676 5931 R	PICKWICK MINE	PG 5931	2125	2832	870	LIMPOPO	AUG. 1940	APR. 1975	4
1750	25 1676 6055 B	MASHUMBA	PG 6055	2112	2833	930	LIMPOPO	JULY 1983		4
1751	25 1676 6149 D	PROSPECT RANCH	PG 6149	2114	2833	910	LIMPOPO	JAN. 1952		4
1752	25 1676 6542 F	TUTI I	PG 6542	2119	2835	890	LIMPOPO	JULY 1983		4
1753	25 1676 6766 Z	MARIBEHA	PG 6766	2106	2837	960	LIMPOPO	APR. 1983		4
1754	25 1676 6835 Z	TUTI II	PG 6835	2123	2837	860	LIMPOPO	JULY 1983		4
1755	25 1676 6853 T	RATANYANE	PG 6853	2113	2837	920	LIMPOPO	JULY 1983		4

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	N.A.R.
1046	25 1776 5883 W	MABUZE	QG 5883	2056	2929	960	LIMPOPO	OCT. 1903		5
1047	25 1776 6412 W	ZEZANI	QG 6412	2134	2933	680	LIMPOPO	OCT. 1955	JUNE 1970	3
1048	25 1776 6944 Z	TAMBA	QG 6944	2116	2935	760	LIMPOPO	JAN. 1912		3
1049	25 1776 7757 H	MKASHI RANCH	QG 7757	2110	2940	830	LIMPOPO	JUNE 1970		4
1050	25 1776 7778 F	MASASE MISSION	QG 7778	2059	2940	920	LIMPOPO	JULY 1938	OCT. 1978	5
1051	25 1776 7878 P	MASASE,BHR W.NICHOLSON	QG 7878	2059	2940	920	LIMPOPO	JULY 1946	FEB. 1956	5
1052	25 1776 8267 M	DWALA RANCH	QG 8267	2104	2943	850	LIMPOPO	JULY 1949	DEC. 1978	5
1053	25 1776 8325 A	MAKADO RANCH	QG 8325	2144	2944	670	LIMPOPO	JAN. 1973		4
1054	25 1776 8485 Z	MUMBANI	QG 8485	2055	2944	980	LIMPOPO	SEP. 1957	SEP. 1979	5
1055	25 1776 8903 D	LIEBIG'S RANCH,MANANTJE	QG 8903	2139	2942	620	LIMPOPO	APR. 1913		3
1056	25 1776 9928 S	LIEBIG'S RANCH,SLGUBGHE	QG 9928	2127	2952	700	LIMPOPO	JULY 1933		4
1057	25 1777 243 K	GONGO	QH 0243	2022	2849	1160	LIMPOPO	JULY 1953		6
1058	25 1777 256 Z	ESIGODINI D.A.	QH 0256	2018	2856	1170	LIMPOPO	JAN. 1912		6
1059	25 1777 350 B	ESIGODINI AGRIC.INST.	QH 0350	2021	2857	1190	LIMPOPO	JULY 1942		6
1060	25 1777 410 R	HOLLINS SECTION	QH 0410	2042	2858	1060	LIMPOPO	SEP. 1967	APR. 1982	5
1061	25 1777 420 L	MAHALINI	QH 0420	2033	2858	1140	LIMPOPO	DEC. 1960		5
1062	25 1777 565 K	FALCON COLLEGE	QH 0565	2014	2857	1220	LIMPOPO	NOV. 1957		6
1063	25 1777 644 W	UMZINGWANE DAM	QH 0644	2024	2859	1060	LIMPOPO	JAN. 1973		6
1064	25 1777 664 S	BUSHTICK MINE	QH 0664	2013	2859	1200	LIMPOPO	SEP. 1939	JUNE 1952	6
1065	25 1777 1147 S	NCEMA DAM	QH 1147	2022	2901	1070	LIMPOPO	DEC. 1950		6
1066	25 1777 1177 A	KODIWAYO	QH 1177	2007	2902	1200	LIMPOPO	FEB. 1922	APR. 1933	6
1067	25 1777 1239 S	NBALABALA	QH 1239	2027	2902	1100	LIMPOPO	JAN. 1910		6
1068	25 1777 1323 J	STRATHMORE	QH 1323	2035	2904	1060	LIMPOPO	NOV. 1927	OCT. 1938	5
1069	25 1777 1360 Z	ESSEXVALE RANCH	QH 1360	2015	2902	1180	LIMPOPO	JULY 1941		5
1070	25 1777 1731 C	NEW BRIGHTON	QH 1731	2030	2906	1040	LIMPOPO	JULY 1929		5
1071	25 1777 1978 W	TWIN RIVERS	QH 1978	2005	2905	1250	LIMPOPO	JULY 1949	JUNE 1973	6
1072	25 1777 2147 E	INYANKUNI DAM	QH 2147	2022	2907	1000	LIMPOPO	JAN. 1973		5
1073	25 1777 2267 K	ESSEXVALE RANCH NDISI	QH 2267	2012	2908	1220	LIMPOPO	OCT. 1952		5
1074	25 1777 2291 L	NAUHOHO	QH 2291	1958	2908	1300	LIMPOPO	OCT. 1929	FEB. 1937	6
1075	25 1777 2822 N	GLASS BLOCK	QH 2822	2036	2911	950	LIMPOPO	OCT. 1964	FEB. 1977	5
1076	25 1777 2968 X	RATHLINE	QH 2968	2011	2911	1200	LIMPOPO	JAN. 1930	APR. 1962	5
1077	25 1777 2995 B	BLINKBONNY	QH 2995	1956	2911	1290	LIMPOPO	JULY 1985		6
1078	25 1777 3207 T	RIXON DAM	QH 3207	2001	2912	1230	LIMPOPO	FEB. 1970		6
1079	25 1777 3546 A	MAYFAIR DAM	QH 3546	2021	2915	1100	LIMPOPO	FEB. 1970		5
1080	25 1777 3685 B	FORT RIXON	QH 3685	2001	2916	1290	LIMPOPO	JULY 1904		6
1081	25 1777 3739 K	EPOCH MINE	QH 3739	2026	2916	1180	LIMPOPO	JAN. 1970		5
1082	25 1777 3927 P	FILABUSI POLICE	QH 3927	2033	2917	1070	LIMPOPO	JULY 1902		5
1083	25 1777 4005 Z	NSIZA EXP.PLOT	QH 4005	2043	2919	1020	LIMPOPO	AUG. 1953		4
1084	25 1777 4063 M	LANCASTER	QH 4063	2013	2918	1200	LIMPOPO	JULY 1922	JUNE 1952	6
1085	25 1777 4601 X	SILALABUWA DAM	QH 4601	2047	2922	980	LIMPOPO	JAN. 1966	AUG. 1978	4
1086	25 1777 4757 R	INFININGWE	QH 4757	2016	2922	1220	LIMPOPO	JUNE 1912	JAN. 1933	6
1087	25 1777 5426 T	DRUMBULCHAN	QH 5426	2032	2926	1000	LIMPOPO	SEP. 1926	JUNE 1931	5
1088	25 1777 5551 E	LYNWOODS FARM	QH 5551	2021	2926	1230	LIMPOPO	NOV. 1957	MAY 1972	5
1089	25 1777 6025 P	MANEZI MISSION	QH 6025	2034	2935	1070	LIMPOPO	SEP. 1925	DEC. 1977	5
1090	25 1777 6922 V	INYEZI	QH 6922	2036	2935	1060	LIMPOPO	JULY 1916	MAY 1939	5

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1801	25 1677 6849 J	MATOPOS TONBRIDGE DIP	PH 6849	2021	2837	1400	LIMPOPO	JULY 1970		5
1802	25 1677 7350 D	SAUERDALE	PH 7350	2020	2839	1380	LIMPOPO	JULY 1924	APR. 1938	5
1803	25 1677 7359 N	HOPE FOUNTAIN MISSION	PH 7359	2016	2839	1440	LIMPOPO	JULY 1800		5
1804	25 1677 7557 D	HAPPY VALLEY	PH 7557	2017	2841	1360	LIMPOPO	OCT. 1954	JUNE 1984	6
1805	25 1677 7744 G	BOOMERANG FARM	PH 7744	2024	2842	1400	LIMPOPO	OCT. 1957		6
1806	25 1677 7937 R	MATOPO MISSION	PH 7937	2028	2843	1490	LIMPOPO	FEB. 1905	DEC. 1977	6
1807	25 1677 8260 S	CLAREMONT/BISON FARM	PH 8260	2015	2844	1400	LIMPOPO	NOV. 1951	APR. 1982	6
1808	25 1677 8555 N	HOW MINE	PH 8555	2018	2846	1250	LIMPOPO	DEC. 1957		6
1809	25 1677 8864 Z	ESIPHEZINI	PH 8864	2013	2848	1270	LIMPOPO	NOV. 1945		6
1810	25 1677 0915 E	IMBU	PH 8915	2040	2849	1110	LIMPOPO	NOV. 1973		5
1811	25 1677 9275 W	KIRTON FARM	PH 9275	2007	2851	1320	LIMPOPO	JULY 1922	APR. 1945	6
1812	25 1677 9356 J	FERNHILL	PH 9356	2017	2851	1250	LIMPOPO	MAR. 1954	AUG. 1983	6
1813	25 1677 9609 J	MTSHABEZI MISSION	PH 9609	2043	2853	1060	LIMPOPO	JULY 1900	JAN. 1977	5
1814	25 1677 9801 S	GWAKWE	PH 9801	2047	2854	1050	LIMPOPO	NOV. 1973	SEP. 1978	4
1815	25 1677 9944 Y	MZINYATI MISSION	PH 9944	2024	2854	1160	LIMPOPO	JULY 1936	APR. 1953	6
1816	25 1775 0890 Z	RUSTLERS' GORGE	QF 0890	2147	2901	610	LIMPOPO	FEB. 1968	FEB. 1977	3
1817	25 1775 1293 M	KONKONI	QF 1293	2145	2903	660	LIMPOPO	FEB. 1968	NOV. 1976	3
1818	25 1775 2875 G	TULI POLICE	QF 2875	2156	2912	580	LIMPOPO	APR. 1896		3
1819	25 1775 3656 F	SHASHI IRRIG.SCHEME	QF 3656	2205	2917	560	LIMPOPO	OCT. 1960		3
1820	25 1775 4383 W	MACHACHUTA	QF 4383	2151	2921	640	LIMPOPO	OCT. 1955	SEP. 1977	3
1821	25 1775 5492 B	LIEBIG'S RANCH,MPANDE	QF 5492	2146	2927	610	LIMPOPO	SEP. 1914	DEC. 1969	3
1822	25 1775 6088 Z	LIEBIG'S MPANDE H'STEAD	QF 6088	2148	2931	630	LIMPOPO	JAN. 1970	APR. 1982	3
1823	25 1775 6249 Z	SENTINEL RANCH	QF 6249	2209	2932	500	LIMPOPO	JAN. 1955		3
1824	25 1775 6773 T	MASERA	QF 6773	2201	2922	590	LIMPOPO	JAN. 1960	AUG. 1977	3
1825	25 1775 7194 B	KWALU IRRIG.SCHEME	QF 7194	2144	2937	580	LIMPOPO	MAY 1971	OCT. 1977	3
1826	25 1775 7985 L	LIEBIG'S RANCH,LANGA	QF 7985	2149	2943	530	LIMPOPO	AUG. 1913	SEP. 1977	3
1827	25 1775 9794 C	LIEBIG'S RANCH,MAZUNGA	QF 9794	2144	2952	600	LIMPOPO	SEP. 1911		3
1828	25 1776 0337 S	SENGAZANI STORE	QG 0337	2122	2857	760	LIMPOPO	JAN. 1933	JAN. 1979	4
1829	25 1776 0535 H	TULI ESTATE	QG 0535	2123	2859	770	LIMPOPO	OCT. 1951		4
1830	25 1776 0615 V	MANAMA MISSION	QG 0615	2133	2859	720	LIMPOPO	NOV. 1938		3
1831	25 1776 0658 R	GWARANYEMBA	QG 0658	2111	2859	880	LIMPOPO	FEB. 1960	SEP. 1970	4
1832	25 1776 0797 S	INSINDI	QG 0797	2049	2900	1040	LIMPOPO	DEC. 1930		4
1833	25 1776 0883 L	GWANDA,POLICE	QG 0883	2057	2900	990	LIMPOPO	JULY 1904		4
1834	25 1776 0984 W	GWANDA,RAIL	QG 0904	2057	2901	990	LIMPOPO	JAN. 1910		4
1835	25 1776 1004 E	GWANDA,HIGH SCHOOL	QG 1004	2056	2901	1000	LIMPOPO	DEC. 1903		4
1836	25 1776 2104 A	SOUTHILL	QG 2104	2055	2908	980	LIMPOPO	MAR. 1930		4
1837	25 1776 2803 K	SOUTHILL II	QG 2803	2057	2914	980	LIMPOPO	MAR. 1930	JUNE 1946	4
1838	25 1776 2903 G	MWALI EXPT.PLOT	QG 2903	2140	2913	710	LIMPOPO	DEC. 1953	FEB. 1972	3
1839	25 1776 3075 T	PAIGNTON	QG 3075	2101	2910	1010	LIMPOPO	JAN. 1935		5
1840	25 1776 3076 V	COLLEEN BAWN	QG 3076	2100	2913	940	LIMPOPO	MAR. 1950		5
1841	25 1776 3274 K	CLEVELAND BLOCK	QG 3274	2102	2914	890	LIMPOPO	DEC. 1947	JUNE 1965	5
1842	25 1776 3923 Q	SUKWE IRRIG.SCHEME	QG 3923	2120	2910	730	LIMPOPO	FEB. 1968	JAN. 1978	3
1843	25 1776 4571 V	WEST NICHOLSON	QG 4571	2103	2922	860	LIMPOPO	AUG. 1952		4
1844	25 1776 4667 B	WEST NICHOLSON RAIL	QG 4669	2104	2922	850	LIMPOPO	FEB. 1910	MAR. 1983	4
1845	25 1776 5808 P	ZEZANI SCHOOL	QG 5808	2136	2930	640	LIMPOPO	JUNE 1961		3

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
193	.. 1077 1713 P	NEWCASTLE	SN 9214	2040	3002	1070	LIMPOPO	MAR. 1930	JUNE 1979	7
1937	25 1077 2314 S	MWEMBE SCHOOL	TN 0215	2039	3008	1052	LIMPOPO	JULY 1950	JAN. 1981	6
1938	25 1975 2025 W	CHIKWARAKWARA	UL 0129	2220	3105	230	LIMPOPO	JUNE 1950		3
1939	25 1975 2020 T	GROOT VLEI	UL 0933	2218	3109	210	LIMPOPO	DEC. 1967	APR. 1976	3
1940	25 1975 2952 D	GEZANI	UL 1057	2205	3110	370	LIMPOPO	APR. 1974	FEB. 1976	4
1941	25 1975 3077 P	RANCH LOUIS	UL 1102	2152	3110	460	LIMPOPO	OCT. 1965	AUG. 1972	5
1942	25 1975 3443 M	MUKUPELA	UL 1447	2211	3112	370	LIMPOPO	MAR. 1974	JULY 1976	3
1943	25 1975 3631 R	DAVATA	UL 1836	2216	3114	200	LIMPOPO	OCT. 1901		3
1944	25 1975 3897 F	MALIKANGO	UM 1701	2141	3114	390	LIMPOPO	SEP. 1973	JUNE 1974	4
1945	25 1975 4092 S	MATIBE	UM 2000	2142	3115	390	LIMPOPO	JULY 1921	JUNE 1936	4
1946	25 1975 4187 W	MASUKWE DIP	UL 2192	2146	3116	420	LIMPOPO	NOV. 1981		4
1947	25 1975 4697 A	CHIKOMBEDZI	UM 2602	2140	3119	400	LIMPOPO	AUG. 1907		4
1948	25 1975 4797 J	CHIKOMBEDZI CLINIC	UM 2602	2141	3120	400	LIMPOPO	JAN. 1960	JULY 1976	3
1949	25 1975 4870 N	MAILELA	UL 2976	2155	3121	350	LIMPOPO	JUNE 1970	FEB. 1979	4
1950	25 1975 5293 Y	ZHOU SCHOOL	UL 3199	2142	3122	400	LIMPOPO	FEB. 1974	MAR. 1976	4
1951	25 1975 5434 B	DOMISA	UL 3640	2214	3124	220	LIMPOPO	JUNE 1970		3
1952	25 1975 5438 F	DUMISA MISSION	UL 3543	2213	3124	220	LIMPOPO	APR. 1957	FEB. 1967	3
1953	25 1975 5653 P	MALIPATI	UL 3759	2204	3125	240	LIMPOPO	JULY 1970		3
1954	25 1975 5930 Q	PALFREY	UL 4136	2217	3128	210	LIMPOPO	JULY 1949	MAR. 1973	3
1955	25 1975 5959 X	MALIPATI BRIDGE	UL 3864	2202	3127	270	LIMPOPO	OCT. 1960	JAN. 1976	3
1956	25 1975 6170 B	MABALA UTA	UL 4176	2155	3127	300	LIMPOPO	APR. 1974		4
1957	25 1975 6452 G	MALVERNIA	UL 6459	2203	3142	460	LIMPOPO	NOV. 1955	JAN. 1976	4
1958	25 1975 6453 H	SANGO	UL 6460	2202	3142	460	LIMPOPO	NOV. 1965	AUG. 1977	4
1959	25 1976 108 G	NUANETSI RANCH,MATIBI	TN 8013	2135	3052	500	LIMPOPO	NOV. 1975	DEC. 1979	3
1960	25 1976 222 F	NUANETSI RANCH,MBIZI	TN 8025	2120	3050	460	LIMPOPO	JUNE 1972		4
1961	25 1976 517 B	MWENEZI EXP.STATION	TN 8521	2130	3055	440	LIMPOPO	JULY 1973	AUG. 1978	4
1962	25 1976 1530 C	MBIZI,RAIL	TN 9334	2123	3101	480	LIMPOPO	OCT. 1950	MAR. 1976	4
1963	25 1976 2906 Y	EDENVALE RANCH	UM 0810	2136	3109	410	LIMPOPO	JUNE 1969	SEP. 1978	4
1964	25 1976 5304 E	MPAGATI	UM 3210	2137	3123	420	LIMPOPO	JULY 1907		4
1965	26 2280 5998 J	RUOKO RANCH	TR 5998	1711	3044	1540	MAZOWERUENYA	SEP. 1915	JUNE 1925	8
1966	26 2280 6296 H	UBRTA	TR 6296	1713	3045	1480	MAZOWERUENYA	JULY 1925	JUNE 1947	8
1967	26 2280 6375 T	HOWICK RIDGE	TR 6375	1724	3046	1370	MAZOWERUENYA	OCT. 1969		8
1968	26 2280 6392 M	MONTGOMERY	TR 6392	1715	3046	1330	MAZOWERUENYA	AUG. 1947		8
1969	26 2280 6398 T	THREE SISTERS FARM(THE)	TR 6398	1711	3046	1350	MAZOWERUENYA	OCT. 1969		8
1970	26 2280 6406 P	NYANDIRWI	TR 6406	1718	3047	1480	MAZOWERUENYA	OCT. 1969	JUNE 1984	8
1971	26 2280 6566 B	OUDE KRAAL	TR 6566	1729	3047	1450	MAZOWERUENYA	OCT. 1968	APR. 1975	8
1972	26 2280 6856 R	BEREA	TR 6856	1734	3048	1450	MAZOWERUENYA	NOV. 1926	DEC. 1936	8
1973	26 2280 6891 E	M'SORODINI FARM	TR 6891	1715	3049	1430	MAZOWERUENYA	NOV. 1927	DEC. 1939	8
1974	26 2280 6960 E	NETHERFIELD	TR 6960	1732	3049	1430	MAZOWERUENYA	OCT. 1953	JUNE 1967	8
1975	26 2280 6976 X	CRANHAM EXTENSION	TR 6976	1729	3049	1360	MAZOWERUENYA	OCT. 1968		8
1976	26 2280 6984 F	MOUNTAIN HOME(CONCESS.)	TR 6984	1719	3050	1510	MAZOWERUENYA	OCT. 1968		9
1977	26 2280 7191 F	ROAD CAMP KM 12	TR 7191	1716	3051	1300	MAZOWERUENYA	MAR. 1973	JULY 1979	9
1978	26 2280 7190 N	MACUNGIRI	TR 7190	1711	3052	1310	MAZOWERUENYA	FEB. 1970		9
1979	26 2280 7270 R	STANLEY KOP	TR 7270	1725	3048	1300	MAZOWERUENYA	DEC. 1913	JUNE 1938	8
1980	.. 2280 7291 P	TSATSI RIVER	TR 7291	1715	3051	1250	MAZOWERUENYA	JAN. 1966	JUNE 1979	9

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	N.A.R.
1891	25 1777 7217 Q	SCALEBY	QH 7217	2037	2936	1030	LIMPOPO	APR. 1926	MAR. 1930	5
1892	25 1777 7339 Y	GWATEMBA	QH 7338	2026	2937	1130	LIMPOPO	JULY 1953		5
1893	25 1777 8002 T	WANEZI BRIDGE	QH 8002	2046	2941	960	LIMPOPO	JAN. 1963	DEC. 1978	5
1894	25 1777 9423 N	BICKWELL	QH 9423	2033	2947	1050	LIMPOPO	JULY 1910	JUNE 1934	5
1895	25 1778 1603 H	GREENLANDS	QJ 1603	1952	2904	1410	LIMPOPO	OCT. 1963		6
1896	25 1778 3012 P	NSIZA HOTEL	QJ 3012	1947	3012	1400	LIMPOPO	JAN. 1910	APR. 1955	6
1897	25 1778 3504 Z	INSINOENI	QJ 3504	1951	2915	1370	LIMPOPO	JULY 1931	JUNE 1956	6
1898	25 1875 165 S	MAZUNGA HYDRO	RF 0165	2200	2955	495	LIMPOPO	FEB. 1986		3
1899	25 1875 462 Q	MTETENGWE	RF 0462	2201	2956	560	LIMPOPO	NOV. 1922	JUNE 1930	3
1900	25 1875 794 B	LIEBIG'S RANCH,MAKALALI	RF 0794	2144	2958	590	LIMPOPO	NOV. 1912	JUNE 1985	3
1901	25 1875 940 K	BEITBRIDGE	RF 0940	2213	3000	460	LIMPOPO	JAN. 1922		3
1902	25 1875 4451 B	NULI	TL 2452	2207	3005	610	LIMPOPO	MAR. 1972	JAN. 1976	3
1903	25 1875 6193 V	SWANSCOE	TL 4095	2143	3030	510	LIMPOPO	JULY 1951	JAN. 1967	3
1904	25 1875 6352 S	GOVINI	TL 4454	2207	3031	510	LIMPOPO	OCT. 1955	SEP. 1971	4
1905	25 1875 7901 N	BUBI	TL 5984	2150	3040	450	LIMPOPO	JULY 1921	JUNE 1936	3
1906	25 1875 8393 L	MATENGENYE	TL 6377	2144	3042	490	LIMPOPO	JULY 1929	MAR. 1936	4
1907	25 1875 9283 D	GONORWE PAN	UL 6289	2147	3140	480	LIMPOPO	JULY 1983		4
1908	25 1875 9496 K	MALUGWE PAN	UM 7303	2140	3145	400	LIMPOPO	JULY 1983		5
1909	25 1876 133 C	TONLA	RG 0133	2125	2954	740	LIMPOPO	DEC. 1947	MAY 1959	4
1910	25 1876 142 M	RIPPLE CREEK HYDRO	RG 0142	2118	2954	690	LIMPOPO	JAN. 1986		4
1911	25 1876 376 R	LIEBIG'S RANCH,SOVELELE	RG 0376	2100	2956	800	LIMPOPO	NOV. 1919		5
1912	25 1876 510 N	LIEBIG'S RANCH,NRANDAS	RG 0510	2131	2957	670	LIMPOPO	JULY 1916	FEB. 1977	4
1913	25 1876 584 S	SANDAWANA MINE	RG 0584	2055	2956	840	LIMPOPO	JULY 1982		5
1914	25 1876 693 L	CEGATO SECONDARY SCHOOL	RG 0693	2053	2957	850	LIMPOPO	MAR. 1957	OCT. 1970	5
1915	25 1876 1151 J	LIEBIG'S RANCH,MJINGWE	RG 1151	2114	2956	720	LIMPOPO	JULY 1951	AUG. 1983	4
1916	25 1876 1878 W	MUTUZUKWE MISSION	SM 9398	2046	3001	820	LIMPOPO	DEC. 1969	AUG. 1976	4
1917	25 1876 1951 D	MLELEZI	SM 9651	2113	3004	750	LIMPOPO	FEB. 1972	AUG. 1976	4
1918	25 1876 2097 M	MTUZUKWE	SM 9596	2049	3004	870	LIMPOPO	APR. 1932	JUNE 1940	6
1919	25 1876 2166 M	LIEBIG'S RANCH,MAKUGWE	SM 9867	2105	3006	790	LIMPOPO	JAN. 1975	FEB. 1984	4
1920	25 1876 2173 V	WEDZA SECTION	SN 9774	2101	3006	730	LIMPOPO	NOV. 1913	JUNE 1938	5
1921	25 1876 2982 Z	GWAVUMUTANGWI DAM	TM 0582	2054	3020	750	LIMPOPO	DEC. 1958	NOV. 1970	5
1922	25 1876 3001 V	LIEBIG'S RANCH,LANULAS	TM 0901	2140	3011	580	LIMPOPO	JULY 1912		3
1923	25 1876 3062 L	CHIRINDI BUS.CENTRE	TM 0762	2107	3011	720	LIMPOPO	MAY 1972		4
1924	25 1876 3292 L	MATAGA	TM 0893	2051	3011	760	LIMPOPO	JULY 1936	OCT. 1979	5
1925	25 1876 3605 N	MUSUME MISSION	TM 1287	2048	3007	740	LIMPOPO	JULY 1930	MAR. 1970	5
1926	25 1876 4017 Z	SANGOKWE	TM 1919	2130	3016	600	LIMPOPO	JULY 1930	JUNE 1936	4
1927	25 1876 4140 H	LIEBIG'S RANCH,MTLENDE	TM 1941	2119	3017	660	LIMPOPO	NOV. 1918		4
1928	25 1876 4459 E	MSAWI	TM 2160	2110	3020	630	LIMPOPO	OCT. 1965	JULY 1976	4
1929	25 1876 4558 M	MARANDA	TM 2159	2109	3019	620	LIMPOPO	SEP. 1981		4
1930	25 1876 6152 V	GANDAMA DIP	TM 3854	2127	3029	590	LIMPOPO	MAY 1972	MAY 1977	4
1931	25 1876 7265 E	MUSHAVA	TM 4960	2104	3035	620	LIMPOPO	NOV. 1950		5
1932	25 1876 7800 L	NUANETSI RANCH,BUBI	TM 5703	2140	3039	520	LIMPOPO	JUNE 1972	FEB. 1978	3
1933	25 1876 0727 T	MWENEZI D.A.	TM 6430	2125	3043	490	LIMPOPO	JULY 1926		4
1934	25 1876 9318 L	NUANETSI RANCH,H.Q.	TM 7221	2131	3047	460	LIMPOPO	APR. 1916		4
1935	25 1877 1401 A	CHOMKOTO	SN 9001	2046	3001	850	LIMPOPO	SEP. 1957	JUNE 1979	6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2026	26 2280 9633 K	HARARE,TR.SC.RAR.CAMP	TR 9633	1747	3104	1530	MAZOWERUENYA	JULY 1947	FEB. 1954	0
2027	26 2280 9735 W	HARARE,GARWAY	TR 9735	1746	3107	1520	MAZOWERUENYA	JAN. 1923		0
2028	26 2280 9770 S	MAZOE,CLIFTON	TR 9770	1723	3105	1140	MAZOWERUENYA	OCT. 1969		0
2029	26 2280 9781 W	VIRGINIA(GLENDALE)	TR 9781	1722	3106	1180	MAZOWERUENYA	OCT. 1911		0
2030	26 2280 9792 H	BALLY HOOLY	TR 9792	1715	3105	1130	MAZOWERUENYA	MAY 1970	MAR. 1974	0
2031	26 2280 9799 Q	ST.ALBAN'S MISSION	TR 9799	1711	3105	1220	MAZOWERUENYA	FEB. 1935	JUNE 1941	0
2032	26 2280 9835 E	HARARE,RUSTON	TR 9835	1747	3105	1520	MAZOWERUENYA	SEP. 1953		0
2033	26 2280 9836 F	HARARE,BORROWDALE	TR 9836	1747	3105	1520	MAZOWERUENYA	JULY 1904	DEC. 1910	0
2034	26 2280 9842 M	HATCLIFFE ESTATE	TR 9842	1742	3106	1570	MAZOWERUENYA	JAN. 1916		0
2035	26 2280 9871 T	VOLYNIA	TR 9871	1726	3105	1370	MAZOWERUENYA	OCT. 1915	JUNE 1930	?
2036	26 2280 9932 K	HARARE,COLNE VALLEY	TR 9932	1748	3107	1520	MAZOWERUENYA	JULY 1940	JUNE 1976	8
2037	26 2280 9939 S	HARARE,PRESTWOOD	TR 9939	1745	3106	1520	MAZOWERUENYA	SEP. 1946	AUG. 1953	0
2038	26 2281 6202 A	O'HEATH	TS 6202	1709	3045	1570	MAZOWERUENYA	JULY 1912	APR. 1949	0
2039	26 2281 6806 G	DANDIJENA	TS 6806	1708	3049	1520	MAZOWERUENYA	OCT. 1924	JUNE 1938	0
2040	26 2281 7006 Z	BUCKHURST	TS 7006	1707	3050	1520	MAZOWERUENYA	OCT. 1937		0
2041	26 2281 7404 G	MSONNEDDI ESTATE	TS 7404	1700	3053	1480	MAZOWERUENYA	OCT. 1969		?
2042	26 2281 7602 X	RUIA M'SONNEDDI	TS 7602	1708	3053	1430	MAZOWERUENYA	JULY 1913	JUNE 1956	?
2043	26 2281 7609 E	MANDINDINDA	TS 7609	1706	3055	1450	MAZOWERUENYA	DEC. 1930	APR. 1936	?
2044	26 2281 7911 H	VIGILA	TS 7911	1704	3056	1420	MAZOWERUENYA	OCT. 1969		?
2045	26 2281 8202 Z	VISA	TS 8202	1709	3056	1300	MAZOWERUENYA	OCT. 1925	JUNE 1930	?
2046	26 2281 8203 A	PETRA FARM	TS 8203	1700	3057	1280	MAZOWERUENYA	OCT. 1969	AUG. 1981	?
2047	26 2281 8611 T	FORRESTER ESTATE,J SECT.	TS 8611	1705	3059	1310	MAZOWERUENYA	OCT. 1922		?
2048	26 2281 8627 L	SARIMBA	TS 8627	1656	3100	1400	MAZOWERUENYA	JULY 1927		?
2049	26 2281 9204 N	ROSA	TS 9204	1700	3103	1230	MAZOWERUENYA	JUNE 1954		0
2050	26 2281 9214 Z	RUSENZA STORE	TS 9214	1703	3103	1290	MAZOWERUENYA	DEC. 1930	JUNE 1949	?
2051	26 2281 9949 Y	MUZARABANI POLICE	TS 9949	1644	3107	1210	MAZOWERUENYA	JUNE 1967	OCT. 1976	7
2052	26 2379 4494 L	PROGRESS	UQ 4494	1801	3131	1600	MAZOWERUENYA	OCT. 1903	DEC. 1909	0
20[illegible]	26 2379 4608 X	MARONDERA POLICE	UQ 4608	1811	3133	1660	MAZOWERUENYA	JULY 1900		0
2054	26 2379 4609 Y	MARONDERA RAIL	UQ 4609	1811	3133	1660	MAZOWERUENYA	JULY 1910		0
2055	26 2379 4709 G	MARONDERA FNS' CO-OP.	UQ 4709	1811	3133	1640	MAZOWERUENYA	NOV. 1953	MAR. 1981	0
2056	26 2379 5597 K	SABLE RANGE	UQ 5597	1808	3138	1620	MAZOWERUENYA	MAY 1929	JUNE 1938	0
2057	26 2379 5790 D	BERNARD MIZEKI COLLEGE	UQ 5790	1806	3139	1580	MAZOWERUENYA	NOV. 1982		0
2058	26 2379 6191 F	THEYDON	UQ 6191	1810	3141	1610	MAZOWERUENYA	NOV. 1914	MAY 1922	0
2059	26 2379 6397 E	DUNSAPPIE	UQ 6397	1808	3143	1580	MAZOWERUENYA	JULY 1938	SEP. 1980	?
2060	26 2379 9587 X	EAGLE'S NEST	UQ 9587	1813	3200	1600	MAZOWERUENYA	JULY 1908	SEP. 1958	0
2061	26 2380 40 P	HARARE,WINCHENDON	UR 0040	1743	3107	1540	MAZOWERUENYA	NOV. 1963		0
2062	26 2380 77 E	VIRGINIA ESTATE	UR 0077	1724	3108	1190	MAZOWERUENYA	OCT. 1924	JAN. 1931	0
2063	26 2380 133 Q	HARARE,CHISIPITE SCH.	UR 0133	1747	3107	1530	MAZOWERUENYA	APR. 1900		0
2064	26 2380 139 X	HARARE,QUINNINGTON	UR 0139	1744	3108	1400	MAZOWERUENYA	JAN. 1973	SEP. 1980	0
2065	26 2380 173 J	USK	UR 0173	1725	3108	1200	MAZOWERUENYA	NOV. 1920	FEB. 1981	0
2066	26 2380 232 Y	HARARE,MANDARA	UR 0232	1740	3108	1530	MAZOWERUENYA	NOV. 1903		0
2067	26 2380 234 A	HARARE,THE GRANGE	UR 0234	1746	3108	1490	MAZOWERUENYA	JULY 1904		0
2068	26 2380 236 C	HARARE,KAMBANJI	UR 0236	1745	3108	1460	MAZOWERUENYA	FEB. 1979	JUNE 1983	0
2069	26 2380 253 H	DUNBOSHAWA	UR 0253	1737	3109	1550	MAZOWERUENYA	FEB. 1922		0
2070	26 2380 330 E	HARARE,GREENDALE EAST	UR 0330	1750	3109	1560	MAZOWERUENYA	AUG. 1966	DEC. 1982	0

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
1981	26 2280 7452 P	ESTES PARK	TR 7452	1735	3053	1420	MAZOWERUENYA	DEC. 1945	JAN. 1984	0
1982	26 2280 7462 A	EVINGAR	TR 7462	1731	3052	1340	MAZOWERUENYA	MAR. 1980	APR. 1981	0
1983	26 2280 7468 G	RIVERSDALE ESTATE	TR 7468	1728	3056	1280	MAZOWERUENYA	OCT. 1924	MAR. 1976	0
1984	26 2280 7571 T	ROTHBURY FARM	TR 7571	1726	3053	1250	MAZOWERUENYA	JUNE 1971		0
1985	26 2280 7575 Y	RADDON FARM	TR 7575	1724	3054	1270	MAZOWERUENYA	OCT. 1969	JUNE 1980	0
1986	26 2280 7576 Z	SOUTHMOUR	TR 7576	1723	3053	1260	MAZOWERUENYA	JAN. 1926	APR. 1932	0
1987	26 2280 7579 C	SUNNYSIDE	TR 7579	1722	3053	1310	MAZOWERUENYA	JAN. 1912		9
1988	26 2280 7660 Q	BELLEVUE	TR 7660	1732	3053	1360	MAZOWERUENYA	JULY 1951	JUNE 1971	0
1989	26 2280 7693 B	GEM(THE)	TR 7693	1715	3054	1220	MAZOWERUENYA	JULY 1942		9
1990	26 2280 7771 L	NDELICOT/RIVERSIDE	TR 7771	1726	3054	1280	MAZOWERUENYA	OCT. 1924	JUNE 1931	0
1991	26 2280 7863 L	ASCOT VALE	TR 7863	1731	3054	1200	MAZOWERUENYA	OCT. 1971	FEB. 1980	0
1992	26 2280 7967 Z	JUMBO MINE	TR 7967	1729	3055	1330	MAZOWERUENYA	NOV. 1970		0
1993	26 2280 7999 J	MAORI RANCH	TR 7999	1711	3055	1370	MAZOWERUENYA	JULY 1931	MAY 1953	9
1994	26 2280 8155 D	MAKALANGA	TR 8155	1735	3056	1370	MAZOWERUENYA	MAY 1946	APR. 1981	0
1995	26 2280 8250 G	PEARSON SETTLEMENT	TR 8250	1737	3056	1350	MAZOWERUENYA	SEP. 1922		0
1996	26 2280 0276 K	CONCESSION,RAIL	TR 8276	1724	3057	1280	MAZOWERUENYA	DEC. 1917		9
1997	26 2280 8278 M	CONCESSION,SCHOOL	TR 8278	1722	3057	1260	MAZOWERUENYA	MAR. 1957	JUNE 1971	9
1998	26 2280 0298 J	RUFARO	TR 8298	1711	3057	1200	MAZOWERUENYA	OCT. 1969		9
1999	26 2280 0378 W	CONCESSION,AGRIC	TR 8378	1722	3057	1290	MAZOWERUENYA	JAN. 1932		0
2000	26 2280 8445 T	BENDAUCH	TR 8445	1741	3058	1490	MAZOWERUENYA	JAN. 1929	APR. 1940	9
2001	26 2280 8454 D	HENDERSON,LYSIMETER	TR 8454	1735	3058	1310	MAZOWERUENYA	OCT. 1957	JUNE 1965	0
2002	26 2280 8455 E	HENDERSON	TR 8455	1735	3058	1290	MAZOWERUENYA	JULY 1921		0
2003	26 2280 8548 F	MGUTU VALLEY	TR 8548	1739	3058	1410	MAZOWERUENYA	JULY 1913		0
2004	26 2280 8563 X	MAZOWE,POLICE	TR 8563	1731	3058	1250	MAZOWERUENYA	MAY 1907		0
2005	26 2280 8656 Y	HENDERSON,FISHERIES	TR 8656	1734	3059	1260	MAZOWERUENYA	JAN. 1960	JULY 1970	0
2006	26 2280 8668 L	MAZOE,YARROWDALE II	TR 8668	1728	3059	1220	MAZOWERUENYA	OCT. 1969		9
2007	26 2280 8680 Z	WITCHWEED DEM.FARM	TR 8681	1720	3058	1190	MAZOWERUENYA	JULY 1939	JUNE 1946	9
2008	26 2280 8681 A	RIDUNA/AUCHENDINNY/TEIGN	TR 8681	1720	3058	1190	MAZOWERUENYA	JULY 1911	JUNE 1972	0
2009	26 2280 8745 V	GLENARA ESTATE	TR 8745	1740	3059	1500	MAZOWERUENYA	JAN. 1914		0
2010	26 2280 8762 N	MAZOE,DAM	TR 8762	1731	3059	1200	MAZOWERUENYA	JULY 1918		9
2011	26 2280 8794 Y	HOWARD INSTITUTE	TR 8794	1714	3059	1200	MAZOWERUENYA	MAY 1926	OCT. 1984	0
2012	26 2280 8851 K	CHRISTON BANK	TR 8851	1737	3100	1430	MAZOWERUENYA	JULY 1980		0
2013	26 2280 8881 S	KILDRUM	TR 8881	1721	3100	1160	MAZOWERUENYA	JAN. 1928		0
2014	26 2280 8904 E	CRAIGENGOWER	TR 8904	1719	3101	1160	MAZOWERUENYA	DEC. 1917		0
2015	26 2280 9004 N	KILMER	TR 9004	1719	3102	1140	MAZOWERUENYA	JULY 1914	JUNE 1931	0
2016	26 2280 9166 C	MAZOE,GLENBERVIE	TR 9166	1729	3102	1250	MAZOWERUENYA	OCT. 1969		9
2017	26 2280 9171 H	MAZOE,CITRUS ESTATE	TR 9171	1720	3101	1160	MAZOWERUENYA	OCT. 1915		9
2018	26 2280 9174 L	MAZOE,LAURENCEDALE	TR 9174	1725	3102	1200	MAZOWERUENYA	OCT. 1969		9
2019	26 2280 9191 E	MWENJI DAM	TR 9191	1717	3103	1140	MAZOWERUENYA	JAN. 1969		0
2020	26 2280 9246 P	CALGARY	TR 9246	1740	3103	1430	MAZOWERUENYA	OCT. 1925		0
2021	26 2280 9249 S	LONDALE	TR 9249	1730	3102	1330	MAZOWERUENYA	MAY 1911	JUNE 1936	0
2022	26 2280 9361 P	MAZOWE,SURTIC	TR 9361	1732	3103	1420	MAZOWERUENYA	OCT. 1969	JAN. 1979	9
2023	26 2280 9400 T	GLENDALE RAIL	TR 9400	1721	3103	1170	MAZOWERUENYA	OCT. 1917		0
2024	26 2280 9405 Z	GLENGREY	TR 9405	1720	3103	1140	MAZOWERUENYA	FEB. 1923		0
2025	26 2280 9591 P	MURIPHUMBA	TR 9591	1716	3104	1160	MAZOWERUENYA	JULY 1921	JUNE 1947	0

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2071	26 2380 335 K	HARARE,GLENLORNE	UR 0335	1746	3108	1510	MAZOWERUENYA	JULY 1951	DEC. 1971	8
2072	26 2380 384 N	AVONDUUR	UR 0384	1720	3109	1110	MAZOWERUENYA	JULY 1912		8
2073	26 2380 439 Y	HARARE,BUDLEIGH PARK	UR 0439	1743	3109	1510	MAZOWERUENYA	OCT. 1962	MAR. 1969	8
2074	26 2380 597 V	DUNMAGLAS	UR 0597	1713	3110	1120	MAZOWERUENYA	JULY 1912	JUNE 1935	8
2075	26 2380 638 P	HARARE,GREY LICHEN	UR 0638	1744	3111	1480	MAZOWERUENYA	OCT. 1971		8
2076	26 2380 680 K	GLENDIVIS	UR 0680	1722	3110	1190	MAZOWERUENYA	OCT. 1922		8
2077	26 2380 742 C	OAKLEY	UR 0742	1742	3111	1460	MAZOWERUENYA	OCT. 1970		8
2078	26 2380 834 C	PANGULA	UR 0834	1747	3112	1510	MAZOWERUENYA	SEP. 1927	JAN. 1935	8
2079	26 2380 939 R	WESTWARD HO!(HARARE)	UR 0939	1743	3112	1400	MAZOWERUENYA	FEB. 1941	SEP. 1954	8
2080	26 2380 1030 Q	SILVEIRA HOUSE	UR 1030	1749	3127	1590	MAZOWERUENYA	SEP. 1966		8
2081	26 2380 1046 H	RATTRAY ARNOLD RES.STN.	UR 1046	1740	3113	1370	MAZOWERUENYA	DEC. 1980		8
2082	26 2380 1232 K	CHISHAWASHA MISSION	UR 1232	1747	3114	1440	MAZOWERUENYA	OCT. 1900		9
2083	26 2380 1241 V	SPRINGS(HARARE)	UR 1241	1743	3113	1330	MAZOWERUENYA	JULY 1921	JUNE 1951	8
2084	26 2380 1245 Z	MUKWENE	UR 1245	1740	3114	1370	MAZOWERUENYA	DEC. 1924		9
2085	26 2380 1542 X	GROVE(THE)	UR 1542	1742	3115	1340	MAZOWERUENYA	JULY 1921		9
2086	26 2380 1562 T	MAKUMBI MISSION	UR 1562	1732	3115	1220	MAZOWERUENYA	FEB. 1939		10
2087	26 2380 1595 E	MALVERN	UR 1595	1713	3116	1340	MAZOWERUENYA	JULY 1921	OCT. 1942	7
2088	26 2380 1736 H	VALLEY(THE)	UR 1736	1745	3116	1400	MAZOWERUENYA	OCT. 1977		9
2089	26 2380 1793 V	RIVER VIEW	UR 1793	1715	3116	1040	MAZOWERUENYA	NOV. 1942		7
2090	26 2380 1838 T	KILMUIR	UR 1838	1744	3117	1300	MAZOWERUENYA	JULY 1921	JUNE 1956	9
2091	26 2380 1883 S	TROJAN MINE	UR 1883	1720	3118	1090	MAZOWERUENYA	NOV. 1960		7
2092	26 2380 2084 L	PHOENIX PRINCE	UR 2084	1719	3119	1100	MAZOWERUENYA	OCT. 1929		7
2093	26 2380 2176 L	MANHENGA	UR 2176	1724	3118	1130	MAZOWERUENYA	JULY 1954		9
2094	26 2380 2183 T	BURNSIDE	UR 2183	1721	3119	1130	MAZOWERUENYA	DEC. 1945	AUG. 1979	7
2095	26 2380 2232 X	ARCTURUS P.O.	UR 2232	1747	3119	1390	MAZOWERUENYA	NOV. 1953		10
2096	26 2380 2234 Z	ARCTURUS MINE	UR 2234	1747	3119	1380	MAZOWERUENYA	OCT. 1980		10
2097	26 2380 2285 E	BINDURA,RAIL	UR 2285	1718	3119	1100	MAZOWERUENYA	OCT. 1913		8
2098	26 2380 2287 G	BINDURA MET.	UR 2287	1719	3120	1090	MAZOWERUENYA	OCT. 1912	JUNE 1961	8
2099	26 2380 2343 S	EWANRIGG	UR 2343	1742	3120	1300	MAZOWERUENYA	NOV. 1914		9
2100	26 2380 2381 J	KINGSTON	UR 2381	1721	3120	1070	MAZOWERUENYA	SEP. 1957	FEB. 1982	8
2101	26 2380 2385 N	BINDURA,RURAL COUNCIL	UR 2385	1718	3119	1100	MAZOWERUENYA	NOV. 1951		8
2102	26 2380 2393 X	CLAVERHILL FARM	UR 2393	1715	3120	1020	MAZOWERUENYA	OCT. 1912	FEB. 1967	7
2103	26 2380 2395 Z	MARSTON	UR 2395	1714	3120	1020	MAZOWERUENYA	NOV. 1920	JUNE 1940	7
2104	26 2380 2433 Q	GUERNSEY	UR 2433	1747	3122	1340	MAZOWERUENYA	FEB. 1942	MAR. 1950	10
2105	26 2380 2441 Z	MEADOWS(ARCTURUS)	UR 2441	1743	3120	1230	MAZOWERUENYA	JULY 1911	JAN. 1947	9
2106	26 2380 2483 V	ATHERSTONE	UR 2483	1721	3121	1070	MAZOWERUENYA	OCT. 1922	SEP. 1977	7
2107	26 2380 2516 F	HIGH TAMARIND	UR 2516	1756	3121	1530	MAZOWERUENYA	OCT. 1905		9
2108	26 2380 2759 V	MASANA	UR 2759	1733	3125	1340	MAZOWERUENYA	NOV. 1954		9
2109	26 2380 2825 R	GOROMONZI,POLICE	UR 2825	1751	3122	1460	MAZOWERUENYA	MAY 1911		10
2110	26 2380 2826 S	GOROMONZI	UR 2826	1751	3122	1460	MAZOWERUENYA	OCT. 1951		10
2111	26 2380 2836 D	ALDERLEY FARM	UR 2836	1745	3122	1290	MAZOWERUENYA	JUNE 1914	FEB. 1984	10
2112	26 2380 2934 K	LOCHEIM FARM	UR 2934	1747	3123	1330	MAZOWERUENYA	JULY 1983		10
2113	26 2380 2936 M	AYLMERSFIELD	UR 2936	1746	3123	1310	MAZOWERUENYA	NOV. 1943	DEC. 1977	10
2114	26 2380 2940 A	BALLY VAUGHAN	UR 2940	1740	3123	1450	MAZOWERUENYA	NOV. 1927	FEB. 1933	8
2115	26 2380 3011 T	SIERRA QUINTA	UR 3011	1759	3124	1490	MAZOWERUENYA	JAN. 1972	DEC. 1976	9

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2116	26 2380 33[illegible] H	HILLSIDE(BROMLEY)	UR 3304	1802	3125	1540	MAZOWERUENYA	OCT. 1915	JUNE 1946	9
2117	26 2380 3425 T	NORA	UR 3425	1752	3126	1500	MAZOWERUENYA	JULY 1928	JUNE 1932	9
2118	26 2380 3522 Z	GUROHONZI ESTATE	UR 3522	1753	3126	1370	MAZOWERUENYA	JULY 1932	DEC. 1973	9
2119	26 2380 3612 X	DATATA	UR 3612	1758	3128	1460	MAZOWERUENYA	OCT. 1926	MAY 1940	9
2120	26 2380 3803 E	LIEMBA	UR 3803	1804	3128	1550	MAZOWERUENYA	JAN. 1930		0
2121	26 2380 3940 D	MAFFUMO	UR 3940	1743	3128	1230	MAZOWERUENYA	NOV. 1954	SEP. 1977	0
2122	26 2380 3946 K	JURU	UR 3946	1739	3129	1230	MAZOWERUENYA	OCT. 1954	MAR. 1982	0
2123	26 2380 3961 B	LION'S HEAD(HYDRO.)	UR 3961	1731	3129	1200	MAZOWERUENYA	DEC. 1952	OCT. 1970	0
2124	26 2380 3972 N	WOODLANDS(SHAMVA)	UR 3972	1724	3128	1070	MAZOWERUENYA	APR. 1920	DEC. 1932	0
2125	26 2380 4083 J	USARAMO	UR 4083	1720	3129	970	MAZOWERUENYA	DEC. 1947	JUNE 1971	0
2126	26 2380 4172 F	CERES	UR 4172	1725	3130	1100	MAZOWERUENYA	JAN. 1914		8
21[illegible]	[illegible] 2380 4206 S	RASTENBURG	UR 4206	1803	3132	1480	MAZOWERUENYA	OCT. 1922	NOV. 1928	8
2128	[illegible] 2380 4216 D	MGARGWE	UR 4216	1757	3132	1540	MAZOWERUENYA	DEC. 1930	SEP. 1952	0
2129	26 2380 4266 H	CHIKWAKA	UR 4266	1730	3227	1208	MAZOWERUENYA	JAN. 1988		8
2130	26 2380 4323 V	KUNZWI	UR 4323	1751	3131	1330	MAZOWERUENYA	NOV. 1954	OCT. 1970	9
2131	26 2380 4449 G	INYAGUI HYDRO	UR 4449	1730	3132	1190	MAZOWERUENYA	FEB. 1952	OCT. 1970	0
2132	26 2380 4665 R	BOSHA CHIKWAKA	UR 4665	1730	3133	1160	MAZOWERUENYA	FEB. 1975	APR. 1978	0
2133	26 2380 4775 L	ZOMBI	UR 4775	1724	3134	1220	MAZOWERUENYA	NOV. 1920	JAN. 1935	0
2134	26 2380 4785 X	SHAMVA,RAIL	UR 4785	1719	3134	950	MAZOWERUENYA	OCT. 1960	AUG. 1977	0
2135	26 2380 4787 Z	SHAMVA,D.A.	UR 4787	1718	3133	970	MAZOWERUENYA	NOV. 1910		0
2136	26 2380 4885 F	SHAMVA MINE	UR 4885	1719	3134	980	MAZOWERUENYA	JULY 1910	JUNE 1930	7
2137	26 2380 4937 M	ST.PAUL'S MISSION	UR 4937	1745	3135	1330	MAZOWERUENYA	NOV. 1930		9
2138	26 2380 5016 Y	MIDDLESEX	UR 5016	1756	3134	1400	MAZOWERUENYA	NOV. 1937		0
2139	26 2380 5179 A	MAIENZI	UR 5179	1723	3136	1220	MAZOWERUENYA	SEP. 1922	JUNE 1973	0
2140	26 2380 5390 E	SHAMVA,PANMURE	UR 5390	1716	3137	0080	MAZOWERUENYA	NOV. 1967		7
2141	26 2380 5503 C	BEMBA	UR 5503	1803	3138	1560	MAZOWERUENYA	JULY 1931	JUNE 1966	0
2142	26 2380 5506 F	DORSET	UR 5506	1802	3138	1520	MAZOWERUENYA	OCT. 1945	JUNE 1950	0
2143	26 2380 6065 N	DANDARA	UR 6065	1730	3141	1160	MAZOWERUENYA	FEB. 1976		8
2144	26 2380 6093 T	CHIPOLI	UR 6093	1715	3141	920	MAZOWERUENYA	JULY 1912	NOV. 1978	7
2145	26 2380 6209 V	DORNERVALE	UR 6209	1801	3142	1400	MAZOWERUENYA	JAN. 1970		8
2146	26 2380 6216 C	RUPTURE	UR 6216	1756	3141	1300	MAZOWERUENYA	JULY 1926	JUNE 1986	8
2147	26 2380 6404 G	BEATON	UR 6404	1804	3142	1440	MAZOWERUENYA	OCT. 1930	SEP. 1952	0
2148	26 2380 6598 S	CHITENGU	UR 6598	1712	3144	720	MAZOWERUENYA	DEC. 1987		7
2149	26 2380 6634 G	KADZERE	UR 6634	1747	3144	1450	MAZOWERUENYA	FEB. 1976	OCT. 1978	8
2150	26 2380 6700 D	GLENISLA	UR 6700	1805	3145	1520	MAZOWERUENYA	JULY 1940		8
2151	26 2380 7048 G	MUREWA AGRIC	UR 7048	1739	3147	1380	MAZOWERUENYA	MAY 1904		8
2152	26 2380 7171 Q	CHITIMBE	UR 7171	1727	3147	1140	MAZOWERUENYA	MAY 1976	JULY 1978	0
2153	26 2380 7240 Z	MUREWA PRISON	UR 7240	1739	3147	1380	MAZOWERUENYA	JULY 1986		0
2154	26 2380 7269 X	MUREWA C.B.S.	UR 7269	1728	3148	1200	MAZOWERUENYA	DEC. 1950	JUNE 1964	0
2155	26 2380 7590 W	MASHAMBANAKA	UR 7590	1716	3149	1100	MAZOWERUENYA	JUNE 1976		7
2156	26 2380 7613 W	CRAIGIE LEA	UR 7613	1759	3149	1440	MAZOWERUENYA	JAN. 1946	AUG. 1967	0
2157	26 2380 7800 Z	FAULT FARM	UR 7800	1805	3151	1500	MAZOWERUENYA	NOV. 1922	APR. 1928	0
2158	26 2380 7916 A	MARYLAND ESTATE	UR 7916	1757	3151	1450	MAZOWERUENYA	JULY 1926		0
2159	26 2380 8021 P	FAIRVIEW FARM	UR 8021	1753	3153	1030	MAZOWERUENYA	JULY 1945		0
2160	26 2380 8062 J	CHITOWA NO.1 SCHOOL	UR 8062	1732	3152	1130	MAZOWERUENYA	FEB. 1969		6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2161	26 2300 0226 M	GLEN SOMERSET	UR 8226	1751	3154	1420	MAZOWERUENYA	DEC. 1912	JUNE 1926	0
2162	26 2300 8280 H	MANYIKA	UR 8280	1721	3152	1130	MAZOWERUENYA	FEB. 1953	SEP. 1970	7
2163	26 2300 8333 D	EXETER	UR 8333	1748	3154	1360	MAZOWERUENYA	DEC. 1947		9
2164	26 2300 8739 V	CHIGURI	UR 8739	1745	3157	1310	MAZOWERUENYA	DEC. 1952	OCT. 1978	8
2165	26 2300 9056 P	MGWALAATI	UR 9056	1735	3158	1170	MAZOWERUENYA	SEP. 1946	JULY 1982	7
2166	26 2300 9317 Y	MEDLAR	UR 9317	1755	3158	1260	MAZOWERUENYA	MAR. 1946	DEC. 1954	0
2167	26 2300 9631 P	GUMBANJERA SCHOOL	UR 9631	1749	3201	1310	MAZOWERUENYA	MAR. 1972		8
2168	26 2300 9674 L	NYADERI MISSION	UR 9674	1725	3202	1020	MAZOWERUENYA	OCT. 1924	NOV. 1970	6
2169	26 2300 9719 K	TWIST FARM	UR 9719	1755	3202	1230	MAZOWERUENYA	JULY 1948	JUNE 1964	8
2170	26 2300 9862 Q	ROCHESTER	UR 9862	1733	3202	1070	MAZOWERUENYA	OCT. 1940	NOV. 1950	7
2171	26 2300 9916 Z	LAMJUNG KOURNINE	UR 9916	1756	3203	1200	MAZOWERUENYA	DEC. 1967	APR. 1981	0
2172	26 2301 31 Z	BARE	US 0031	1654	3108	1230	MAZOWERUENYA	JULY 1954		8
2173	26 2301 50 V	CENTENARY D.A.	US 0050	1644	3107	1220	MAZOWERUENYA	NOV. 1975		7
2174	26 2301 246 H	KENNITH	US 0246	1649	3109	1130	MAZOWERUENYA	DEC. 1953	JUNE 1979	0
2175	26 2301 251 N	EUREKA	US 0251	1642	3110	1200	MAZOWERUENYA	NOV. 1953	SEP. 1983	7
2176	26 2301 557 W	CLOUDY RIVER	US 0557	1640	3110	1180	MAZOWERUENYA	JULY 1954	JUNE 1970	7
2177	26 2301 659 G	KOORDORA	US 0659	1639	3111	1200	MAZOWERUENYA	OCT. 1970		7
2178	26 2301 874 Q	VIEWFIELD FARM	US 0874	1630	3112	1220	MAZOWERUENYA	OCT. 1969		7
2179	26 2301 903 X	CHELVEY	US 0903	1710	3112	1300	MAZOWERUENYA	JAN. 1938		0
2180	26 2301 1013 R	LAGNAHA	US 1013	1704	3112	1210	MAZOWERUENYA	OCT. 1912	JUNE 1919	0
2181	26 2301 1018 X	HINTON	US 1018	1701	3114	1180	MAZOWERUENYA	OCT. 1924	JUNE 1931	0
2182	26 2301 1106 S	DUNDRY(MAZOWE)	US 1106	1707	3112	1220	MAZOWERUENYA	JULY 1919	MAR. 1926	0
2183	26 2301 1126 P	CHUMBERE	US 1126	1656	3113	1120	MAZOWERUENYA	NOV. 1932		0
2184	26 2301 1229 B	LILSTOCK	US 1229	1655	3115	1140	MAZOWERUENYA	MAY 1949		8
2185	26 2301 1315 V	ARGYLE PARK	US 1315	1703	3114	1300	MAZOWERUENYA	OCT. 1924		0
2186	26 2301 1402 P	BENRIDGE	US 1402	1710	3115	1100	MAZOWERUENYA	JULY 1919	MAY 1936	0
2187	26 2301 1740 G	CHIPA	US 1740	1649	3117	1000	MAZOWERUENYA	JUNE 1903		7
2188	26 2301 1748 Q	VENTURE	US 1748	1645	3117	1050	MAZOWERUENYA	OCT. 1970		7
2189	26 2301 1778 Y	ST.ALBERT'S MISSION	US 1778	1628	3118	1230	MAZOWERUENYA	OCT. 1962		7
2190	26 2301 1833 H	RUIA FALLS	US 1833	1653	3117	1080	MAZOWERUENYA	JULY 1930	JUNE 1941	0
2191	26 2301 1879 H	KANDEYA WEST	US 1879	1629	3118	1300	MAZOWERUENYA	OCT. 1954	FEB. 1973	7
2192	26 2301 1943 C	RUIA RANCH 1	US 1943	1649	3117	1060	MAZOWERUENYA	OCT. 1924	JAN. 1939	7
2193	26 2301 2351 W	CHIBULI	US 2351	1644	3118	1060	MAZOWERUENYA	DEC. 1955	JUNE 1968	7
2194	26 2301 2353 Y	BRETTEN	US 2353	1642	3120	1070	MAZOWERUENYA	NOV. 1968		7
2195	26 2301 2402 B	KINGHAMDALE	US 2402	1710	3121	1130	MAZOWERUENYA	MAY 1954	JUNE 1966	0
2196	26 2301 2565 D	CASA MIA	US 2565	1635	3122	1160	MAZOWERUENYA	JULY 1975	SEP. 1985	7
2197	26 2301 2757 M	DOLPHIN PARK	US 2757	1640	3122	1070	MAZOWERUENYA	JULY 1984		7
2198	26 2301 2913 G	MUPFURUDZI	US 2913	1704	3124	1100	MAZOWERUENYA	OCT. 1975		8
2199	26 2301 2942 N	RUIA RANCH II	US 2942	1640	3124	1040	MAZOWERUENYA	SEP.. 1937		7
2200	26 2301 3214 J	KASINGGWI	US 3214	1703	3124	1100	MAZOWERUENYA	OCT. 1954	SEP. 1974	8
2201	26 2301 3618 Y	BRADLEY INSTITUTE	US 3618	1701	3127	1210	MAZOWERUENYA	DEC. 1929	FEB. 1977	0
2202	26 2301 3622 C	MADZIWA BASE CAMP	US 3622	1659	3129	1130	MAZOWERUENYA	NOV. 1975		7
2203	26 2301 3709 X	SHASHI ESTATE	US 3709	1706	3128	1020	MAZOWERUENYA	OCT. 1939	MAY 1978	8
2204	26 2301 3861 N	RIDGELANDS	US 3861	1638	3129	1020	MAZOWERUENYA	JAN. 1970	JUNE 1983	7
2205	26 2301 3922 D	MADZIWA T.T.L.	US 3922	1659	3129	1120	MAZOWERUENYA	SEP. 1948	MAR. 1975	7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2206	26 2301 4153 E	KARUYANA P.A.	US 4153	1642	3130	980	MAZOWERUENYA	JAN. 1965		7
2207	26 2301 4329 H	GOORA	US 4329	1653	3132	1070	MAZOWERUENYA	NOV. 1954	JUNE 1974	7
2208	26 2301 4412 L	EBEN DAM	US 4412	1705	3132	990	MAZOWERUENYA	MAY 1968		7
2209	26 2301 4520 M	KEEP 7 GOORA	US 4520	1655	3133	1080	MAZOWERUENYA	NOV. 1975		7
2210	26 2301 4635 D	FURA	US 4635	1652	3133	1000	MAZOWERUENYA	JUNE 1903	DEC. 1985	7
2211	26 2301 4752 F	CHIMINBA INSTITUTE	US 4752	1643	3136	950	MAZOWERUENYA	SEP. 1951	NOV. 1976	7
2212	26 2301 4840 B	KENMARE	US 4840	1649	3134	1080	MAZOWERUENYA	JULY 1932	JUNE 1947	7
2213	26 2301 4860 G	DOTITO KEEP	US 4860	1634	3035	1020	MAZOWERUENYA	FEB. 1976	JUNE 1977	7
2214	26 2301 4945 A	MOUNT DARWIN	US 4945	1647	3135	970	MAZOWERUENYA	SEP. 1901		7
2215	26 2301 4960 D	MFURA-KANDEYA	US 4960	1635	3135	1010	MAZOWERUENYA	NOV. 1954		7
2216	26 2301 5202 V	JITI	US 5202	1712	3138	1070	MAZOWERUENYA	SEP. 1954	NOV. 1977	7
2217	26 2301 5210 D	UMFURUDZI	US 5210	1706	3137	940	MAZOWERUENYA	NOV. 1951	AUG. 1978	7
2218	26 2301 5400 K	BUSHU	US 5400	1711	3137	1040	MAZOWERUENYA	AUG. 1978		7
2219	26 2301 5775 S	KANDEYA,NORTH	US 5775	1628	3142	1070	MAZOWERUENYA	FEB. 1958	NOV. 1975	7
2220	26 2301 5863 N	NYATSANGA DAM	US 5863	1637	3140	960	MAZOWERUENYA	OCT. 1970	JULY 1974	7
2221	26 2301 5963 X	CHAWANDA	US 5963	1637	3141	960	MAZOWERUENYA	NOV. 1980		7
2222	26 2301 6108 E	BATSIRANAI	US 6108	1706	3142	880	MAZOWERUENYA	JAN. 1952		7
2223	26 2301 6235 S	NADA MINE	US 6235	1652	3142	880	MAZOWERUENYA	NOV. 1937	JUNE 1940	7
2224	26 2301 6320 T	MAGODZI ROCK	U6 6320	1655	3143	900	MAZOWERUENYA	JULY 1903		7
2225	26 2301 6363 G	CHIBARA SCHOOL	US 6363	1637	3143	950	MAZOWERUENYA	NOV. 1977	APR. 1979	7
2226	26 2301 6443 T	NYAJENJE	US 6444	1647	3143	920	MAZOWERUENYA	APR. 1966		7
2227	26 2301 6463 Q	KANDEYA,EAST	US 6463	1639	3146	960	MAZOWERUENYA	DEC. 1957	FEB. 1970	7
2228	26 2301 7046 Z	CHIWENGA	US 7046	1646	3147	870	MAZOWERUENYA	DEC. 1980		6
2229	26 2301 7050 D	NYAKASIKANA	US 7050	1644	3147	900	MAZOWERUENYA	FEB. 1968		6
2230	26 2301 7559 G	KARANDA HOSPITAL	US 7559	1639	3150	870	MAZOWERUENYA	SEP. 1960	JUNE 1970	6
2231	26 2301 7647 C	PANEMUNHU DAM	US 7647	1646	3150	860	MAZOWERUENYA	JAN. 1965	JAN. 1973	6
2232	26 2301 7803 X	NYAGANDE	US 7803	1709	3151	810	MAZOWERUENYA	NOV. 1987		6
2233	26 2301 7862 L	CHIRONGA MISSION	US 7862	1635	3152	880	MAZOWERUENYA	MAR. 1955	JUNE 1960	6
2234	26 2301 8106 N	CHIGANGO	US 8106	1624	3152	630	MAZOWERUENYA	NOV. 1975	DEC. 1976	6
2235	26 2301 8254 M	NYAMAHOBOGO	US 8254	1642	3153	880	MAZOWERUENYA	NOV. 1964		6
2236	26 2301 8762 P	MHORO SCHOOL	US 8762	1637	3156	890	MAZOWERUENYA	AUG. 1970		6
2237	26 2301 8944 M	DANZA DAM	US 8944	1647	3157	780	MAZOWERUENYA	MAR. 1960	FEB. 1974	6
2238	26 2301 9107 P	MUTAWATAWA	US 9107	1706	3159	1070	MAZOWERUENYA	FEB. 1953	SEP. 1977	6
2239	26 2301 9154 Q	KUJAWARA DAM	US 9154	1642	3159	860	MAZOWERUENYA	JAN. 1965		6
2240	26 2301 9661 R	RUSHINGA	US 9661	1638	3201	1040	MAZOWERUENYA	OCT. 1975		6
2241	26 2301 9858 F	GWANGWAVA	US 9858	1640	3203	860	MAZOWERUENYA	OCT. 1986		6
2242	26 2301 9970 C	MBUNGWE	US 9970	1633	3204	870	MAZOWERUENYA	DEC. 1960	SEP. 1975	6
2243	26 2479 1101 R	ARDLAMONT	VQ 1181	1816	3210	1360	MAZOWERUENYA	OCT. 1921	APR. 1975	8
2244	26 2479 1295 Q	SENZACHENA	VQ 1295	1808	3210	1300	MAZOWERUENYA	NOV. 1940	JUNE 1968	8
2245	2479 1609 T	MWARAZI DAM	VQ 1609	1811	3212	1280	MAZOWERUENYA	MAY 1976		8
2246	26 2479 2275 F	INYATI NO.8 FARM	VQ 2275	1819	3216	1600	MAZOWERUENYA	DEC. 1945	MAR. 1981	8
2247	26 2479 2896 P	TWO STREAMS	VQ 2896	1808	3219	1200	MAZOWERUENYA	NOV. 1948	APR. 1955	8
2248	26 2479 2991 J	EXCELSIOR(RUSAPE)	VQ 2991	1810	3120	1300	MAZOWERUENYA	OCT. 1978	OCT. 1981	8
2249	26 2479 4367 E	HAREWOOD	VQ 4367	1823	3227	1760	MAZOWERUENYA	AUG. 1946	SEP. 1978	8
2250	26 2479 5476 K	HANGARA RANCH	VQ 5476	1819	3234	1450	MAZOWERUENYA	FEB. 1984		8

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2251	26 2479 5570 M	SANYATWE	VQ 5570	1822	3236	1700	MAZOWERUENYA	OCT. 1952	JAN. 1984	9
2252	26 2479 5884 D	DEMERA FARM	VQ 5884	1814	3236	1400	MAZOWERUENYA	JULY 1960	FEB. 1979	8
2253	26 2479 6270 Y	COTSWOLD(RUSAPE)	VQ 6270	1822	3238	1800	MAZOWERUENYA	SEP. 1950	OCT. 1968	10
2254	26 2479 6271 Z	PUNCH ROCK	VQ 6271	1822	3238	1840	MAZOWERUENYA	SEP. 1950	JAN. 1983	9
2255	26 2479 6288 S	ABERDEEN	VQ 6288	1812	3237	1340	MAZOWERUENYA	DEC. 1947	MAY 1958	8
2256	26 2479 6291 W	NYARERWE FARM	VQ 6291	1810	3238	1240	MAZOWERUENYA	JULY 1958	AUG. 1971	8
2257	26 2479 6469 P	JULIASDALE	VQ 6469	1822	3239	1860	MAZOWERUENYA	JULY 1921	JAN. 1959	10
2258	26 2479 6472 S	YORK FARM	VQ 6472	1820	3239	1660	MAZOWERUENYA	JAN. 1909	JUNE 1922	10
2259	26 2479 7078 B	R.I.N.P.,OFFICE	VQ 7078	1817	3243	1760	MAZOWERUENYA	JULY 1969		10
2260	26 2479 7278 T	RHODES INYANGA HOTEL	VQ 7278	1817	3244	1780	MAZOWERUENYA	NOV. 1917	MAR. 1956	10
2261	26 2479 7286 C	NYANGA POLICE	VQ 7286	1813	3244	1680	MAZOWERUENYA	FEB. 1905		9
2262	26 2479 7292 J	KADZIMA	VQ 7292	1810	3245	1460	MAZOWERUENYA	JAN. 1963	MAY 1979	9
2263	26 2479 7374 Y	BIDEFORD	VQ 7374	1820	3245	1800	MAZOWERUENYA	OCT. 1948	SEP. 1979	11
2264	26 2479 7378 C	NYANGA EXP. STN.,HOUSE	VQ 7379	1817	3245	1820	MAZOWERUENYA	NOV. 1938		11
2265	26 2479 7379 D	NYANGA EXP. STN.,OFFICE	VQ 7378	1817	3245	1840	MAZOWERUENYA	OCT. 1951		11
2266	26 2479 7478 L	NYANGA EXP. STN.	VQ 7478	1817	3245	1800	MAZOWERUENYA	JAN. 1961		11
2267	26 2479 7677 C	R.I.N.P.,TROUT HATCHERY	VQ 7677	1818	3246	1940	MAZOWERUENYA	OCT. 1974		14
2268	26 2479 7792 C	LITTLE CONNEMARA	VQ 7792	1810	3247	2240	MAZOWERUENYA	JAN. 1961		10
2269	26 2479 8089 A	TROUTBECK INN	VQ 8089	1811	3249	2020	MAZOWERUENYA	OCT. 1970		11
2270	26 2479 8090 B	TROUTBECK	VQ 8090	1811	3248	2000	MAZOWERUENYA	OCT. 1948	APR. 1978	11
2271	26 2479 8192 M	INYANGA DOWNS WEST	VQ 8192	1810	3249	1980	MAZOWERUENYA	JULY 1985		10
2272	26 2479 8387 Z	QWARAGUZI	VQ 8387	1813	3251	2100	MAZOWERUENYA	JAN. 1946	MAR. 1979	12
2273	26 2479 8398 L	BARWON DOWNS	VQ 8398	1807	3250	1960	MAZOWERUENYA	JUNE 1967		12
2274	26 2479 8693 G	INYANGA DOWNS	VQ 8693	1809	3252	1830	MAZOWERUENYA	FEB. 1932	JUNE 1985	16
2275	26 2479 8980 T	ABERFOYLE,GLENEAGLES	VQ 8980	1816	3254	1650	MAZOWERUENYA	JAN. 1953	NOV. 1976	12
2276	26 2479 9289 E	NYAFARU SCHOOL	VQ 9289	1811	3256	1660	MAZOWERUENYA	SEP. 1970	FEB. 1976	12
2277	26 2480 21 A	CHIKANDAKWE	VR 0021	1755	3203	1190	MAZOWERUENYA	SEP. 1950	MAY 1967	8
2278	26 2480 144 J	SELOUS NEK	VR 0144	1740	3204	1200	MAZOWERUENYA	NOV. 1911	JUNE 1939	8
2279	26 2480 263 N	RATHGAR FARM	VR 0263	1732	3203	1080	MAZOWERUENYA	NOV. 1952	JUNE 1977	6
2280	26 2480 301 E	WENSLEYDALE	VR 0301	1805	3205	1300	MAZOWERUENYA	JULY 1920	DEC. 1956	8
2281	26 2480 325 F	VIRGINIA(MACHEKE)	VR 0325	1753	3205	1140	MAZOWERUENYA	NOV. 1930	JUNE 1949	8
2282	26 2480 406 T	ST.BENEDICT'S MISSION	VR 0406	1802	3206	1350	MAZOWERUENYA	JULY 1938	AUG. 1978	8
2283	26 2480 467 K	NYADERI FARMS	VR 0467	1728	3204	1070	MAZOWERUENYA	FEB. 1942	MAR. 1982	6
2284	26 2480 496 R	CHINDENGA	VR 0496	1713	3206	990	MAZOWERUENYA	JULY 1954		6
2285	26 2480 659 T	VITA	VR 0659	1734	3206	1130	MAZOWERUENYA	OCT. 1947	AUG. 1980	7
2286	26 2480 812 K	RUNYANGI B.CENTRE	VR 0812	1750	3208	1330	MAZOWERUENYA	MAY 1954	OCT. 1964	8
2287	26 2480 828 C	INYOSI	VR 0828	1750	3208	1110	MAZOWERUENYA	NOV. 1939	AUG. 1972	8
2288	26 2480 878 G	KATSEKUNYA	VR 0878	1723	3209	1100	MAZOWERUENYA	JULY 1954	AUG. 1976	6
2289	26 2480 908 P	WEYA CLINIC	VR 0908	1801	3208	1300	MAZOWERUENYA	NOV. 1964	MAY 1980	8
2290	26 2480 930 N	NYAGADZI	VR 0930	1749	3209	1160	MAZOWERUENYA	OCT. 1972		8
2291	26 2480 1008 Y	NYANGADZI HYDRO	VR 1008	1801	3209	1220	MAZOWERUENYA	JAN. 1906		8
2292	26 2480 1305 W	WEYA	VR 1305	1803	3211	1270	MAZOWERUENYA	JULY 1951	JUNE 1964	8
2293	26 2480 1540 B	EXCELSIOR EST.(MACHEKE)	VR 1540	1744	3211	1070	MAZOWERUENYA	NOV. 1979	JULY 1981	7
2294	26 2480 1602 T	MPURU	VR 1602	1805	3212	1300	MAZOWERUENYA	JAN. 1965	NOV. 1971	8
2295	26 2480 1637 G	REDLANDS	VR 1637	1745	3213	1090	MAZOWERUENYA	SEP. 1947	APR. 1979	7

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2296	26 2400 1774 F	MUTOKO	VR 1774	1725	3213	1250	MAZOWERUENYA	JULY 1908		6
2297	26 2400 1922 R	MARAPARA FARM	VR 1922	1753	3214	1130	MAZOWERUENYA	JULY 1930	JUNE 1964	7
2298	26 2400 2051 G	GANDAL	VR 2051	1737	3215	1060	MAZOWERUENYA	JUNE 1903		7
2299	26 2400 2072 E	MUTOKO PUMP STATION	VR 2072	1726	3215	1200	MAZOWERUENYA	MAR. 1959		6
2300	26 2400 2090 Z	KABASA	VR 2090	1715	3215	910	MAZOWERUENYA	JULY 1954	NOV. 1963	6
2301	26 2400 2091 A	NYAMAZUWE	VR 2091	1716	3215	910	MAZOWERUENYA	FEB. 1969	OCT. 1978	6
2302	26 2400 2124 L	MAYO POLICE	VR 2124	1752	3217	1100	MAZOWERUENYA	DEC. 1963		7
2303	26 2400 2161 B	RUKORE FARM	VR 2161	1732	3215	1070	MAZOWERUENYA	JAN. 1960	NOV. 1977	7
2304	26 2400 2313 R	LENTEGLOS ESTATE	VR 2313	1757	3217	1130	MAZOWERUENYA	SEP. 1943	AUG. 1967	7
2305	26 2400 2426 P	SELBORNE(MAYO)	VR 2426	1751	3217	1100	MAZOWERUENYA	JULY 1943	FEB. 1952	7
2306	26 2400 2525 X	MAYO RANCH	VR 2525	1752	3218	1100	MAZOWERUENYA	JULY 1923	JUNE 1943	6
2307	26 2400 2832 F	UGARO	VR 2832	1748	3219	1070	MAZOWERUENYA	JULY 1974	NOV. 1978	6
2308	26 2400 2984 W	MUDZONGA	VR 2984	1718	3222	1070	MAZOWERUENYA	JULY 1954	AUG. 1976	6
2309	26 2400 3053 W	NYANSIZI	VR 3053	1736	3220	1033	MAZOWERUENYA	NOV. 1987		7
2310	26 2400 3118 R	TANDA I.C.A.	VR 3118	1755	3221	1100	MAZOWERUENYA	OCT. 1969		7
2311	26 2400 3264 A	BUDJGA MARIRA SCHOOL	VR 3264	1731	3221	1050	MAZOWERUENYA	OCT. 1966		7
2312	26 2400 3287 A	MUDZONGA	VR 3287	1718	3221	1030	MAZOWERUENYA	FEB. 1984		6
2313	26 2400 3427 C	UITHOEK	VR 3427	1750	3223	1040	MAZOWERUENYA	DEC. 1947	JULY 1973	6
2314	26 2400 3579 S	RUKAU	VR 3579	1723	3223	1080	MAZOWERUENYA	OCT. 1954	OCT. 1963	6
2315	26 2400 3581 V	ALL SOULS' MISSION	VR 3581	1721	3224	1070	MAZOWERUENYA	JULY 1938	MAY 1981	6
231·	.. 2400 3673 V	MSHIMBO	VR 3673	1726	3224	1090	MAZOWERUENYA	JAN. 1984		6
2317	26 2400 3697 H	RUNYANGA	VR 3697	1713	3224	910	MAZOWERUENYA	DEC. 1970	FEB. 1976	6
2318	26 2400 3709 J	TANDA,MAPARURA	VR 3709	1801	3224	1300	MAZOWERUENYA	JUNE 1973	FEB. 1979	7
2319	26 2400 3718 T	TANDA,NYAHOWE	VR 3718	1758	3225	1000	MAZOWERUENYA	MAY 1954	MAR. 1978	7
2320	26 2400 3953 Z	BUDJGA DUKU SCHOOL	VR 3953	1737	3226	1000	MAZOWERUENYA	NOV. 1980	AUG. 1984	6
2321	26 2400 3960 G	MATEDZA CLINIC	VR 3960	1733	3223	960	MAZOWERUENYA	DEC. 1963		6
2322	26 2400 4378 L	KAPONDORO	VR 4378	1723	3228	960	MAZOWERUENYA	FEB. 1966	APR. 1978	6
2323	26 2400 4502 W	RATHCLINE NO.6	VR 4502	1804	3229	1280	MAZOWERUENYA	MAR. 1970	SEP. 1978	8
2324	26 2400 4540 M	DAKATORA	VR 4540	1743	3229	1000	MAZOWERUENYA	SEP. 1971	AUG. 1976	6
2325	26 2400 4590 R	MAKOSA	VR 4590	1717	3230	950	MAZOWERUENYA	AUG. 1944		6
2326	26 2400 4618 X	ST.MARY'S(MHANDAMBIRI)	VR 4618	1755	3230	1100	MAZOWERUENYA	OCT. 1969	OCT. 1974	7
2327	26 2400 4625 E	TANDA,DEWERWI	VR 4625	1750	3220	1020	MAZOWERUENYA	MAY 1954	MAY 1979	6
2328	26 2400 4851 A	CHIKORE NORTH	VR 4851	1735	3235	950	MAZOWERUENYA	OCT. 1962	AUG. 1976	6
2329	26 2400 4946 D	NYAHANJI HILLS	VR 4946	1740	3230	960	MAZOWERUENYA	MAY 1954	JUNE 1971	6
2330	26 2400 5090 K	KATSANDE AGRIC	VR 5090	1717	3232	965	MAZOWERUENYA	DEC. 1983		6
2331	26 2400 5239 X	MUTASA	VR 5239	1744	3233	040	MAZOWERUENYA	JULY 1907		6
2332	26 2400 5589 C	MAKAHA KEEP	VR 5509	1717	3235	900	MAZOWERUENYA	JAN. 1976	FEB. 1978	6
2333	26 2400 6002 B	MARUSHO	VR 6002	1804	3230	1215	MAZOWERUENYA	APR. 1987		7
2334	26 2400 6090 X	MAKAHA STORE	VR 6090	1719	3236	070	MAZOWERUENYA	JUNE 1916	JUNE 1939	6
2335	26 2400 6214 G	NYAJESI	VR 6214	1759	3230	1130	MAZOWERUENYA	NOV. 1950	OCT. 1976	6
2336	26 2400 6329 G	JENHA	VR 6329	1751	3242	1080	MAZOWERUENYA	JULY 1907		7
2337	26 2400 6399 H	NYAHATAHA	VR 6399	1712	3239	759	MAZOWERUENYA	DEC. 1987		6
2338	26 2400 6501 T	CARLOW	VR 6501	1804	3240	1260	MAZOWERUENYA	JAN. 1916	SEP. 1925	7
2339	26 2400 6542 N	NAMBUKA	VR 6542	1744	3240	1005	MAZOWERUENYA	AUG. 1987		6
2340	26 2400 6695 F	CHAZARINY	VR 6695	1714	3241	760	MAZOWERUENYA	FEB. 1955	JULY 1958	6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2341	26 2400 6896 Y	MAKAHA CHAMBER	VR 6896	1713	3242	760	MAZOWERUENYA	SEP. 1950	SEP. 1971	5
2342	26 2400 7004 Q	TURNER'S FARM	VR 7004	1803	3243	1260	MAZOWERUENYA	JAN. 1976	SEP. 1976	7
2343	26 2400 7097 R	NYAHANDE KEEP	VR 7097	1713	3243	780	MAZOWERUENYA	JAN. 1976	APR. 1978	5
2344	26 2400 7112 H	MOUNT MELLERAY	VR 7112	1758	3204	1310	MAZOWERUENYA	JULY 1952	FEB. 1977	7
2345	26 2400 7207 L	FLAKNEK	VR 7207	1802	3244	1340	MAZOWERUENYA	OCT. 1971	SEP. 1975	8
2346	26 2400 7214 T	NYANGA SECONDARY SCHOOL	VR 7214	1758	3246	1330	MAZOWERUENYA	DEC. 1960	MAY 1979	8
2347	26 2400 7754 F	ELIM MISSION	VR 7754	1736	3249	870	MAZOWERUENYA	DEC. 1952		7
2348	26 2400 7769 X	AVILA MISSION	VR 7769	1720	3247	730	MAZOWERUENYA	OCT. 1954	OCT. 1986	6
2349	26 2400 7809 R	NYANGUI	VR 7809	1801	3247	1990	MAZOWERUENYA	FEB. 1969	DEC. 1978	10
2350	26 2400 7984 F	NYARUGWE MINE	VR 7984	1720	3248	550	MAZOWERUENYA	FEB. 1985	JUNE 1986	5
2351	26 2400 8537 G	NYATSANGA	VR 8537	1745	3252	900	MAZOWERUENYA	JULY 1973	MAR. 1979	8
2352	26 2400 8562 J	NYAZINGWE	VR 8562	1732	3251	820	MAZOWERUENYA	AUG. 1976	JAN. 1977	6
2353	26 2400 8709 T	NYAMAROPA,SEREKO	VR 8709	1801	3253	1040	MAZOWERUENYA	NOV. 1950	DEC. 1978	12
2354	26 2400 8825 V	REGINA COELI MISSION	VR 8825	1752	3253	880	MAZOWERUENYA	JAN. 1957		9
2355	26 2400 0997 G	CHIKWIZO T.T.L.	VR 0997	1712	3252	660	MAZOWERUENYA	DEC. 1963	APR. 1975	5
2356	26 2400 9139 L	NYADOWA	VR 9139	1744	3255	1250	MAZOWERUENYA	JULY 1973	FEB. 1979	7
2357	26 2400 9451 A	MATIZI	VR 9451	1738	3257	760	MAZOWERUENYA	OCT. 1976	OCT. 1977	6
2358	26 2400 9525 F	NYAMAROPA IRRIGATION	VR 9525	1752	3257	840	MAZOWERUENYA	JUNE 1953		8
2359	26 2400 9805 X	FOMBE	VR 9805	1719	3259	640	MAZOWERUENYA	MAY 1964	MAR. 1976	5
2360	26 2400 9893 F	RUENYA RIVER	VR 9893	1715	3259	510	MAZOWERUENYA	JUNE 1956	FEB. 1976	5
2361	26 2401 156 R	MAGUWA DAM	VS 0156	1641	3204	810	MAZOWERUENYA	MAR. 1972	MAR. 1978	6
2362	26 2401 226 S	CHITSUNGO MFUNGWE	VS 0226	1652	3205	760	MAZOWERUENYA	OCT. 1976	NOV. 1978	6
2363	26 2401 533 B	DINDI	VS 0533	1648	3205	700	MAZOWERUENYA	MAR. 1953	SEP. 1976	6
2364	26 2401 861 H	CHIMANDA	VS 861	1630	3208	840	MAZOWERUENYA	NOV. 1981		6
2365	26 2401 1001 K	CHAREWA	VS 1001	1711	3208	850	MAZOWERUENYA	NOV. 1963	AUG. 1976	6
2366	26 2401 1362 C	RUSAMBO MISSION	VS 1362	1635	3213	790	MAZOWERUENYA	NOV. 1954	AUG. 1977	6
2367	26 2401 2110 Q	CHINGURURU	VS 2110	1705	3215	820	MAZOWERUENYA	JULY 1954	JUNE 1975	6
2368	26 2401 2219 J	BENSON MINE	VS 2219	1701	3216	690	MAZOWERUENYA	NOV. 1975	OCT. 1976	6
2369	26 2401 2348 Z	OLD MAZOWE BRIDGE	VS 2348	1645	3217	572	MAZOWERUENYA	DEC. 1987		7
2370	26 2401 2705 M	MADIMUTSA SCHOOL	VS 2705	1708	3219	090	MAZOWERUENYA	JAN. 1983		6
2371	26 2401 3079 T	NYABANDA TSETSE CAMP	VS 3079	1628	3221	580	MAZOWERUENYA	OCT. 1970	JUNE 1974	6
2372	26 2401 3604 P	NYAMKOMO	VS 3604	1709	3224	760	MAZOWERUENYA	JULY 1954		6
2373	26 2401 3927 Q	SHINGA RIVER	VS 3927	1702	3226	630	MAZOWERUENYA	NOV. 1959	APR. 1976	6
2374	26 2401 3958 Z	MARYMOUNT MISSION	VS 3958	1640	3226	620	MAZOWERUENYA	JAN. 1951		6
2375	26 2401 4208 W	MUDZI	VS 4208	1707	3227	880	MAZOWERUENYA	JAN. 1976	DEC. 1980	6
2376	26 2401 4712 T	CHINGWENE SCHOOL	VS 4712	1704	3229	870	MAZOWERUENYA	FEB. 1966	JULY 1975	6
2377	26 2401 5227 D	MUROSI DAM	VS 5227	1657	3229	680	MAZOWERUENYA	FEB. 1966	FEB. 1978	6
2378	26 2401 5450 W	NYATANA	VS 5450	1644	3234	440	MAZOWERUENYA	NOV. 1964	JAN. 1975	6
2379	26 2401 5461 H	MUKOSA	VS 5461	1638	3234	640	MAZOWERUENYA	JAN. 1969	FEB. 1972	5
2380	26 2401 5559 P	MUKOSA SCHOOL	VS 5559	1638	3234	660	MAZOWERUENYA	NOV. 1959	JAN. 1965	6
2381	26 2401 6132 M	KONDO DAM	VS 6132	1655	3238	620	MAZOWERUENYA	FEB. 1966	MAR. 1974	6
2382	26 2401 6521 K	ROAD CAMP MSE 4	VS 6521	1700	3241	720	MAZOWERUENYA	MAR. 1973	DEC. 1977	6
2383	26 2401 6819 J	KOTWA KEEP	VS 6819	1701	3242	720	MAZOWERUENYA	DEC. 1975	FEB. 1977	6
2384	26 2401 6822 M	NYAMAYARUKA	VS 6822	1659	3242	760	MAZOWERUENYA	NOV. 1987		6
2385	26 2401 7739 J	MSAU KEEP	VS 7739	1650	3247	560	MAZOWERUENYA	JAN. 1976	JULY 1976	6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2386	26 2481 0554 Q	GOZI KEEP	VS 0504	1709	3252	670	MAZOWERUENYA	JAN. 1976	JUNE 1977	5
2387	26 2481 0525 N	NYAMAPANDA,POLICE	VS 0525	1657	3253	630	MAZOWERUENYA	SEP. 1966	OCT. 1977	6
2388	26 2481 0600 V	GOZI,AGRIC	VS 0600	1711	3252	670	MAZOWERUENYA	NOV. 1987		5
2387	26 2481 0841 G	NYAMUKU RIVER SCHOOL	VS 0841	1649	3253	520	MAZOWERUENYA	SEP. 1972	JUNE 1976	6
23.?	27 2477 4331 D	TUZUKA	VN 4331	2031	3227	880	E.BORDER	AUG. 1962		8
2391	27 2477 4443 A	CHIPANGARA	VN 4443	2025	3228	1020	E.BORDER	JAN. 1967	NOV. 1976	8
2392	27 2477 4713 T	ZAMCHIYA	VN 4713	2042	3229	580	E.BORDER	OCT. 1960	APR. 1975	8
2393	27 2477 4741 Z	CHIKORE MISSION	VN 4741	2027	3231	1030	E.BORDER	SEP. 1912		10
2394	27 2477 5051 L	HORUS	VN 5051	2021	3231	1060	E.BORDER	NOV. 1946	FEB. 1977	9
2395	27 2477 5551 E	GELUK(CHIPINGE)	VN 5551	2021	3234	1000	E.BORDER	JULY 1951	JUNE 1963	11
2396	27 2477 6167 Z	CHIPINGE	VN 6167	2012	3237	1130	E.BORDER	JULY 1912		11
2397	27 2477 6234 X	ELIZABETHVILLE	VN 6234	2030	3238	1000	E.BORDER	MAR. 1937	MAR. 1949	12
2398	27 2477 6328 Z	GWENZI	VN 6328	2033	3238	840	E.BORDER	OCT. 1962		12
2399	27 2477 6364 N	CHIPINGE EXP.STN.	VN 6364	2013	3239	990	E.BORDER	JULY 1949		10
2400	27 2477 6477 L	VLEIPLAATS	VN 6477	2007	3241	1040	E.BORDER	NOV. 1940		9
2401	27 2477 6535 Z	SANNIESRUST	VN 6535	2029	3239	940	E.BORDER	DEC. 1941	OCT. 1946	12
2402	27 2477 6589 H	ROOKWOOD	VN 6589	2000	3240	1330	E.BORDER	MAY 1929		12
2403	27 2477 6631 D	JERSEY TEA ESTATE	VN 6631	2031	3240	770	E.BORDER	SEP. 1939		11
2404	27 2477 6638 L	CHINYADUMA	VN 6638	2029	3241	1000	E.BORDER	NOV. 1962		12
2405	27 2477 6943 S	GUNGUNYANA	VN 6943	2024	3243	1100	E.BORDER	JULY 1944	JAN. 1957	12
2406	27 2477 7042 A	MOUNT SELINDA MISSION	VN 7042	2025	3243	1080	E.BORDER	NOV. 1910		14
2407	27 2477 7054 N	LETTIE SWAN	VN 7054	2019	3242	920	E.BORDER	DEC. 1924	JUNE 1964	9
2408	27 2477 7143 K	GUNGUNYANA FOREST	VN 7143	2024	3244	1080	E.BORDER	DEC. 1950		11
2409	27 2477 7153 W	STIRLING(CHIPINGE)	VN 7153	2018	3243	900	E.BORDER	JULY 1964		9
2410	27 2477 7240 Q	ZONA	VN 7240	2027	3244	880	E.BORDER	JAN. 1946		12
2411	27 2477 7291 W	ONRUST	VN 7291	2000	3244	1340	E.BORDER	NOV. 1929	JUNE 1936	12
2412	27 2477 7298 D	THORNTON	VN 7298	1955	3244	1650	E.BORDER	OCT. 1940		10
2413	27 2477 7374 L	LAUGHING WATERS	VN 7374	2008	3245	1100	E.BORDER	OCT. 1943		12
2414	27 2477 7383 W	LUSITU POWER STATION	VN 7383	2003	3244	860	E.BORDER	SEP. 1965	NOV. 1973	12
2415	27 2477 7394 H	TANDEVEL	VN 7394	1957	3245	1400	E.BORDER	MAR. 1946		12
2416	27 2477 7542 T	MT.SILINDA BORDER POST	VN 7542	2025	3245	990	E.BORDER	JAN. 1972	AUG. 1976	12
2417	27 2477 7594 A	CARPENHAM	VN 7594	1957	3245	1460	E.BORDER	AUG. 1960	JAN. 1976	12
2418	27 2477 7889 W	LITTLEBERG	VN 7889	2000	3248	1130	E.BORDER	JUNE 1976	OCT. 1977	14
2419	27 2477 7894 B	DEYSBROOK	VN 7894	1958	3248	1590	E.BORDER	JULY 1960	AUG. 1970	12
2420	27 2477 7992 H	MUTZARARA	VN 7992	1958	3248	1580	E.BORDER	AUG. 1968	NOV. 1978	12
2421	27 2477 7999 Q	WESTWARD HO!	VN 7999	1954	3248	1240	E.BORDER	JAN. 1969		10
2422	27 2477 8062 J	RATELSHOEK	VN 8062	2015	3248	900	E.BORDER	DEC. 1932		11
2423	27 2477 8069 R	WOLF'S CRAG	VN 8069	2011	3249	990	E.BORDER	MAY 1979		14
2424	27 2477 8076 Z	UPPER RANDFONTEIN	VN 8076	2007	3248	1080	E.BORDER	SEP. 1906		12
2425	27 2477 8159 P	SOUTHDOWN	VN 8159	2016	3249	750	E.BORDER	SEP. 1970		10
2426	27 2477 8164 V	CHIBUZANA	VN 8164	2013	3249	800	E.BORDER	JULY 1920	DEC. 1937	11
2427	27 2477 8189 X	ALBANY(CHIMANIMANI)	VN 8189	1959	3249	1220	E.BORDER	OCT. 1946	APR. 1976	12
2428	27 2477 8365 N	HELVETIA	VN 8365	2014	3250	880	E.BORDER	FEB. 1905	JUNE 1922	15
2429	27 2477 8374 Y	MAYFIELD	VN 8374	2000	3250	900	E.BORDER	SEP. 1986		12
2430	27 2477 8462 T	EASTLEIGH	VN 8462	2015	3251	860	E.BORDER	MAR. 1944	JULY 1977	11

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2431	27 2477 8472 E	VERMONT	VN 8472	2009	3251	1020	E.BORDER	OCT. 1910		15
2432	27 2477 8569 K	WOLVERHAMPTON	VN 8569	2011	3252	1600	E.BORDER	DEC. 1945	JAN. 1979	12
2433	27 2477 8502 Z	NDIMA	VN 8781	2004	3252	640	E.BORDER	FEB. 1963		12
2434	27 2477 8503 A	LOWER INGORIMA	VN 8583	2003	3251	530	E.BORDER	OCT. 1962	APR. 1979	12
2435	27 2477 8672 X	FERN CREEK	VN 8672	2009	3252	1080	E.BORDER	SEP. 1906		12
2436	27 2477 8685 L	RUSITU MISSION	VN 8685	2002	3252	1070	E.BORDER	JULY 1938	SEP. 1977	17
2437	27 2477 8998 B	CHINOKWE PATROL	VN 8998	1955	3253	1300	E.BORDER	JUNE 1955	MAR. 1970	12
2438	27 2477 9195 Q	SPRINGFIELD	VN 9195	1957	3255	1190	E.BORDER	JULY 1944	MAY 1970	12
2439	27 2477 9290 T	GLENCOE FOREST	VN 9290	1959	3255	1310	E.BORDER	SEP. 1953	OCT. 1970	12
2440	27 2477 9386 Y	MUCHADZIYA	VN 9386	2001	3256	0700	E.BORDER	JULY 1987		12
2441	27 2477 9392 E	TARKA FOREST	VN 9392	1958	3256	1190	E.BORDER	AUG. 1955		12
2442	27 2477 9588 S	UPPER VIMBA	VN 9588	2001	3257	1060	E.BORDER	FEB. 1960	JAN. 1979	12
2443	27 2478 7191 G	CLOUDLANDS	VP 7191	1905	3244	1600	E.BORDER	JULY 1927	MAY 1983	11
2444	27 2478 7193 J	LAURENCEVILLE	VP 7193	1903	3244	1200	E.BORDER	JULY 1926	JUNE 1959	11
2445	27 2478 7194 K	FARLEIGH	VP 7194	1903	3244	1200	E.BORDER	AUG. 1959	MAR. 1969	10
2446	27 2478 7285 J	GREENCROFT COFFEE ESTATE	VP 7285	1908	3244	1310	E.BORDER	NOV. 1972		11
2447	27 2478 7287 L	VUMBA HEIGHTS	VP 7287	1907	3244	1710	E.BORDER	OCT. 1948	JUNE 1984	11
2448	27 2478 7289 N	NYAMHENI	VP 7289	1905	3244	1630	E.BORDER	JULY 1948	JUNE 1968	14
2449	27 2478 7377 J	MANYERA	VP 7377	1913	3245	780	E.BORDER	JAN. 1948		11
2450	27 2478 7408 E	SELDOMSEEN	VP 7488	1907	3245	1670	E.BORDER	JULY 1985		9
2451	27 2478 7493 K	EXCELSIOR FALLSCROFT	VP 7493	1904	3246	1500	E.BORDER	MAR. 1905		11
2452	27 2478 7496 N	LAS ANOD	VP 7496	1901	3245	1220	E.BORDER	JULY 1951	JUNE 1966	11
2453	27 2478 7592 S	EXCELSIOR FALLS	VP 7592	1904	3246	1360	E.BORDER	MAR. 1967		20
2454	27 2478 7707 S	SETTLER	VP 7707	1950	3246	1300	E.BORDER	JAN. 1969		9
2455	27 2478 7785 C	LEOPARD ROCK HOTEL	VP 7785	1908	3247	1460	E.BORDER	JAN. 1938	DEC. 1980	15
2456	27 2478 7786 D	HEXTLE	VP 7786	1907	3250	1660	E.BORDER	OCT. 1952	APR. 1975	12
2457	27 2478 7787 E	VUMBA NATIONAL PARK	VP 7787	1907	3247	1520	E.BORDER	JULY 1929		16
2458	27 2478 7991 B	HOBOKEN	VP 7991	1904	3248	1190	E.BORDER	FEB. 1918	AUG. 1926	12
2459	27 2478 8094 N	VUMBA ESTATE	VP 8094	1903	3248	1220	E.BORDER	JULY 1948	JUNE 1965	12
2460	27 2478 0185 M	NORSELAND	VP 8185	1908	3249	1220	E.BORDER	SEP. 1927	JUNE 1945	17
2461	27 2478 8391 L	CRAKE VALLEY	VP 8391	1904	3250	1080	E.BORDER	OCT. 1967	JAN. 1977	12
2462	27 2478 8478 F	BROWNHILL ESTATE	VP 8478	1911	3251	700	E.BORDER	AUG. 1967	MAR. 1980	9
2463	27 2478 8494 Y	MUGANHU	VP 8494	1903	3251	1060	E.BORDER	MAY 1974		12
2464	27 2478 8503 H	NYHODI FARM	VP 8503	1953	3251	1220	E.BORDER	NOV. 1967	FEB. 1975	10
2465	27 2478 8515 W	SAWEROMBI	VP 8515	1946	3251	1000	E.BORDER	OCT. 1940	APR. 1978	12
2466	27 2478 8587 Z	CHINDINGWI FARM	VP 8587	1907	3251	730	E.BORDER	APR. 1980		12
2467	27 2478 8610 Z	CHIMANIMANI,POLICE	VP 8610	1948	3252	1520	E.BORDER	SEP. 1953		10
2468	27 2478 8710 H	CHIMANIMANI,D.A.	VP 8710	1948	3252	1470	E.BORDER	SEP. 1898		10
2469	27 2478 8712 K	CHIMANIMANI,PORK PIE	VP 8712	1947	3253	1970	E.BORDER	DEC. 1976		11
2470	27 2478 8801 G	CHISENGU	VP 8801	1953	3253	1480	E.BORDER	MAY 1955		11
2471	27 2478 8907 X	BELMONT(CHIMANIMANI)	VP 8907	1950	3254	1460	E.BORDER	NOV. 1946	OCT. 1963	10
2472	27 2478 8912 C	EASTERN HIGHLANDS RES.ST	VP 8912	1947	3253	1520	E.BORDER	JAN. 1953	MAY 1965	11
2473	27 2478 9002 A	MUGUZO PATROL	VP 9002	1953	3254	1620	E.BORDER	NOV. 1953		11
2474	27 2478 9004 C	LIONHILLS FOR.RES.	VP 9004	1952	3254	1510	E.BORDER	NOV. 1956	JUNE 1971	10
2475	27 2478 9106 N	LIONHILLS(MAWENJE)	VP 9106	1951	3255	1540	E.BORDER	JAN. 1941	OCT. 1956	10

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2476	27 2478 9121 E	ROAD CAMP MAN 8	VP 9121	1943	3255	1160	E.BORDER	MAR. 1973	JUNE 1978	12
2477	27 2478 9315 Q	MARTIN FOREST	VP 9315	1946	3256	1320	E.BORDER	AUG. 1946		12
2478	27 2478 9321 X	CHIKUKWA SCHOOL	VP 9321	1943	3256	1130	E.BORDER	APR. 1902		12
2479	27 2478 9600 A	TILBURY	VP 9600	1954	3258	1010	E.BORDER	OCT. 1947		12
2480	27 2478 9608 J	WELGELEGEN	VP 9608	1950	3257	1130	E.BORDER	NOV. 1950	DEC. 1984	11
2481	27 2478 9813 G	OUTWARD BOUND SCHOOL	VP 9813	1946	3258	1130	E.BORDER	JULY 1965	JULY 1978	12
2482	27 2479 7134 P	NKONDWE	VQ 7134	1841	3243	1580	E.BORDER	JAN. 1934	DEC. 1953	12
2483	27 2479 7356 F	CHIPUNGU FALLS	VQ 7356	1829	3245	1760	E.BORDER	NOV. 1939	AUG. 1975	16
2484	27 2479 7449 G	DUMBA	VQ 7449	1834	3245	820	E.BORDER	DEC. 1952	NOV. 1976	11
2485	27 2479 7665 R	R.I.N.P.,PUNGWE FALLS	VQ 7665	1824	3247	1740	E.BORDER	OCT. 1974	FEB. 1976	20
2486	27 2479 7750 S	IRON CLIFFS	VQ 7758	1828	3247	1850	E.BORDER	MAR. 1976	JUNE 1979	20
2487	27 2479 7776 M	R.I.N.P.,UPPER PUNGWE	VQ 7776	1818	3247	2020	E.BORDER	OCT. 1974		12
2488	27 2479 7845 M	MPOTEDZI	VQ 7845	1835	3248	900	E.BORDER	DEC. 1950	JULY 1977	11
2489	27 2479 7947 Y	MONDE BUSINESS CENTRE	VQ 7947	1834	3248	840	E.BORDER	OCT. 1979		11
2490	27 2479 7972 A	R.I.N.P.,INDZERA	VQ 7972	1821	3248	2040	E.BORDER	OCT. 1974	FEB. 1976	16
2491	27 2479 8069 F	MTENDERE DAM	VQ 8069	1822	3249	1820	E.BORDER	OCT. 1959	JUNE 1971	12
2492	27 2479 8070 G	R.I.N.P.,MATENDERERE	VQ 8070	1822	3249	1840	E.BORDER	OCT. 1974	FEB. 1976	16
2493	27 2479 8152 W	GATSI	VQ 8152	1829	3249	760	E.BORDER	SEP. 1962	MAY 1977	12
2494	27 2479 8169 P	R.I.N.P.,CIRCULAR DRIVE	VQ 8169	1822	3249	1870	E.BORDER	OCT. 1974	FEB. 1976	16
2495	27 2479 8229 E	RUPERE MOUNTAIN	VQ 8229	1844	3250	1850	E.BORDER	DEC. 1960		12
2496	27 2479 8267 W	R.I.N.P.,PUNGWE GORGE	VQ 8267	1823	3250	1180	E.BORDER	OCT. 1974	FEB. 1976	12
2497	27 2479 8334 T	HOPE PATROL	VQ 8334	1841	3250	1650	E.BORDER	NOV. 1951	AUG. 1976	12
2498	27 2479 8338 Y	KORSTEN SCHOOL	VQ 8338	1839	3251	1520	E.BORDER	AUG. 1970	MAR. 1977	12
2499	27 2479 8430 Y	RUPERE NURSERY	VQ 8430	1843	3250	1610	E.BORDER	JULY 1960		14
2500	27 2479 8434 C	HOPE MAPOPO	VQ 8434	1841	3251	1650	E.BORDER	NOV. 1951	AUG. 1976	12
2501	27 2479 8456 B	MAUNA	VQ 8456	1829	3251	800	E.BORDER	FEB. 1978		12
2502	27 2479 8531 H	MUKANDI	VQ 8531	1843	3251	1270	E.BORDER	DEC. 1960		12
2503	27 2479 8539 R	SELBORNE(PENHALONGA)	VQ 8539	1838	3250	1200	E.BORDER	APR. 1929	FEB. 1935	12
2504	27 2479 8546 Z	NGARURA VALLEY	VQ 8546	1834	3253	800	E.BORDER	OCT. 1960	APR. 1973	12
2505	27 2479 8573 D	R.I.N.P.,NYAZENGU FALLS	VQ 8573	1820	3251	2020	E.BORDER	OCT. 1974	FEB. 1976	20
250[illegible]	[illegible] 2479 8656 T	ROAD CAMP MAN 12	VQ 8656	1829	3252	780	E.BORDER	FEB. 1973	APR. 1976	12
2507	[illegible] 2479 8832 K	MUTEMA	VQ 8832	1842	3253	930	E.BORDER	SEP. 1960	AUG. 1976	12
2508	27 2479 8833 L	MUCHAKATA J.N.F.R.S.	VQ 8833	1842	3253	1060	E.BORDER	SEP. 1960	AUG. 1976	12
2509	27 2479 8932 T	MAHOYO	VQ 8932	1842	3254	850	E.BORDER	DEC. 1960	AUG. 1976	12
2510	27 2479 9029 Z	NYAMASHE'S KRAAL	VQ 9029	1843	3254	790	E.BORDER	DEC. 1960	AUG. 1976	12
2511	27 2479 9172 E	INYANGANI LULECHE	VQ 9172	1821	3255	870	E.BORDER	DEC. 1953		12
2512	27 2479 9234 X	CHIWENGWA	VQ 9234	1841	3255	690	E.BORDER	DEC. 1960	AUG. 1976	12
2513	27 2479 9370 V	ZINDI	VQ 9370	1822	3256	760	E.BORDER	MAR. 1969		12
2514	27 2479 9371 W	MRUWA	VQ 9371	1821	3256	840	E.BORDER	MAR. 1969		20
2515	27 2479 9473 G	NYAWAMBA	VQ 9473	1820	3257	820	E.BORDER	JULY 1987		12
2516	27 2479 9665 Q	CHUWIRA	VQ 9665	1825	3257	700	E.BORDER	JULY 1956	OCT. 1976	12
2517	27 2479 9674 A	WANBA FACTORY	VQ 9674	1820	3258	740	E.BORDER	APR. 1902		12
2518	27 2479 9775 K	ABERFOYLE,WEST	VQ 9775	1819	3258	800	E.BORDER	JAN. 1972		14
2519	27 2479 9777 M	ABERFOYLE,MAIN OFFICE	VQ 9777	1818	3258	980	E.BORDER	JUNE 1959		12
2520	27 2479 9779 P	ABERFOYLE,NORTH	VQ 9779	1817	3259	900	E.BORDER	JAN. 1972		14

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2521	? 2479 9877 W	ABERFOYLE,EAST	VQ 9877	1818	3259	720	E.BORDER	JAN. 1972		14
2522	27 2578 212 C	CHIMANIMANI NAT.PARK	WP 0212	1947	3301	1600	E.BORDER	NOV. 1907		20
2523	27 2579 75 Y	SADONDO	WQ 0075	1819	3300	680	E.BORDER	JAN. 1973	JULY 1974	12
2524	27 2579 76 Z	SAGAMBE	WQ 0076	1819	3300	750	E.BORDER	OCT. 1975	MAY 1976	12
2525	27 2579 473 F	CHIWANZA	WQ 0473	1820	3302	680	E.BORDER	APR. 1901		10
2526	27 2579 569 K	KATIYO	WQ 0569	1822	3303	640	E.BORDER	SEP. 1969		12
2527	27 2579 668 S	KATIYU LOWER	WQ 0668	1823	3303	590	E.BORDER	SEP. 1969	MAR. 1977	12
2528	28 1478 269 V	DONTCHETCHI	MJ 0269	1916	2604	980	KALAHARI	OCT. 1936	OCT. 1954	6
2529	28 1478 5413 L	SIBANINI PAN	MJ 5413	1947	2634	940	KALAHARI	DEC. 1930	JUNE 1953	5
2530	28 1478 7457 H	GOSIVANINI	MJ 7457	1923	2645	990	KALAHARI	DEC. 1972	MAR. 1973	5
2531	28 1479 3009 M	NEHIMBA	MK 4010	1857	2619	1020	KALAHARI	OCT. 1936	JUNE 1947	6
2532	28 1479 5815 S	SHAPI	MK 5815	1852	2636	1060	KALAHARI	JAN. 1967	AUG. 1972	6
2533	28 1479 9529 E	HWANGE,MAIN CAMP	MK 9529	1844	2657	1080	KALAHARI	SEP. 1940		6
2534	28 1577 1097 G	MAITENGWE	NH 1097	1955	2706	1020	KALAHARI	NOV. 1981		5
2535	28 1577 1197 Q	MASILI DAM	NH 1197	1955	2706	1030	KALAHARI	OCT. 1966	JULY 1977	5
2536	28 1577 3943 A	GUNGWE RANCH	NH 3943	2025	2722	1400	KALAHARI	JULY 1948	JUNE 1970	5
2537	28 1577 4455 G	MALALUME	NH 4455	2018	2725	1220	KALAHARI	NOV. 1981	SEP. 1982	5
2538	28 1577 4572 J	MADHLAMBUSI	NH 4572	2009	2726	1140	KALAHARI	OCT. 1964		5
2539	28 1577 4793 Z	KAMI	NH 4093	1950	2727	1110	KALAHARI	MAR. 1959		5
2540	28 1577 5141 C	HUNGERFORD	NH 5141	2026	2730	1250	KALAHARI	MAR. 1944	JUNE 1949	5
2541	28 1577 6453 D	TJOMPANI	NH 6453	2019	2737	1200	KALAHARI	OCT. 1915	JUNE 1954	6
2542	28 1577 6544 C	DOMBODEMA MISSION	NH 6544	2024	2737	1280	KALAHARI	OCT. 1930		5
2543	28 1577 6762 P	MALIKONGWA DIP	NH 6762	2014	2738	1260	KALAHARI	APR. 1959	JULY 1970	5
2544	28 1577 7847 T	RETREAT(PLUMTREE)	NH 7847	2023	2745	1280	KALAHARI	DEC. 1901	JUNE 1904	5
2545	28 1577 7930 S	SUNRIDGE FARM	NH 7930	2028	2745	1360	KALAHARI	OCT. 1974	DEC. 1980	5
2546	28 1577 0071 M	MATJINGE	NH 0071	2010	2746	1200	KALAHARI	DEC. 1981		5
2547	28 1577 0235 Q	PLUMTREE	NH 0235	2029	2748	1390	KALAHARI	NOV. 1933		5
2548	28 1577 0335 Z	PLUMTREE,RAIL/POLICE/SCH	NH 0335	2029	2749	1390	KALAHARI	NOV. 1962		5
2549	28 1577 0651 S	GWAMBE	NH 0651	2020	2750	1340	KALAHARI	NOV. 1954		6
2550	28 1577 0681 A	MTOFU	NH 0681	2004	2749	920	KALAHARI	FEB. 1960	NOV. 1977	5
2551	28 1577 9336 M	SEAFIELD	NH 9336	2028	2753	1400	KALAHARI	OCT. 1947	SEP. 1975	5
2552	28 1577 9843 N	TJANKWA	NH 9843	2026	2756	1380	KALAHARI	NOV. 1917	JUNE 1937	5
2553	28 1578 621 J	GULAKABILI	NJ 0621	1949	2644	1000	KALAHARI	JULY 1957	NOV. 1977	5
2554	28 1578 739 M	SALAMKOMO	NJ 0739	1937	2709	990	KALAHARI	OCT. 1953	APR. 1970	5
2555	28 1578 956 Y	GWABAZABUYA	NJ 0956	1924	2702	1010	KALAHARI	JULY 1954	JUNE 1976	5
2556	28 1578 1141 Z	NINTILI	NJ 1141	1931	2706	990	KALAHARI	MAY 1973	MAR. 1979	5
2557	28 1578 4244 X	DHLAMINI	NJ 4244	1930	2721	1000	KALAHARI	NOV. 1952		5
2558	28 1578 4524 B	TSHITATSHAWA	NJ 4524	1941	2726	1050	KALAHARI	SEP. 1974	JAN. 1978	5
2559	28 1578 4908 T	SITABANAKWA	NJ 4900	1950	2728	1080	KALAHARI	JUNE 1974	DEC. 1977	5
2560	28 1578 5206 E	NGAMO	NJ 5206	1907	2730	1020	KALAHARI	JULY 1916	SEP. 1930	6
2561	28 1578 6048 H	MPANEDZIBA	NJ 6048	1928	2734	1030	KALAHARI	JULY 1974	MAY 1978	5
2562	28 1579 227 A	MALINDI,RAIL	NK 0227	1845	2701	1070	KALAHARI	NOV. 1906	DEC. 1917	6
2563	28 1579 525 Z	WATERLOOP PUMPING STN.	NK 0525	1846	2702	1060	KALAHARI	OCT. 1957		6
2564	28 1579 1715 S	ANTOINETTE FARM	NK 1715	1852	2710	1010	KALAHARI	OCT. 1965	JUNE 1978	6
256[illegible]	[illegible] 1579 4909 P	KALUGU NGAMO	NK 4909	1854	2720	730	KALAHARI	MAR. 1972		6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2566	28 1677 164 Z	NTUNUNGWE	PH 0164	2013	2758	1300	KALAHARI	APR. 1959		5
2567	28 1677 330 N	EDWINTON(PLUMTREE)	PH 0330	2027	2800	1420	KALAHARI	JULY 1900	JUNE 1929	5
2568	28 1677 965 V	MANANDA DAM	PH 0965	2013	2803	1310	KALAHARI	APR. 1968		5
2569	28 1677 1235 N	MARULA SCHOOL	PH 1235	2029	2805	1460	KALAHARI	OCT. 1944	JULY 1975	5
2570	28 1677 1336 Y	MARULA RAIL	PH 1336	2029	2805	1450	KALAHARI	OCT. 1971		5
2571	29 1579 1982 K	TINDE	NK 1982	1815	2711	890	SEBUNGWE	JAN. 1903		7
2572	29 1579 6789 R	KAMAZEU	NK 6289	1811	2735	1020	SEBUNGWE	NOV. 1962	JUNE 1968	7
2573	29 1580 017 N	M'LIBIZI	NL 0017	1756	2704	490	SEBUNGWE	JAN. 1976	APR. 1981	6
2574	29 1580 3652 V	BINGA	NL 3652	1737	2720	620	SEBUNGWE	DEC. 1957		6
2575	29 1580 5613 B	KARIYANGWE MISSION	NL 5613	1758	2733	810	SEBUNGWE	JAN. 1900		7
2576	29 1580 6783 Y	CHETE	NL 6783	1721	2737	550	SEBUNGWE	FEB. 1901	AUG. 1971	6
2577	29 1580 7492 T	CHETE AGRIC	NL 7492	1715	2740	540	SEBUNGWE	FEB. 1903		6
2578	29 1580 8803 T	LUSULU	NL 8803	1804	2750	990	SEBUNGWE	OCT. 1940		7
2579	29 1580 9151 X	CHIZARIRA FOOTHILLS	NL 9151	1738	2752	850	SEBUNGWE	JULY 1969	NOV. 1976	6
2580	29 1580 9231 J	SIMAGOGAS RIDGE	NL 9231	1749	2752	1150	SEBUNGWE	OCT. 1973	NOV. 1976	7
2581	29 1580 9245 Z	CHIZARIRA GAME RESERVE	NL 9245	1741	2753	980	SEBUNGWE	JAN. 1960		7
2582	29 1580 9817 W	KALINYENGWA	NL 9817	1756	2756	850	SEBUNGWE	OCT. 1973	NOV. 1976	7
2583	29 1581 0504 N	SINAMWENDA	NM 0504	1709	2748	490	SEBUNGWE	FEB. 1960	MAR. 1975	6
2584	29 1581 0603 W	MWENDA RIVER	NM 0603	1709	2749	500	SEBUNGWE	FEB. 1963	MAR. 1975	6
2585	29 1679 1482 Y	ZHAMBA	PK 1482	1815	2804	1020	SEBUNGWE	JULY 1982		7
2586	29 1679 2892 F	SENGWA INSTITUTE	PK 2892	1811	2814	870	SEBUNGWE	NOV. 1972		7
2587	29 1679 2989 L	SENGWA GORGE	PK 2989	1811	2814	870	SEBUNGWE	SEP. 1965	JULY 1972	7
2588	29 1679 3598 Y	MANYONI	PK 3598	1807	2817	880	SEBUNGWE	DEC. 1963	MAR. 1972	7
2589	29 1679 4181 G	SENGWA BRIDGE	PK 4181	1816	2820	920	SEBUNGWE	JUNE 1904		7
2590	29 1679 4491 T	CHIEF SAI	PK 4491	1810	2822	980	SEBUNGWE	APR. 1972	JUNE 1978	7
2591	29 1679 4560 T	MANOTI	PK 4659	1827	2823	1100	SEBUNGWE	DEC. 1966	SEP. 1982	7
2592	29 1679 5177 P	NGOMENI DIP	PK 5177	1817	2826	900	SEBUNGWE	MAY 1972	AUG. 1978	7
2593	29 1679 5993 B	MANYEPA	PK 5993	1809	2831	1170	SEBUNGWE	MAY 1972		7
2594	29 1679 6165 N	MATETA C.SCHOOL	PK 6165	1824	2831	1130	SEBUNGWE	OCT. 1973	DEC. 1977	7
2595	29 1679 6259 Q	LUFUSE	PK 6259	1827	2832	1160	SEBUNGWE	NOV. 1965	JUNE 1978	7
2596	29 1679 7679 J	FOREST AREA WEST	PK 7679	1817	2840	1110	SEBUNGWE	FEB. 1969	FEB. 1979	7
2597	29 1679 8085 A	SWISWI RIVER	PK 8085	1813	2842	1130	SEBUNGWE	NOV. 1973	JULY 1975	7
2598	29 1679 8946 L	NYAJE	PK 8946	1834	2847	1130	SEBUNGWE	NOV. 1965	OCT. 1978	7
2599	29 1679 9278 X	MAFUNGABUSI FOREST AREA	PK 9278	1817	2849	1130	SEBUNGWE	JAN. 1967	AUG. 1980	7
2600	29 1679 9760 W	MAFUNGABUSI LUTOPE	PK 9760	1822	2852	1200	SEBUNGWE	JULY 1906		7
2601	29 1680 1168 B	ST ABUWA	PL 1168	1720	2803	660	SEBUNGWE	NOV. 1950		6
2602	29 1680 1490 K	CHUNGA	PL 1498	1712	2804	520	SEBUNGWE	FEB. 1903		6
2603	29 1680 2570 A	CHIKWAKARA	PL 2570	1727	2811	730	SEBUNGWE	OCT. 1974	APR. 1975	6
2604	29 1680 2945 H	SIMCHEMBU	PL 2945	1741	2814	720	SEBUNGWE	OCT. 1961		6
2605	29 1680 3372 X	NENYUNGA	PL 3372	1726	2815	600	SEBUNGWE	FEB. 1904		6
2606	29 1680 4157 A	ZHOMBA STORE	PL 4157	1734	2820	740	SEBUNGWE	DEC. 1975	JUNE 1977	6
2607	29 1680 4616 Z	CHIRISA	PL 4616	1756	2823	940	SEBUNGWE	SEP. 1976	NOV. 1977	7
2608	29 1680 5730 K	HUCHU SCHOOL	PL 5730	1749	2829	820	SEBUNGWE	JAN. 1906		6
2609	29 1680 5898 S	CHIFUDZE	PL 1680	1712	2829	640	SEBUNGWE	FEB. 1907		6
2610	29 1680 6630 X	SESSAMI RIVER	PL 6630	1745	2837	700	SEBUNGWE	FEB. 1966	NOV. 1978	6

RAINFALL STATION NETWORK

RECORD NUMBER	GRID REFERENCE	STATION NAME	TRUE CO-ORDS.	LAT.	LONG.	ALT.	CATCHMENT	FIRST RECORD	LAST RECORD	M.A.R.
2611	29 1600 7129 F	MASAKADZA	PL 7129	1750	2036	760	SEBUNGWE	APR. 1984		6
2612	29 1600 7159 N	CHIREYA AGRIC	PL 7159	1733	2037	660	SEBUNGWE	DEC. 1975		6
2613	29 1600 7819 F	GWAVE RIVER	PL 7819	1755	2041	790	SEBUNGWE	JAN. 1967	OCT. 1978	7
2614	29 1600 8005 H	TARE RIVER	PL 8005	1802	2042	870	SEBUNGWE	JAN. 1967	NOV. 1978	7
2615	29 1600 8312 R	ST.BONIFACE SCHOOL	PL 8312	1758	2044	830	SEBUNGWE	JUNE 1973	NOV. 1978	7
2616	29 1600 8415 D	NEMANGWE	PL 8415	1757	2045	800	SEBUNGWE	OCT. 1961	APR. 1973	7
2617	29 1600 8811 J	INYOKA	PL 8811	1753	2035	820	SEBUNGWE	JULY 1910	JUNE 1922	7
2618	29 1600 9433 K	DENDA	PL 9433	2132	3129	800	SEBUNGWE	APR. 1978	JULY 1978	7
2619	29 1600 9724 B	GORODEMA	PL 9724	1752	2052	820	SEBUNGWE	MAR. 1972	SEP. 1978	7
2620	29 1601 0815 H	SENGWA MOUTH	PM 0815	1703	2801	490	SEBUNGWE	OCT. 1978		6
2621	29 1601 2441 E	ISLAND 109	PM 2441	1649	2810	490	SEBUNGWE	JUNE 1967	JUNE 1982	6
2622	29 1601 4341 V	BUMI HILLS SAFARI LODGE	PM 4341	1647	2820	590	SEBUNGWE	APR. 1969		6
2623	29 1601 4441 D	BUME HILL P.O.D.	PM 4441	1647	2821	490	SEBUNGWE	NOV. 1962		6
2624	29 1601 4506 Z	SIAKOBVU	PM 4506	1708	2822	750	SEBUNGWE	JAN. 1983		6
2625	29 1601 5522 D	VULANDULI	PM 5522	1659	2827	470	SEBUNGWE	JULY 1975		6
2626	29 1601 5540 Y	TASHINGA	PM 5540	1649	2827	490	SEBUNGWE	OCT. 1967		6
2627	29 1601 7853 H	FOTHERGILL ISLAND	PM 7853	1642	2840	500	SEBUNGWE	DEC. 1978		6
2628	29 1601 8050 B	SPURWING ISLAND	PM 8050	1643	2841	490	SEBUNGWE	DEC. 1973		6
2629	29 1601 8340 R	SANYATI WEST	PM 8340	1649	2843	500	SEBUNGWE	FEB. 1982		6
2630	29 1779 0306 N	GOKWE	QK 0306	1813	2856	1280	SEBUNGWE	DEC. 1912		7
2631	29 1779 1976 R	NJELELE	QK 1976	1817	2904	1220	SEBUNGWE	NOV. 1965		7

APPENDIX C

INVENTORY OF EVAPORATION PAN STATIONS

Zimbabwe : Evaporation Stations

HYDR ZONE	REF No.	NAME OF STATION	ALT	LAT	LONG	OPENED	CLOSED	MEAN AN EVAP
			m	° 'S	° 'E			mm
AZ4	AE/ 4	Gokwe	1280	18 13	28 56	1958		2114
AG3	AE/ 5	Umgusa Dam	1220	20 01	28 32	1959		1894
AZ2	AE/ 7	Binga	620	17 37	27 21	1959		2285
AB1	AE/ 8	Lupane	1000	18 55	27 47	1959		1950
AG3	AE/ 9	Bulawayo Goetz Observatory	1340	20 09	28 37	1959		1969
AG5	AE/ 10	Kame Dam	1280	20 08	28 25	1959		1785
AZ1	AE/ 13	Victoria Falls Pump Station	884	17 55	25 51	1965		2126
AD	AE/ 14	Whange National Park Airport	1070	1844	26 55	1966		
AG4	AE/ 15	Tsholotsho Experimental Station	1070	19 52	27 47	1967		2267
AZ1	AE/ 16	Vic. Falls Airport Met. Station	1060	18 06	25 51	1967		2023
AN	AE/ 17	Mananda Dam	1318	20 13	28 03	1968		1824
BT4	BE/ 2	Matopos Research Station Nursery	1340	20 25	28 28	1959		1935
BUZ3	BE/ 3	West Nicholson	860	21 04	29 22	1959		1941
BL2	BE/ 4	BeitBridge	460	22 13	29 59	1959		2133
BNC	BE/ 5	Ncema Dam	1120	20 22	29 00	1960		1858
BT4	BE/ 6	Matopos Research Station Sandveld	1340	20 24	28 29	1961		2070
BUZ4	BE/ 8	Umzingwane Dam	1100	20 24	28 59	1963		1737
BIK	BE/ 9	Inyankuni Dam	1100	20 22	29 07	1963		1835
	BE/ 10	Shashi Irrigation Scheme	580					
BB1	BE/ 11	Chikwarakwara	244	22 19	31 03	1967	1977	
BIN2	BE/ 12	Rixon Dam	1220	20 00	29 12	1969		1873
CH5	CE/ 4	Cleveland Dam	1530	17 51	31 09	1958	1974	
CH5	CE/ 9	Kutsaga Tobacco Research Station	1470	17 56	31 05	1958		1929
CH4	CE/ 11	Lake McIlwaine	1350	17 53	30 46	1958		1612
CZ2	CE/ 12	Chirundu Sugar Estate	410	16 01	28 54	1957	1967	
CZ1	CE/ 13	Lake Kariba	560	16 32	28 37	1958		2331
CA2	CE/ 14	Karoi	1350	16 53	29 37	1958		1827
CUN5	CE/ 16	Ngesi Dam	1310	18 43	30 33	1958		1946
CUS	CE/ 18	Kadoma Cotton Research Station	1160	18 19	29 54	1958		2171
CUN3	CE/ 19	Dutchmans Pool Dam	1710				1979	
CH5	CE/ 20	Grasslands Research Station	1690	18 10	31 29	1961		1696
CH4	CE/ 21	Harare Agricultural Research Station	1500	17 48	31 03	1965		1662
CUF3	CE/ 22	Chibero Agricultural College	1330	18 05	30 40	1968		1915
CH4	CE/ 23	Gwebi Agricultural College	1450	17 41	30 51	1969		1830
CH3	CE/ 27	Banket Research Station	1240	17 19	30 24	1972		1782
DM7	DE/ 2	Henderson Lysimeter	1290	17 35	30 58	1957		1805
DM2	DE/ 3	Mount Darwin	960	16 47	31 36	1958		1853
DN1	DE/ 4	Mutoko Pump House	1260	17 45	32 13	1958		
DR6	DE/ 5	Rhodes Inyanga Orchard	1860	18 18	32 45	1962		1384
DM4	DE/ 7	Shamva Panmure	880	17 16	31 37	1972		1794
EO3	EE/ 3	Grand Reef	1020	18 58	32 28	1958		1943
ET2	EE/ 4	Umshandige Dam	950	20 09	30 48	1958		1529
EL1	EE/ 5	Hippo Valley Estate	350	21 10	31 33	1958	1967	
EL6	EE/ 6	Gwenoro Dam	1140	19 46	29 53	1958		1823
EUT2	EE/ 8	Kyle Dam	1050	20 16	31 03	1962		2060
EO5	EE/ 9	Erin Hydro Station	1890	18 23	32 40	1961		1389
EO1	EE/ 10	Nyanyadzi Irrigation Scheme	530	19 45	32 25	1961	1977	
ES2	EE/ 11	Chisumbanje Research Station	420	20 46	32 13	1961		2074
EUT1	EE/ 13	Esquilingwe Weir	460	20 51	31 18	1963		2096
EUT2	EE/ 14	Bangala Dam	555	20 42	31 14	1963		1923
EUT3	EE/ 15	Makaholi Experimental Station	1189	19 50	30 47	1964		1887
EUT1	EE/ 17	Buffalo Range	430	21 01	31 35	1967		1891
EO4	EE/ 18	Odzani Dam	1510	18 46	32 43	1973		1624
EUT3	EE/ 19	Masvingo PWE Office	1080	20 04	30 49	1972		1786
EC2	EE/ 21	Manjirenji Dam	540	20 38	31 37	1975		1863

Zimbabwe : Evaporation Stations

HYDR ZONE	REF No.	NAME OF STATION	ALT	LAT	LONG	OPENED	CLOSED	MEAN AN EVAP
			m	° 'S	° 'E			mm
EUT1	EE/ 22	Triagle Research Station	410	21 01	31 25	1970		1536
ES2	EE/ 23	Middle Save Met. Station						
FB	FE/ 1	Chipinge Meteorological Station	1134	20 12	32 37	1960		1612
FB	4	Chipinge Experimental Farm	1006	20 14	32 39	1963		1449
FH	7	Rupere Mount John Meikle Res. Stat.	1850	18 43	32 49	1969		1009
FH	8	Rupere Nursery John Meikle Res. Stat.	1610	18 43	32 50	1969		1101

All stations are equipped with painted and screened U.S. Class A pans.
Mean annual evaporation data upto 1980

APPENDIX D

INVENTORY OF HYDROMETRIC STATIONS

APPENDIX D

Zimbabwe: River Flow Recorder Stations

Abbreviations:

Br.	Bridge
Cf.	Confluence
C/S	Control section
C/W	Causeway
D.	Dam
D/S	Downstream
Est.	Estate
Fl.	Flume
G/W	Gauging Weir
N.	Notch
NRZ	National Railways of Zimbabwe
RC	Rural Council
Rd.	Road
Res.	Research
Reg.	Regeneration
Spt.	Spruit
Stat.	Station
S/W	Spillway
U/S	Upstream

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone A

HYDR ZONE	REF NR	RIVER : NAME	AREA sq km	LAT ° 'S	LONG ° 'E	OPENED	CLOSED	TYPE	NOTCH CAP m3/s	REMARKS
AB1	A 39	Bubi:Lupane G/W	4080	18 57	27 46	1965				
AB1	A 67	Bubi:Gourlay Block Flume	557	19 16	28 39	1975		F&P	7.45	
AB2	A 14	Bembesi:Motapa Mine Weir	2040	19 29	28 33	1952	1976			
AB2	A 46	Bembesi:Siamkolo Pool G/W	3570	19 09	27 53	1966	1979			
AB3	A 7	Ingwegwesi:Braemar C/W	508	19 37	28 41	1951				Now A44
AB3	A 9	Bembesi:Portwe Causeway	790	19 39	28 24	1951	1965			
AB3	A 10	Ngwenya:Ngwenya Dam S/W	39	19 56	28 52	1951	1953			Reopened 27/02/58
AB3	A 15	Ngwenya Dam D/S G/W	39	19 51	28 52	1952	1973			
AB3	A 17	Bembesi:Ingwegwesi G/W	1530	19 38	28 41	1953			121	Closed 1978/79
AB3	A 33	Bembesi trib:Lochard L/F Notch	1230	19 51	28 59	1961	1976			Records unreliable
AB3	A 34	Ingwegwesi trib:Allendale L/F	122	19 18	29 03	1959	1976			Records unreliable
AB3	A 44	Ingwegwesi:Braemar New C/W	547	19 37	28 41	1966				Closed 1978/79
AD	A 40	Deka:Lower Deka C/S	7650	18 06	26 43	1965	1971		0.106	
AD	A 57	Deka:H.Waldemaar G/W	2950	18 06	26 43	1971	1979	F&P	55.8	
AD	A 65	Deka:Deka Flume	2040	18 23	26 19	1973			28	
AG1	A 22	Gwayi:Kamativi G/W	38600	18 22	27 03	1955			80	
AG1	A 38	Gwayi:Dahlia Control Section	21200	18 36	27 10	1964	1978			
AG1	A 68	Gwayi:D/S Bembesi Confluence	14400	19 01	27 44	1975			150	
AG3	A 4	Umgusa:Sawmills G/W	2616	19 35	28 02					
AG3	A 5	Umgusa:Lower Dam S/W	474	20 02	28 32	1950	1976			Records unreliable
AG3	A 6	Umgusa:Upper Dam S/W	386	20 04	28 35	1951	1976			Records unreliable
AG3	A 24	Umgusa:Lower Dam D/S G/W	474	20 01	28 32	1956				
AG3	A 30	Matsheumhlope:Up. Hillside Dam		20 11	28 37	1959	1969			
AG3	A 31	Matsheumhlope:Low.Hillside Dam		20 11	28 37	1959	1969			
AG3	A 43	Umgusa:Buda 'C' G/W	2720	19 37	28 05	1965		F&P	62	
AG3	A 50	Umgusa:Umgusa Low. Dam U/S G/W	435	20 03	28 33	1968		F&P		
AG3	A 51	Umgusa:Upper Dam U/S G/W	321	20 05	28 36	1968		F&P		Records unreliable
AG3	A 62	Umguzan:Redwood Flume	181	19 44	28 24	1972				Composite with A63
AG3	A 63	Umguzan:Redwood Flume	181	19 44	28 24	1972				
AG4	A 53	Gwayi:Tsholotsho G/W	3660	19 44	27 48	1969				
AG5	A 1	Kame: Kame Dam U/S Notch		20 11	28 27	1925	1947			Bulawayo City Recorder
AG5	A 2	Kame:Kame Dam	399	20 08	28 25	1925	1947			Bulawayo City Recorder
AG5	A 3	Kame:Kame Dam D/S G/W	399	20 08	28 25	1925			119	Bulawayo City Recorder
AG5	A 8	Kame:Slights Weir	492	20 05	28 32	1951				+ L/F Notch 1955
AG5	A 35	Umganin:Sunnyside G/W	78	20 11	28 30	1960				

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone A

HYDR ZONE	REF NR	RIVER : NAME	AREA sq km	LAT ° 'S	LONG ° 'E	OPENED	CLOSED	TYPE	NOTCH CAP m3/s	REMARKS
AG5	A 45	Kame:Porter G/W	1410	19 51	28 01	1966			40.5	
AG6	A 23	Gwayi:Collaton Weir	13	20 20	28 24	1953	1975			
AG6	A 25	Umgululu:Caterham L/F Notch	537	20 21	28 17	1957	1964			
AG6	A 26	Umgululu:Figtree Dam D/S Notch	188	20 21	28 16	1957	1966			
AIN	A 66	Inyantue:Inyantue Flume	640	18 24	26 46	1974			13.9	
AL	A 52	Lukosi:Vic. Falls Road Flume	1300	18 24	26 36	1969				
AM	A 27	Matetsi:Railway Weir	1740	18 15	25 57	1958				Closed 1978/79
AM	A 58	Matetsi:Hillcrest G/W	1980	18 14	26 04	1971		F&P	39.3	
AN	A 47	Mananda:Mananda U/S G/W	184	20 15	28 03	1966			32.3	Closed 1978/79
AN	A 48	Amanzamnyama:Mananda D.U/S G/W	150	20 14	28 04	1967			2.5	Closed 1978/79
AN	A 49	Amanzamnyama:Mananda Dam S/W	383	20 13	28 03	1967			55.1	
AN	A 56	Amanzamnyama:Longwe Pan G/W	821	20 10	27 49	1970		F&P	58	
AR	A 54	Ruziruhuru:Chizarira Game Res.G/W	143	17 41	27 55	1969		F&P	34.2	
AR	A 59	Mwenda:Nuffield Res. Stat. Fl.	277	17 10	27 51	1971	1976		36.8	
AS1	A 36	Shangani:Gwayi confl. Flumes	17200	18 30	27 13	1961				
AS1	A 37	Kana:Japiwa Dip G/W	1370	18 34	27 33	1964			20.4	
AS1	A 42	Lubimbi:Hot Springs V-Notch		18 28	27 17	1965	1968			
AS2	A 19	Shangani:Tshotsholo C/W	15000	18 39	27 33	1954	1976			Flooded by new dam
AS2	A 41	Tshongokwe:Kana road G/W	502	18 40	27 34	1965			15.3	
AS3	A 13	Gweru:Gweru River C/W	4120	18 43	28 48	1952	1976		142	Records unreliable
AS3	A 28	Gweru:Ambleside G/W	1630	19 03	29 21	1958	1978		50.8	
AS4	A 11	Shangani:Shangani C/W	5100	18 56	28 52	1951	1982			
AS4	A 32	Shangani:Sir G.H.Bridge Flume	5910	18 55	28 52	1959			36.4	Closed 19/78/79
AS5	A 29	Vungu:Riverbound G/W	1840	19 06	29 03	1958				Closed 1978/79
AS6	A 18	Shangani:Up.L/F Rlwy.Weir	233	19 45	20 25	1954	1975			NRZ Recorder
AS6	A 20	Shangani:Low.Rlwy Weir	254	19 45	29 25	1953				NRZ Recorder
AS6	A 60	Tiyabenzi:Dam U/S Flume	137	19 37	29 24	1972			10.8	
AS6	A 61	Shangani:Tiyabenzi Dam U/S Fl.	622	19 39	29 22	1972			13.7	
AT	A 12	Tegwani Weir	73	20 23	27 48	1951				
AT	A 55	Tegwani:Madhlambudzi G/W	850	20 10	27 31	1970		F&P		
AZ2	A 64	Mlibizi:Mlibizi Flume	2600	18 01	27 07	1972		F&P	29.3	

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone B

HYDR ZONE	REF NR	RIVER : NAME	AREA sq km	LAT ° 'S	LONG ° 'E	OPENED	CLOSED	TYPE	NOTCH CAP. m3/s	REMARKS
BB1	B 27	Bubye:Chikwakwara G/W	8029	22 17	31 03	1957	1978	F&P		Unreliable
BB2	B 59	Bubye:BeitBridge Road C/S	4260	21 43	30 30	1965	1968			
BB3	B 63	Bubiana:Towla G/W	469	21 18	29 54	1966		F&P	53.3	
BIK	B 41	Inyankuni:Inya. Dam D/S L/F N.	365	20 23	29 08	1962			0.912	
BIK	B 60	Inyankuni:Inyankuni D. U/S G/W	194	20 18	29 06	1965				
BIK	B 61	Inyali:Inyankuni Dam U/S G/W	49	20 18	29 08	1965			14.2	
BIN1	B 13	Kangesi:Eskdale Causeway	456	20 36	29 25	1951				
BIN1	B 17	Insiza:Reitfontein Slope Area St.		20 22	29 15	1952	1973			Shifting bed:unreliable
BIN1	B 19	Insiza:Mayfair L/F Notch	1870	20 22	29 15	1953	1962			
BIN1	B 51	Insiza:Filabusi Upper Weir	2000	20 31	29 16	1964				Composite with B52
BIN1	B 52	Insiza:Filabusi Upper Weir L/F	2000	20 31	29 16	1964			5.05	
BIN1	B 65	Insiza:Silalabuhwa Dam D/S G/W	3030	20 47	29 22	1966	1978		9.74	
BIN1	B 66	Kangesi:Silalabuhwa D. U/S G/W	673	20 43	29 22	1966	1978		47.1	
BIN1	B 69	Insiza:Silalabuhwa Dam U/S G/W	2260	20 41	29 21	1966	1978		51.2	
BIN1	B 70	Insiza:Silalabuhwa Dam S/W	3042	20 47	29 22	1967	1978			Composite with B69
BIN1	B 92	Insiza:Mayfair Dam D/S G/W	1800	20 22	29 15	1976			1.5	
BIN2	B 57	Insiza:Rixon Dam D/S G/W	570	20 01	29 13	1965			40	
BIN2	B 74	Jama:Rixon Dam U/S G/W	75	19 59	29 10	1968			4.79	
BIN2	B 75	Insiza:Rixon Dam U/S G/W	401	19 57	29 12	1968			39.9	
BIN2	B 76	Insiza:Rixon Dam S/W	531	20 00	29 12	1968				
BIN2	B 88	Nyazani:Mayfair Dam U/S flume	389	20 11	29 11	1973			13.5	
BIN2	B 89	Insiza:Mayfair Dam U/S Flume	982	20 10	29 15	1973			15.4	Records unreliable in 1978/79
BL	B 35	Limpopo:BeitBridge Pump C/S	196000	22 13	29 59	1959				
BL	B 53	Limpopo:BeitBridge C/S	196000	22 13	30 00	1965	1975			
BM	B 5	Mchabezi:Gwanda Weir	940	20 57	29 00	1950				
BM	B 15	Lumane:Insindi Weir	267	20 46	28 59	1952				
BM	B 16	Mchabesi:Sheet Dam		20 49	28 57	1952			0.78	
BM	B 29	Mchabesi:Sheet Dam U/S G/W	363	20 45	28 56	1958			180	
BM	B 55	Mchabezi:Gwanda L/F G/W	987	20 58	28 59	1965			9.91	
BNC	B 1	Ncema:Ncema Dam U/S G/W	640	20 19	29 00	1943			25.4	Bulawayo City Council
BNC	B 2	Ncema:Ncema Dam	723	20 22	29 01	1943				Bulawayo City Council
BNC	B 3	Nceme:Ncema Dam D/S G/W	723	20 22	29 01	1943				Bulawayo City Council
BNC	B 4	Fern Spruit:Plot 19 Notch	83	20 17	28 57	1952				
BNC	B 6	Fern Spruit:Plot 26 Weir	34	20 18	28 54	1950				

Zimbabwe : River Flow Recorder Stations : Hydro Zone B

HYDR ZONE	REF NR	RIVER : NAME	AREA sq km	LAT ° 'S	LONG ° 'E	OPENED	CLOSED	TYPE	NOTCH CAP. m3/s	REMARKS
BNC	B 11	Ncema:Longdens Weir	218	20 12	28 56	1951				
BNC	B 32	Nicholson Sprt:Ncema Dam U/S G/W	21	20 21	28 59	1959			4.83	
BNC	B 36	Bumani:Ncema Dam U/S G/W	21	20 19	29 00	1959			3.41	
BN1	B 37	Mwenezi:Malapati Bridge C/S	13000	22 02	31 27	1959	1978			+ L/F Flume 01/11/65
BN2	B 28	Mwenezi:Jeka Bridge G/W	1990	20 50	29 56	1958			174	
BN2	B 58	Mwenezi:Hodgson's Weir	6500	21 23	30 43	1964	1975			Composite with B57
BN2	B 79	Mwenezi: Manyoshi G/W	4610	21 04	30 23	1969	1978			
BN3	B 14	Mwenezi:Inyesi Weir	260	20 36	29 35	1952	1979			
BR	B 64	Ingwezi:Ingwezi Dam U/S G/W	712	20 58	27 54	1966			37.2	
BR	B 71	Ramaquabane:Madabe Dam & S/W	213	20 51	27 43	1967	1974			
BR	B 72	Ingwezi:Ingwezi Dam S/W	862	21 02	27 55	1968	1977			
BR	B 73	Ingwezi:Ingwezi Dam D/S G/W	862	21 04	27 55	1968			15.5	
BR	B 84	Ingwesi:Dam Seepage Notch	862	21 02	27 55	1970			0.01	
BS2	B 86	Shashani:Shashi G/W	2770	21 42	28 47	1971			148	
BS3	B 12	Shashani:Antelope Mine Weir	666	21 03	28 26	1951	1970			
BS3	B 77	Shashani:Antelope Dam U/S G/W	539	20 58	28 21	1969				
BS3	B 78	Zgalangamate:Antelope U/S G/W	49	20 59	28 27	1969			6.79	
BS3	B 82	Shashani:Antelope Dam S/W	738	21 02	28 26	1970				
BS5	B 93	Mangwe:Mangwe Dam D/S G/W	230	20 55	28 28	1987			2.87	
BS6	B 26	Sansukwe:Ingwesi G/W	189	21 06	28 00	1955				
BT1	B 9	Thuli:Ntalali Causeway	5880	21 19	28 57	1951				+ L/F G/W 1957
BT1	B 85	Thuli:Shashi G/W	7670	21 45	29 03	1971			175	
BT2	B 87	Mwewe:Gwaranyemba T.T.L. Flume	1386	21 10	28 50	1972			60.3	
BT4	B 7	Mtsheleli:Freda Weir	1810	20 58	28 48	1950	1978			Composite with B54
BT4	B 23	Mpopoma:Mpopoma Dam D/S Flume	104	20 34	28 23	1955				
BT4	B 24	Mpopoma:Mpopoma Dam S/W	104	20 34	28 24	1955	1976			
BT4	B 39	Mpopoma:Mpopoma Dam U/S G/W	91	20 32	28 21	1960			19.6	
BT4	B 54	Mtsheleli:Freda L/F Weir	1810	20 58	28 58	1965	1978		16.7	Composite with B7
BT4	B 80	Maleme:Maizana U/S G/W	523	20 49	28 41	1970			40.4	Closed 1978/79
BT4	B 81	Ove:Mtshelele G/W	785	20 55	28 43	1970		F&P	31.8	
BT4	B 83	Mtshelele:Maizana U/S G/W	363	20 47	28 42	1969	1978			Reopened 1980
BT5	B 8	Thuli:Freda Weir	767	20 58	28 48	1950	1962			
BT5	B 31	Thuli:Thuli Gorge G/W	4140	21 05	28 50	1958				
BT5	B 56	Thuli:Makwe Dam U/S G/W	645	20 54	28 47	1965	1978		36	

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone B

HYDR ZONE	REF NR	RIVER : NAME	AREA sq km	LAT ° 'S	LONG ° 'E	OPENED	CLOSED	TYPE	NOTCH CAP. m3/s	REMARKS
BT5	B 67	Thuli:Makwe Dam	761	20 58	28 48	1966	1978			
BT5	B 68	Thuli:Makwe Dam D/S G/W	767	20 58	28 48	1966	1978		9.98	Reopened 1980
BUZ1	B 90	Mtetengwe:Mtetengwe Weir	1510	29 55	22 01	1976				
BUZ1	B 91	Umzingwane:Kwalu G/W	4100	29 39	21 45	1975				
BUZ3	B 20	Umzingwane:Glass Block G/W	2530	20 35	29 11	1953				Closed 1978/79
BUZ3	B 22	Umzingwane:Liebig's Weir	7340	21 03	29 22	1953	1962			
BUZ3	B 50	Umzingwane:Cloete's Causeway	3600	20 55	29 18	1964	1976			Records unreliable
BUZ4	B 10	Umzingwane:Umz. Dam D/S G/W	490	20 24	28 59	1951				
BUZ4	B 30	Umzingwane:Umzing. Dam U/S G/W	448	20 22	28 54	1958			4.94	Bulawayo City Council
BUZ4	B 33	Umzingwane:Umzingwane Dam	480	20 24	28 59	1959	1959			Bulawayo City Council
BUZ4	B 34	Umzingwane:Dam Compensation N.	480	20 24	28 59	1959			0.079	
BUZ4	B 38	Umzingwane:Umzingwane Dam S/W	479	20 24	28 59	1959				
BUZ4	B 40	Umzingwane:Umzing. Dam D/S Fl.	496	20 24	29 01	1060			33	
BUZ4	B 62	Umzingwane:Doddieburn Rnch G/W	9740	21 24	29 23	1966		F&P	141	

Zimbabwe : River Flow Recorder Stations : Hydro Zone C

HYDR ZONE	REF NR	RIVER : NAME	AREA sq km	LAT ° 'S	LONG ° 'E	OPENED	CLOSED	TYP	NOTCH CAP. m3/s	REMARKS
CA2	C 86	Angwa:Chengu Farm	656	17 10	29 58	1975			6.58	
CH1	C 69	Dande:Chitanha Flume	1280	16 31	30 33	1966	1976			
CH2	C 53	Draai trib.:Mtoroshanga No.1		17 10	30 41	1960	1966			R/O research:0.2 ha plots
CH2	C 54	Draai trib.:Mtoroshanga No.2		17 10	30 41	1960	1966			R/O research:0.2 ha plots
CH2	C 55	Draai trib.:Mtoroshanga No.3		17 10	30 41	1960	1966			R/O research:0.2 ha plots
CH2	C 56	Draai trib.:Mtoroshanga No.4		17 10	30 41	1960	1966			R/O research:0.2 ha plots
CH2	C 57	Manyame:Nyakapupu C/S	9744	16 40	30 29	1960	1974			
CH2	C 63	Manyame:Mhangura Mine Weir	7900	16 57	30 21	1965			74.3	
CH2	C 64	Manyame:Nyakapupu G/W	9744	16 40	30 29	1965				
CH2	C 77	Manyame:Yomba D/S G/W	8010	16 55	30 22	1972			24.5	
CH2	C 80	Mesitkwe:Berry's Post G/W	1140	16 49	30 30	1974	1978			
CH3	C 17	Manyame: Hunyani Poort Dam	2220	17 53	30 46	1952				
CH3	C 25	Mukwadzi:Ayres Poort G/W	282	17 26	30 37	1953	1966			
CH3	C 51	Manyame:Roehampton C/S	3850	17 49	30 15	1958	1976			
CH3	C 61	Manyame:Chinhoyi Old Rd Br.G/W	5340	17 21	30 13	1964			16.52	
CH3	C 74	Manyame:Mukwadzi G/W	6110	17 05	30 18	1971			49.5	
CH3	C 75	Mukwadzi:Manyame Confl. G/W	1730	17 06	30 19	1971			35	
CH3	C 85	Muneni:Banket W/S Dam D/S G/W	187	17 28	30 28	1975			2.61	
CH3	C 89	Manyame:Darwendale D. D/S G/W	3790	17 49	30 30	1976		F&P	15.5	
CH3	C 90	Manyame:Darwendale Dam	3790	17 49	30 30	1977				
CH3	C ***	Mukwadzi:Mazvikadei D. D/S G/W		17 13	35 24	1988			8.65	
CH4	C 24	Marimba:Hunyani Poort U/S G/W	189	17 55	30 52	1953			17.1	
CH4	C 27	Manyame:Huny. Poort D. D/S G/W	2220	17 53	30 46	1953	1977			Flooded by Darwend. D.
CH4	C 52	Gwebi:Longwood G/W	759	17 46	30 33	1958	1975			Replaced by C83
CH4	C 79	Umzururu:Darwendale D. U/S G/W	221	17 47	30 40	1973			7.35	
CH4	C 83	Gwebi:Darwendale D.U/S Fl. + G/W	362	17 37	30 37	1973			49.1	
CH4	C 91	Avondale Spt.:Kensington		17 48	31 01	1977	1980			Canal
CH4	C 92	Avondale Spt.:2nd Street Ext.	5.67	17 48	31 02	1977	1980			Bridge culvert
CH5	C 1	Mukuvisi:Cleveland Dam	18	17 51	19 09	1913	1976			Records unreliable
CH5	C 2	Manyame:Prince Edw.Dam U/S G/W	777	18 00	31 07	1942	1972			
CH5	C 3	Manyame:Prince Edw.Dam D/S G/W	793	17 59	31 04	1974				
CH5	C 21	Manyame:Huny. Poort D. U/S G/W	1510	17 58	30 54	1952			95	
CH5	C 22	Mukuvisi:Huny. Poort D.U/S G/W	231	17 57	30 54	1952			14.7	

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone C

HYDR ZONE	REF NR	RIVER : NAME	AREA sq km	LAT ° 'S	LONG ° 'E	OPENED	CLOSED	TYP	NOTCH CAP. m3/s	REMARKS
CH5	C 23	Nyatsime:Edinburgh G/W	500	18 04	31 04	1953				Flood damage 1974
CH5	C 28	Mukuvisi:Cleveland Dam D/S G/W	20	17 51	31 09	1954				
CH5	C 43	Manyame Trib:Grasslands G/W	3.5	18 10	31 29	1955				
CH5	C 45	Mukuvisi:Cleveland Dam L/F G/W	18	17 51	31 09	1955	1976			
CH5	C 49	Chiripagura:Forest Nursery G/W	2.59	17 49	31 05	1957			0.122	
CH5	C 81	Manyame:Henry Hallam D. U/S G/W	488	18 00	31 09	1974				
CH5	C 82	Ruwa:Henry Hallam D. U/S G/W	189	17 57	31 09	1974				
CH5	C 97	Duri:Seki Duri	13.3	18 02	31 05	1979				
CH5	C 98	Nyamafufu:Seki	11.5	18 04	31 06	1979				
CH5	C 99	Castle Kop Str.:Amalinda Pol.G/W	23	17 55	30 53	1982				
CS	C 59	Sanyati:Copper Queen C/S	37500	17 30	29 24	1962	1979			Reopened 1981
CUF1	C 62	Mupfure:Copper Queen C/S	11900	17 30	29 24	1965	1973			
CUF1	C 84	Mupfure:Copper Queen G/W	12100	17 30	29 25	1974	1979			Reopened 1981
CUF2	C 12	Mupfure:Twyford Weir	5180	18 07	30 13	1950			12.6	+ L/F notch on crest
CUF2	C 78	Mupfure:Johannadale Flume	8240	17 52	29 55	1973	1979	F&P		
CUF3	C 10	Mupfure:Lower Seigneury Weir		18 12	30 22	1950	1966			
CUF3	C 44	Mupfure:Low.Seign Dam D/S G/W		18 11	30 22	1955	1972			Operable when Poole D.drawn down.
CUF3	C 60	Mupfure:Poole Dam U/S Flume		18 10	30 17	1964	1966		4.05	
CUF3	C 65	Mupfure:Upper Seigneury U/S G/W	4144	18 14	30 26	1964	1979	F&P	33.8	Reopened 1980
CUF3	C 66	Sivundazi:Bougainvillea G/W	195	18 14	30 26	1966	1967			
CUF3	C 67	Mupfure:Maynard Weir U/S G/W	3650	18 14	30 30	1966	1979		25.7	Reopened 1981
CUF4	C 70	Mupfure:Beatrice G/W	1210	18 15	30 46	1969			202	
CUF4	C 71	Mtsike:Denby Flume	329	18 15	30 45	1969	1974			No records:recorder outflanked
CUF4	C 72	Nyachidze:Nyachidze G/W	130	18 07	30 51	1969	1977			
CUG2	C 68	Musengesi:Aurelia Flumes	951	16 37	31 05	1966				
CUN1	C 88	Munyati:Copper Queen	24400	17 37	29 20	1976	1978			Reopened 1981
CUN2	C 8	Munyati:Power Station Weir	5890	18 39	29 47	1949				
CUN2	C 30	Munyati:Rhodesdale L/F G/W	2780	18 47	30 13	1954				
CUN2	C 94	Munyati:Power Station Flume	5900	18 39	29 47	1977				No rating table
CUN3	C 7	Kwekwe:Cactus Poort Dam	1250	19 03	29 48	1949				Recorder installed 1951
CUN3	C 9	Kwekwe:Cactus Poort D. D/S G/W	1250	19 03	29 47	1949			28.7	
CUN3	C 11	Kwekwe:Cactus Poort D. U/S G/W	1220	19 04	29 49	1950			43.2	
CUN3	C 13	Kwekwe:Whitewaters Dam U/S G/W	150	19 22	30 01	1950			8.9	Gweru City Council

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone C

HYDR ZONE	REF NR	RIVER : NAME	AREA sq km	LAT ° 'S	LONG ° 'E	OPENED	CLOSED	TYP	NOTCH CAP. m3/s	REMARKS
CUN3	C 14	Kanuka:Whitwaters Dam U/S G/W	101	19 24	30 03	1950			8.9	
CUN3	C 15	Kwekwe:Whitewaters Dam D/S G/W	326	19 19	30 00	1950			3.1	Gweru City Council
CUN3	C 16	Kwekwe:Whitewaters Dam	326	19 20	30 00	1951				
CUN3	C 29	Sebakwe:Dutchman's Pool Dam	4170	18 51	29 49	1954				
CUN3	C 31	Bembezaan:Rockdale G/W	391	19 06	30 04	1954	1979	F&P		
CUN3	C 36	Sebakwe:Dutchmans Pool D/S G/W	4170	18 51	29 49	1954			111	
CUN3	C 46	Sebakwe:Dutch. Pool D. U/S G/W	3390	18 52	29 54	1955			6.1	
CUN3	C 58	Bembezaan:Dutch.Pool D. + C/S		18 56	29 55	1961	1973			
CUN4	C 32	Sebakwe:Sebakwe Dam D/S G/W	2640	19 01	30 13	1954			247	
CUN4	C 33	Sebakwe:Chivhu G/W	194	19 06	30 53	1954				
CUN4	C 34	Little Sebakwe:Ortons Drft G/W	119	19 09	30 38	1954	1976			
CUN4	C 35	Umvumi:Nyamafufu G/W	285	19 14	30 25	1954	1976			
CUN4	C 37	Sebakwe:Roger's Pool G/W	800	19 09	30 41	1954	1974			
CUN4	C 39	Weriwedzi:Sebakwe Dam U/S G/W	17.5	19 03	30 17	1955			15.3	
CUN4	C 41	Umvumi:Sebakwe Dam U/S G/W	855	19 04	30 21	1955			83.4	
CUN4	C 42	Chimachi:Sebakwe Dam U/S G/W	36	19 02	30 20	1955			12.6	
CUN4	C 47	Sebakwe:Sebakwe Dam U/S G/W	1550	19 04	30 21	1956			217	
CUN4	C 50	Sebakwe:Sebakwe Dam	2538	19 02	30 15	1957				
CUN5	C 4	Ngesi:Ngesi Dam	1304	18 43	30 23	1946				Recorder installed 1951
CUN5	C 5	Ngesi:Ngesi Dam D/S G/W	1400	18 44	30 23	1947			34.8	
CUN5	C 6	Ngesi:Ngesi Dam U/S G/W	1040	18 40	30 31	1948				
CUN5	C 20	Ngesi:Rhodesdale L/F G/W	1820	18 44	30 14	1952			2.76	
CUN6	C 18	Munyati:Dyke G/W	2630	18 49	30 19	1952	1976		11.3	
CUS	C 40	Umsweswe:Carbis Ranch G/W	474	18 30	30 24	1955	1979	F&P	75.7	
CUS	C 48	Umsweswe:Claw Dam D/S G/W	2480	18 27	29 52	1956			83.5	Formerly Umsw.Lion Farm G/W
CUS	C 87	Umsweswe:Claw Dam U/S G/W	1990	18 27	29 59	1973			47.3	

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone D

HYDR ZONE	REF NR	RIVER : NAME	AREA	LAT	LONG	OPENED	CLOSED	TYPE	NOTCH CAP	REMARKS
			sq km	° 'S	° 'E				m3/s	
DIY1	D 2	Umwindsi:Kilmuir G/W	241	17 44	31 18	1925			4.15	
DIY1	D 10	Umwindsi:Lion's Head G/W	829	17 32	31 30	1951	1978		18.2	Reopened 1980
DIY1	D 14	Marsala:Marsala G/W	29	17 37	31 28	1956	1978		3.79	To be re-rated
DIY1	D 15	Domvorgwe:Bally Vaughan G/W	24	17 40	31 22	1956	1979		0.175	Reopened 1980
DIY1	D 16	Double Spruit:Frascati G/W	39	17 35	31 27	1956	1978		2.18	Reopened 1980
DIY1	D 17	Manyongo:Nthaba G/W	36	17 44	31 11	1956			0.624	
DIY1	D 20	Umtenje:Meadows L/F Notch	80	17 43	31 20	1956	1979		1.75	Reopened 1980
DIY1	D 21	Mabfen:Atlanta L/F Notch	114	17 43	31 22	1956	1979		1.45	Reopened 1980
DIY1	D 22	Umwindsi:Bally Vaughan Flume	658	17 40	31 23	1956	1973			
DIY1	D 37	Domvorgwe:Bally Vaughan Intake Notch	22	1739	31 2231 2	1965	1972			
DIY1	D 45	Munenga:Bally Vaughan G/W	137	17 40	31 23	1968	1979		6.06	Reopened 1980
DIY2	D 6	Shawanoya:Mutoko Road Bridge	1170	17 38	31 36	1949	1978			
DIY2	D 11	Munenga:Chabwino Dam		17 41	31 36	1952	1962			
DIY2	D 67	Nyakomberi:Seaton	157	18 03	31 42	1972			4.22	
DIY2	D 68	Nyamtorwa:Seaton	55	18 02	31 42	1972			3.72	
DIY3	D 7	Inyagui:Mutoko Road Bridge	1600	17 38	31 32	1949	1978			
DIY3	D 12	Ruwidzi:Goromonzi Dam	5.7	17 52	31 22	1954				
DIY3	D 58	Inyagui:Inyagui Dip Flume & G/W	1590	17 39	31 32	1970	1978			Not rated
DIY3	D 62	Chinyika:Northfield Flume	158	17 48	31 30	1971			6.27	Temp. closure 1979:reopened 1980
DIY3	D 63	Nyura:Northfield G/W	329	17 50	31 30	1971			4.05	Temp. closure 1979:reopened 1980
DIY3	D 64	Chinyika:Chinwiri Estates G/W	173	17 58	31 32	1971			4.09	
DIY3	D 65	Nyambuya:Chinwiri Estates G/W	440	17 59	31 32	1971			15.2	
DIY3	D 66	Inyagui:Chinwiri Estates G/W	124	17 58	31 34	1971			44.5	
DM1	D 35	Mazowe:Nyatana Control Section	9270	16 43	32 33		1976			
DM2	D 52	Ruia:Frogmore U/S G/W	59.6	17 05	30 56	1969			4.05	
DM2	D 53	Masawere:Frogmore U/S G/W	24.6	17 04	30 56	1970			4.05	
DM2	D 54	Ruia:Frogmore D/S G/W	127	17 07	31 00	1969			10.7	
DM2	D 59	Ruia:Ruia Falls Flume	426	16 50	31 17	1970	1977	F&P		
DM3	D 42	Mufurudzi:Eben Dam U/S G/W	163	17 10	31 30	1968			37.4	
DM3	D 43	Mufurudzi:Eben Dam D/S G/W	288	17 09	31 32	1968			4.04	
DM3	D 69	Mufurudzi:Eben Dam Spillway	288	17 09	31 32	1972				
DM4	D 25	Mazowe:Panmure L/F G/W	4540	17 16	31 37	1958	1974			
DM4	D 34	Mazowe:Panmure Control Section	4550	17 16	31 37	1964	1974			

Zimbabwe : River Flow Recorder Stations : Hydro Zone D

HYDR ZONE	REF NR	RIVER : NAME	AREA sq km	LAT ° 'S	LONG ° 'E	OPENED	CLOSED	TYPE	NOTCH CAP m3/s	REMARKS
DM4	D 41	Mazowe:Lion's Den G/W	3300	17 17	31 33	1967			114	
DM4	D 70	Sambi:Foothills G/W	316	17 15	31 17	1974			1.31	
DM5	D 9	Poti:Arcadia G/W	1060	17 22	31 26	1950	1962			
DM5	D 24	Poti:Arcadia U/S G/W	1060	17 22	31 26	1958			9.71	
DM5	D 44	Pote:Myross G/W	1220	17 16	31 33	1968			65.3	
DM6	D 26	Little Mazowe:Maz.Cit. Est.L/F N.	65	17 29	31 00	1961				
DM6	D 29	Tatagura:Maz. Citrus Est. L/F N.	67	17 31	30 59	1962			0.618	
DM6	D 30	Mazowe:Citrus Est. Intake L/F G/W		17 30	30 59	1962				
DM6	D 31	Urry's Spruit:Maz.Cit.Est.L/F N.	18.7	17 26	31 01	1962			0.265	
DM6	D 32	Mazowe:Cit.Est.Bloomfield L/F N.	547	17 24	31 04	1962			1.813	
DM6	D 33	Little Mazowe:Cit. Est.Syphon N.	34	17 28	30 59	1962				
DM6	D 38	Mazowe:Bindura Sangere	2360	17 18	31 18	1967			5.936	
DM6	D 60	Mazowe:Virginia G/W	655	17 21	31 05	1971			3.98	
DM7	D 1	Mazowe:Mazowe Dam S/W	334	17 31	30 59	1918				Recorder installed 1952
DM7	D 4	Dassura:Mazowe Dam U/S G/W	70	17 34	31 00	1927				Flooded by Mazowe Dam Raising
DM7	D 5	Mazowe:Mazowe Dam U/S G/W	223	17 34	31 00	1927				Flooded by Mazowe Dam Raising
DM7	D 27	Dassura:Mazowe Dam U/S G/W	70	17 34	31 00	1961			8.98	Replaced D4
DM7	D 28	Mazowe:Mazowe Dam U/S G/W	223	17 35	31 01	1962			2.49	Replaced D5
DN2	D 56	Nyazikatsi:Pirimangwe Flume	284	17 35	32 02	1970	1978			Reopened 1981
DN2	D 57	Nyadire:Pirimangwe F.& L/F G/W	510	17 34	32 01	1970	1978			Reopened 1981
DR1	D 8	Mudzi:Mutoko Dam		17 23	32 19	1949	1963			
DR4	D 47	Nyagadzi:Weya G/W	233	18 01	32 09	1969			60.2	
DR5	D 46	Mwarazi:Mwarazi Dam U/S G/W	202	18 12	32 12	1968			59.7	
DR5	D 55	Dora:Mwarazi Dam U/S G/W	63.4	18 14	32 13	1969			4.32	
DR6	D 13	Mare:Mare Dam D/S G/W	8.6	18 18	32 46	1955			4.43	
DR6	D 18	Mare:Mare Dam	8	18 18	32 46	1956	1966			
DUR1	D 39	Wengi:Mwenje D.Limbeck D/S G/W	570	17 19	31 03	1967			26.5	
DUR1	D 48	Wengi:Mwenje Dam U/S Flume	399	17 15	30 57	1969			31.1	
DUR1	D 49	Sawi:Mwenje Dam U/S G/W	109	17 10	30 59	1969				
DUR1	D 50	Nyamasanga:Mwenje Dam U/S Flume	13	17 13	30 59	1970			0.896	
DUR1	D 61	Wengi:Mwenje Dam Outlet Flume	557	17 16	31 02	1971			2.96	
DUR2	D 3	Murowodzi:Glen Grey Weir		17 19	31 03	1962				
DUR2	D 23	Murowodzi:Kia Ora G/W	715	17 20	31 00	1957	1983		43.4	

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone D

HYDR ZONE	REF NR	RIVER : NAME	AREA	LAT	LONG	OPENED	CLOSED	TYPE	NOTCH CAP	REMARKS
			sq km	° 'S	° 'E				m3/s	
DUR2	D 40	Murowodzi:Glengrey Drift	1400	17 20	31 04	1967			3.29	
DUR2	D 51	Murowodzi:Kilmer Flume	777	17 20	31 02	1970			3.69	

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone E

HYDR ZONE	REF NR		RIVER : NAME	AREA	LAT	LONG	OPENED	CLOSED	TYPE	NOTCH CAP.	REMARKS
				sq km	° 'S	° 'E				m3/s	
EC1	E	17	Chiredzi:Ruware Ranch G/W	1700	20 46	31 38	1952			40.3	
EC1	E	95	Luhlangwalungwe:Nandi Fl.# 1		21 02	31 38	1965	1966			
EC1	E	96	Luhlangwalungwe:Nandi Fl.# 2		21 01	31 39	1965	1966			
EC1	E	97	Luhlangwalungwe:Nandi Fl.# 3		21 00	31 41	1965	1966			
EC1	E	98	Luhlangwalungwe:Nandi Fl.# 4		20 59	31 41	1965	1966			
EC1	E	113	Mungwesi:Sanga Flumes	461	20 52	31 35	1966	1979	F&P	60.1	
EC1	E	142	Chiredzi:R/B Canal Pickup Weir	2460	20 55	31 38	1972				
EC1	E	145	Chiredzi:R/B Canal Pickup Bypass		20 55	31 40	1973			0.65	
EC2	E	108	Chiredzi:Manjirenji D. U/S Fl.	1040	20 29	31 32	1966				
EC2	E	159	Mururezi:U/S Canal Confluence	181	20 30	31 36	1975			5.36	
EL1	E	168	Mlemi:Mlemi River G/W		21 09	31 32	1982				
EL1	E	169	Mamandi:Mamandi G/W		21 10	31 45	1982			0.648	
EL1	E	170	Mteri:Hippo Valley Reg. FL.		21 09	31 35	1982				
EL2	E	83	Runde:Tokwe Cf.U/S C/S & L/F N.	15400	21 10	31 12	1962				
EL2	E	110	Runde:Rhino C/S		20 55	30 49	1966	1966			
EL2	E	133	Runde:Runde Ingesi Flumes	5390	20 37	30 27	1970			3.98	
EL3	E	13	Runde:Zvishavane Old Mine Weir	4020	20 16	30 08	1950	1972			
EL3	E	74	Runde:Tokwe Cf.D/S C/S+L/F G/W	22500	21 08	31 16	1961				
EL4	E	33	Gwetshetshe:Standhope G/W	18.1	19 44	29 43	1957	1977			
EL4	E	137	Runde:Wande G/W	2510	20 01	30 01	1971			43.5	
EL5	E	40	Little Umtebekwe:Mt. Bougai G/W	285	19 49	30 03	1958				Temporary closure 1978
EL5	E	42	Umtebekwe:Rietfontein G/W	648	19 53	29 57	1959				Temporary closure 1979
EL5	E	138	Umtebekwe:Mashawa G/W	142	19 30	30 06	1971	1978	F&P		
EL6	E	23	Nyamadziwa:Gwenoro Dam U/S G/W	85.5	19 41	29 51	1955			38.2	
EL6	E	25	Runde:Gwenoro Dam D/S G/W	422	19 47	29 52	1955				
EL6	E	30	Runde:Gwenoro Dam U/S G/W	254	19 41	29 52	1956			64.6	
EL6	E	31	Gwenoro:Killarney G/W	16.3	19 42	29 52	1957			13.3	
EL6	E	38	Runde:Gwenoro Dam Spillway	422	19 46	29 52	1958				
EL6	E	93	Impali:Impaluli G/W	124	19 47	29 55	1965			8.44	
EL6	E	156	Impali:impali Dam U/S Flume	43.7	19 39	29 56	1974			0.939	
EM1	E	123	Mare:Condo U/S G/W	492	19 00	31 55	1969			48	
EM2	E	10	Lesapi:Rusape R.C. Weir	632	18 32	32 07	1950	1973			
EM2	E	19	Macheke:Condo U/S G/W	3320	18 55	31 57	1954			137	

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone E

HYDR ZONE	REF NR		RIVER : NAME	AREA sq km	LAT ° 'S	LONG ° 'E	OPENED	CLOSED	TYPE	NOTCH CAP. m3/s	REMARKS
EM2	E	109	Chitora:Woodlands G/W	26	18 25	32 11	1966			16.52	
EM2	E	131	Lesapi:Lesapi Dam D/S G/W	676	18 36	32 05	1970			30	
EM2	E	136	Lesapi:Lesapi Dam U/S G/W	635	18 33	32 07	1971			15.1	
EM2	E	141	Macheke:Lesapi D/S G/W	2820	18 43	32 01	1972				
EM2	E	152	Chimbi:Glenfarg G/W	146	18 26	32 11	1974			3.91	
EM3	E	63	Macheke:Mere G/W	989	18 26	31 51	1960	1977			
EM3	E	139	Mezi:Tandi G/W	329	18 32	31 59	1972				
EN1	E	150	Ingesi:Sivumba Flume	4230	20 34	30 17	1973	1978			
EN2	E	35	Umchingwe:Mberengwa Rd.Br.G/W	1630	20 25	29 52	1957	1978			
EN2	E	124	Umchingwe:Umch. D. Outlet V N.		20 12	29 31	1969	1976			
EN3	E	28	Ingesi:Mberengwa Rd.Br.G/W	1680	20 22	29 54	1956	1978			
EN3	E	163	Ingesi:Palawan Dam U/S G/W	1180	20 06	29 46	1978				
EN3	E	164	Ingesi:Palawan Dam	1313	20 06	29 48	1978				
EO1	E	9	Odzi:Hot Springs G/W	6300	19 38	32 28	1950	1977			
EO1	E	90	Nyanyadzi:Nya.Dam D/S G/W	458	19 45	32 36	1968				
EO1	E	119	Nyanyadzi:Nyany. D. D/S G/W	458	19 45	32 36	1968			85.5	Temp.closure 1978:re-opened 1980
EO1	E	120	Piriviri:Nyany. D. U/S G/W	150	19 46	32 40	1968	1978			
EO1	E	121	Nyanyadzi:Nyany. D. U/S G/W	186	19 45	32 41	1968	1978		88.8	Temp.closure 1978:re-opened 1981
EO1	E	122	Makwe:Nyany. D. U/S/G/W	83	19 46	32 49	1969	1969			
EO1	E	125	Umvumvumvu:Old Cashel Rd.Br.G/W	433	19 31	32 37	1970				
EO1	E	126	Shinja:Nyanyadzi G/W	194	19 44	32 37	1969	1978			
EO1	E	130	Odzi:Odzi Gorge G/W	7324	19 46	32 24	1970		F&P		
EO2	E	12	Odzi:Maranke Weir	3200	19 08	32 28	1950	1976			
EO2	E	29	Impudzi:Zimunya G/W	75.1	19 08	32 40	1956	1978			
EO2	E	144	Impudzi:Chitora G/W	217	19 18	32 35	1973			23.7	Temp.closure 1979:re-opened 1982
EO2	E	146	Shetora:Impudzi Flume	241	19 19	32 35	1973			21.1	
EO3	E	1	Mutare:Premier Estate G/W	249	18 55	32 33	1925				
EO4	E	18	Odzani:Municipal Intake G/W	161	18 46	31 42	1954			79.6	
EO4	E	32	Odzani:Odzani Irr. Board Intake	225	18 47	32 37	1957			0.84	
EO4	E	53	Odzani:Flintell L/F G/W	391	18 49	32 31	1960	1977			
EO4	E	61	Odzi:Odzi Bridge C/S	2450	18 55	32 25	1960			1.17	
EO4	E	72	Nyakawunga:Odzani Dam U/S G/W	8.4	18 47	32 45	1961			7.35	
EO4	E	88	Odzani:Odzani Mun.Intake Spillage		18 46	32 41	1954	1971			

Zimbabwe : River Flow Recorder Stations : Hydro Zone E

HYDR ZONE	REF NR		RIVER : NAME	AREA sq km	LAT ° 'S	LONG ° 'E	OPENED	CLOSED	TYPE	NOTCH CAP. m3/s	REMARKS
EO4	E	104	Odzani:Odzani Dam G/W	57	18 46	32 45	1966	1983			
EO4	E	105	Odzani:Odzani Dam D/S G/W	75.4	18 46	32 43	1966			2.94	
EO4	E	106	Nyambwa:Drennan G/W	77.7	18 45	32 43	1966			37.5	
EO4	E	147	Inyamajura:Simondale G/W	318	18 48	32 28	1973				
EO4	E	148	Nyatanda:Odzi Confluence G/W	679	18 44	32 19	1973			27.5	
EO4	E	155	Nyambwa:Eastbourne U/S G/W	40	18 43	32 45	1974			5.3	
EO4	E	162	Odzi:Odzi Falls Flume	2165	18 53	32 26	1976			54.7	
EO5	E	39	Erin:Hydro. Station Upper G/W	0.21	18 23	32 40	1958				
EO5	E	41	Erin:Hydro. Station Lower G/W	0.97	18 24	32 40	1959				
EO5	E	73	Odzi:Selbourne G/W	181	18 32	32 38	1961			61.1	
EO5	E	127	Nyamazi:Selbourne G/W	67.3	18 32	32 38	1970			1.38	
EO5	E	128	Nyakupinga:Minnehaha G/W	46.6	18 28	32 42	1970				
EO5	E	129	Odzi:Minnehaha G/W	75.1	18 28	32 41	1970			36.4	
EO5	E	132	Umvumira:Lisnakea	34	18 25	32 31	1970			19.4	
EO5	E	157	Erin:Hydro Stat. V Notch	0.97	18 24	32 40	1975	1976			
ER1	E	27	Ruzawi:Condo U/S G/W	2070	18 55	31 56	1956	1978			
ER2	E	47	Wenimbi:Idapu Flume	375	18 32	31 39	1959			29	
ER2	E	50	Chinekwa:Scorror Estates G/W	168	18 32	31 32	1959				
ER2	E	56	Karimbi:Igudu G/W	269	18 28	31 35	1960			46.3	
ER2	E	64	Wenimbi Trib:Igava Broad V	0.05	18 27	31 38	1960	1975			
ER2	E	65	Wenimbi Trib:Igava H L Flume	0.13	18 27	31 38	1960	1975			
ER2	E	66	Wenimbi Trib.:Igava G/W	0.13	18 27	31 33	1960				
ER2	E	67	Wenimbi Trib.:Igava G/W	1.04	18 27	31 38	1960			9.1	
ER2	E	68	Wenimbi Trib.:Igava G/W	0.05	18 27	31 38	1960			2.29	
ER2	E	75	Wenimbi Trib:Igava HL Flume	0.52	18 27	31 38	1962	1975			
ER2	E	76	Wenimbi Trib:Igava H Flume	0.05	18 27	31 38	1962	1975			
ER2	E	77	Wenimbi Trib:Igava H Flume	0.26	18 27	31 38	1962	1975			
ER2	E	78	Wenimbi Trib:Igava H Flume	0.13	18 27	31 38	1962	1975			
ER2	E	79	Ruzawi Trib:Edinburgh H Flume	0.26	18 27	31 36	1962	1975			
ER2	E	80	Ruzawi Trib:Edinburgh HL Flume	0.65	18 27	31 36	1962	1975			
ER2	E	81	Ruzawi Trib:Edinburgh H Flume	0.08	18 27	31 36	1962	1975			
ER2	E	82	Ruzawi Trib.:Edinburgh G/W	1.06	18 27	31 36	1962				
ER2	E	91	Ruzawi Trib.:Edinburgh H Flume	0.34	18 27	31 36	1963	1970			

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone E

HYDR ZONE	REF NR		RIVER : NAME	AREA	LAT	LONG	OPENED	CLOSED	TYPE	NOTCH CAP.	REMARKS
				sq km	° 'S	° 'E				m3/s	
ER2	E	92	Ruzawi:Goba Hills C/S	1813	18 44	31 50	1964	1975			
ER2	E	102	Ruzawi:Mtemwa Weir	627	18 28	31 35	1965				
ES1	E	43	Save:Save Gorge C/S	43400	21 11	32 17	1959	1977			
ES1	E	100	Mkwasini:Impala Ranch Weir	1445	20 52	32 01	1966	1975			
ES1	E	149	Save:Save Causeway	42300	21 00	32 10	1973		F&P		
ES2	E	37	Tanganda:Buffels Drift G/W	246	20 06	32 32	1958				
ES3	E	114	Roswa:Roswa Turgwe Flume	197	20 10	31 36	1967			17.5	
ES3	E	115	Turgwe:Turgwe Roswa Flumes	223	20 10	31 36	1967			17.4	
ES3	E	158	Mujichi:U/S Turgwe Confluence	556	20 22	31 52	1975	1978			
ES3	E	160	Turgwe:	977	20 22	31 52	1975	1978			
ES4	E	11	Devure:Lower Devure G/W		19 58	32 15	1950	1963			
ES4	E	118	Devure:Chisurgwe Flume	8200	19 54	32 07	1967		F&P		
ES4	E	135	Chiwaka:Mutsinzwa Flume	259	19 55	31 55	1971	1976	F&P		
ES5	E	62	Nyazwidzi:Buhera G/W & Flume	1990	19 23	31 28	1960	1979			
ES5	E	134	Nyazwidzi:Chirorgwe Fl.+ C/S	3470			1971	1979	F&P		
ES5	E	140	Chidsikisa:Nerutanga Dam S/W	87	19 17	31 24	1972				
ES6	E	161	Save:Nyamasanga		19 42	32 17	1974	1976			
ES7	E	34	Mwerihari:Nyashanu G/W	2470	19 16	31 54	1956				
ES7	E	151	Mwerihari:Chunga Flumes + N.	1270	19 09	31 29	1973			82.7	
ES8	E	8	Save:Condo Old Site		19 12	32 01	1950	1965			
ES8	E	21	Save:Condo D/S G/W	11000	19 13	32 01	1954	1979		171	
ES8	E	24	Tsungwesi:Condo U/S G/W	557	19 03	32 07	1955	1979		139	
ES8	E	26	Save:Condo U/S G/W	3550	19 07	31 52	1955	1978			
ES9	E	59	Sengesi:Wedza Flume & G/W	324	18 46	31 31	1960			43.8	
ES9	E	60	Sengesi:Lower Sengesi G/W	325	18 46	31 31	1960	1974			
ET1	E	84	Tokwe:Runde Cf.U/S C/S+L/F N.	7950	21 08	31 16	1962				Catchment excludes Umshandige D.
ET1	E	101	Tokwe:Tokwe Weir	7700	21 03	31 10	1965				
ET1	E	103	Tokwe:Manana C/S	7304	20 45	30 58	1965	1973			
ET1	E	107	Musokwezi:Gadziguri Flumes	249	20 34	30 47	1966	1978			
ET1	E	116	Tokwe:Makorsi C/S	7070	20 44	30 53	1967	1975			
ET2	E	3	Umshandige:Umshandige Dam S/W	647	20 09	30 38	1931				
ET2	E	143	Tokwe:Austral Dam S/W	4250	20 08	30 27	1972				
ET3	E	14	Shasha:Gaths Mine Weir	2870	20 00	30 26	1951	1976			

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone E

HYDR ZONE	REF NR		RIVER : NAME	AREA	LAT	LONG	OPENED	CLOSED	TYPE	NOTCH CAP.	REMARKS
				sq km	° 'S	° 'E				m3/s	
ET3	E	111	Shasha:Mushwe Flumes	1620	19 57	30 28	1966			56.6	
ET4	E	117	Ngezi:Mushwe Flumes	1090	19 55	30 27	1967			67.9	
ET5	E	112	Tokwe:Bhganya Flumes	1200	20 01	30 24	1966			82	
EUT1	E	4	Mutirikwi:Esquilingwe D/S G/W	803	20 51	31 18	1949				Catchment excludes Bangala Dam
EUT1	E	36	Mutirikwi:Esquilingwe D/S G/W	803	20 51	31 18	1957				
EUT1	E	51	Mutirikwi:Bangala D.& D/S Flumes	1980	20 45	31 14	1960				
EUT1	E	55	Umshavutwe:Esq.Weir U/S G/W	552	20 43	31 16	1960	1978		17.9	
EUT1	E	71	Mutitikwe:Esq.Weir Storage		20 51	31 18	1961	1966			
EUT1	E	85	Cheche:Triangle Reg. Flumes	135	21 05	31 25	1962			3.13	
EUT1	E	86	Gungwa:Triangle Reg. Flume	3	21 05	31 25	1962	1964			
EUT1	E	87	Makari:Triangle Reg. Flumes	11.1	21 05	31 25	1962			0.437	
EUT1	E	99	Mutirikwi:Triangle Reg. N.		21 05	31 25	1965	1972			
EUT2	E	6	Mutirikwi:Kyle Dam +D/S G/W	3980	20 15	31 02	1949				
EUT2	E	44	Bevumi:Kyle Dam U/S G/W	114	20 10	31 08	1959			22.1	
EUT2	E	46	Tsjibaka:Rusinga Flume	430	20 24	31 11	1959	1975			
EUT2	E	57	Mutirikwi:Bangala Dam U/S Flume	1550	20 28	31 11	1960	1978		36.4	
EUT2	E	70	Mzero: Mzero G/W	101	20 20	30 56	1960	1978			
EUT2	E	94	Mutirikwi:Kyle Dam S/W	3980	20 15	31 02	1965				Composite with E6
EUT3	E	2	Umshagashi:Waterworks Weir	541	20 03	30 51	1928				
EUT3	E	15	Umshagashe:Jubilee Dam	484	19 58	30 50	1952	1975			
EUT3	E	54	Umpopinyani:Kyle Dam U/S G/W	212	20 06	30 54	1960			1.12	
EUT3	E	69	Umshagashi:Kyle Dam U/S G/W	938	20 07	30 52	1960			26.1	
EUT3	E	89	Umshagashe:Copota Dam S/W	425	19 56	30 49	1962	1979			
EUT3	E	153	Umshagashe:Makaholi Dam U/S Flume	146	19 49	30 44	1973	1979		0.837	Re-opened 1980
EUT3	E	154	Umshagashe:Makaholi D. D/S Fl.	155	19 49	30 45	1973	1979		0.803	Re-opened 1980
EUT3	E	166	Flamboyant:Sewage Farm Overflow		20 05	30 51	1980			0.997	
EUT3	E	167	Flamboyant:Sewage Farm Overflow		20 05	30 51	1981			0.025	
EUT4	E	7	Popotekwe:Popotekwe Gorge G/W		20 08	31 02	1949	1961			Flooded by Kyle Dam
EUT4	E	49	Popotekwe:Kyle Dam U/S G/W	1010	20 07	31 01	1959			31.8	
EUT5	E	5	Mutirikwi:Smallies Weir	1264	20 08	31 04	1949	1962			
EUT5	E	45	Mutirikwi:Kyle Dam U/S G/W	847	20 05	31 04	1959				
EUT5	E	48	Msali:Kyle Dam U/S G/W	365	20 06	31 05	1959			0.39	

APPENDIX D

Zimbabwe : River Flow Recorder Stations : Hydro Zone F

HYDR ZONE		REF NR	RIVER : NAME	AREA	LAT	LONG	OPENED	CLOSED	TYPE	NOTCH CAP	REMARKS
				sq km	° 'S	° 'E				m3/s	
FB	F	21	Busi:Bangazaan G/W	28.50	20 13	32 36	1971				
FB	F	4	Chibudzana: Southdown L/F Notch	75.70	20 16	32 50	1972			0.789	See FGP42 for earlier records
FB	F	18	Busi:Ypres	148.00	20 16	32 40	1975			15	
FG2	F	6	Tsanga:Tsanga Troutbeck D/S G/W	17.90	18 11	32 49	1958				
FH	F	1	Mapopo:Stapleford G/W	6.50	18 40	32 51	1954				
FH	F	22	Nyatsanga:Hope Patrol L/F Notch	0.26	18 40	32 51	1955			1.38	
FLS	F	5	Chisengu:Chisengu Upper G/W	0.80	19 55	32 54	1955	1978			
FLS	F	19	Chisengu:Chisengu Lower G/W	1.90	19 55	32 54	1955	1978			
FLS	F	2	Nyahodi:Nyaruwa Fl.& G/W	127.00	19 51	32 48	1958			58.9	
FLS	F	6	Lusitu:Lusitu Power Station	142.00	20 02	32 44	1968				ZESA station
FLS	F	20	Chisengu:Chisengu Up. G/W L/F N.	0.80	19 55	32 54	1955	1978			Composite with F3
FLS	F	3	Chisengu:Chisengu Low.G/W L/F N.	1.90	19 55	32 54	1955				Composite with F4
FM2	F	10	Zonwi:Hoboken G/W	31.10	19 05	32 47	1966				
FP	F	7	Pungwe:Pungwe Causeway	85.50	18 24	32 47	1970				

APPENDIX E

BIBLIOGRAPHY

BIBLIOGRAPHY OF REFERENCES FOR ZIMBABWE

AUTHOR	YEAR	TITLE OF REFERENCE
Ahrenovitz, M	1974	Flood equation for Rhodesian catchments. Internal paper, Ministry of Water Resources and Development
Anon		Preliminary outline plans for the development of the surface water resources of Zimbabwe (River System 1 - 8)
Anon	1982	Schedule of mean annual runoff and CV
Aquator	1984	Underground water resources in the plain of the Zambesi River east of Kariba. Technical report No. IDRO A 1701
Aquator	1987	Investigation of underground water of the Lake Kariba south shore - Karoo system. Technical report No. IDRO A 2658/B
Banda, WH /Hindson, LL /Wurzel, P	1979	Investigation of the Nyamandhlovu Aquifers. Internal paper, Ministry of Water Resources and Development
Barker, MD	1959	Empirical relationship between solar radiation and hours of sunshine, and solar radiation and cloud amount
Beasley, AJ		Hydrogeology of the area around Nyamandhlova. PhD thesis
Bradley, PG	1975	Zambezi river - run-off at Livingstone
Central African Power Corp	1978	Reappraisal of the power generation potential of the Zambezi river. Part I - reappraisal of the lower catchment hydrology
Chikwanha, R	1980	Sediment yields from selected rivers in Zimbabwe. MEWRD internal publication
Chikwanha, R	1981	Preliminary assessment of sediment yields in the Save catchment. MEWRD internal publication
Chitavro, JJ		Hydrology of the Zambezi Basin as it affects Zimbabwe hydroelectric schemes
Collins, MO	1965	Atlas of Rhodesia
CSO		1982 main demographic features of the population of Zimbabwe: an advance report based on a 10 percent sample
CSO		Population projections of Zimbabwe: 1982 to 2032
CSO	1988a	Quarterly digest of statistics
CSO	1988b	Statistical yearbook 1987
Department of the Surveyor		Catalogue of maps,charts and air phototgraphs.
District Development Fund		National monitoring system for wells and springs, training notes
DMS		Catalogue of publications
DMS		Climate information sheets
DMS		Climate of South Africa. Part 8. General survey. Weather Bureau, Pretoria
DMS		Climatological summaries for Southern Rhodesia, Northern Rhodesia and Nyasaland, 1948/49 to 1953/54
DMS		Climatological/meteorological summaries for the Federation, 1954/55 to 1965/66
DMS		Mean annual rainfall Rhodesia, with commentary. 1 : 2 500 000
DMS		Mean annual temperature, Federation of Rhodesia and Nyasaland. 1 : 5 000 000
DMS		Meteorological notes. Series A
DMS		Meteorological notes. Series B
DMS		Meteorological summaries for Rhodesia and Malawi, 1966/67 to 1968/69
DMS		Monthly meteorological summaries for Rhodesia/Zimbabwe, 1969/70 onwards
DMS		Rainfall handbook supplements
DMS		Rainfall report: season 1969/70
DMS		Rainfall report: season 1978/79
DMS		Rainfall reports, Rhodesia/Zimbabwe, annually from 1969/70
DMS		Rhodesia climatic comfort/discomfort belts and building design. 1:2 500 000 map
DMS		Totals of monthly and annual rainfall (up to 1945/46) for stations in the eastern area. Rainfall Handbook Supp No 1

BIBLIOGRAPHY OF REFERENCES FOR ZIMBABWE

AUTHOR	YEAR	TITLE OF REFERENCE
DMS		Totals of monthly and annual rainfall (up to 1945/46) for stations in the northern area. Rainfall Handbook Supp No 2
DMS		Totals of monthly and annual rainfall (up to 1945/46) for stations in the southern, western and central areas. Rainfall Handbook Supp Nos 3, 4 and 5 (one volume)
DMS		Totals of monthly and annual rainfall 1946/47 to 1955/56 for stations published in previous Supplements, and Supplementary Stations hitherto unpublished. Rainfall Handbook Supp No 6
DMS		Totals of monthly and annual rainfall for Rhodesia and Malawi, years 1966/67 to 1968/69.
DMS		Totals of monthly and annual rainfall for the Federation, and mean rainfall by areas (northern and southern Rhodesia), years 1960/61 to 1965/66
DMS		Totals of monthly and annual rainfall for the Federation, years 1956/57 to 1959/60
DMS	1951a	Rainfall handbook
DMS	1951b	Southern Rhodesia rainfall handbook
DMS	1952	Climatological tables for the period July 1931 to June 1951. Clim Handbook Supp No 1
DMS	1956	Variability of air temperature in Rhodesia and Nyasaland
DMS	1958	Mean upper winds over the Federation of Rhodesia and Nyasaland
DMS	1961a	Climate of the south-eastern lowveld of Rhodesia
DMS	1961b	Maximum temperature. Clim Handbook Supp No 3
DMS	1961c	Mean upper air conditions and extreme temperatures
DMS	1962	Sabi valley climate: a comparison with other similar climates
DMS	1963	Climatological summaries, Southern Rhodesia, Northern Rhodesia, Nyasaland, means for 1951 to 1961. Clim Handbook Supp No 2
DMS	1965	Mean monthly atmospheric pressure and standard deviation at standard times for Bulawayo, Salisbury, Blantyre and Lusaka airports
DMS	1967	Area/depth relationships for selected storms in Rhodesia and Malawi
DMS	1968	Soil temperature means, extremes, frequencies and diurnal variations
DMS	1970a	March of temperature at Bulawayo through the year
DMS	1970b	Mean monthly rainfall as a percentage of mean annual rainfall
DMS	1971	Sunshine frequencies
DMS	1972a	Air pollution, concentration and dispersal by meteorological causes
DMS	1972b	Distribution of thunderstorm days over Rhodesia
DMS	1972c	Diurnal variation of mean surface winds over Rhodesia
DMS	1972d	Fog in Rhodesia
DMS	1972e	Frequency of hourly rainfall amounts, Salisbury and Bulawayo
DMS	1973a	Climate of Rhodesia compared with the climates in other countries
DMS	1973b	Diurnal variation of visibility at Salisbury airport
DMS	1974a	Climate of Rhodesia (season by season)
DMS	1974b	Maximum wind values
DMS	1974c	Mean surface winds
DMS	1974d	Pressure and wind systems as a background to the climate of Rhodesia
DMS	1974e	Sun angles
DMS	1974f	Surface wind frequencies
DMS	1974g	Variation of relative humidity at Salisbury and Bulawayo
DMS	1975a	Climatic extremes
DMS	1975b	Rainfall intensity in Rhodesia. Rainfall Handbook Supp No 7
DMS	1975c	Rhodesian weather design data
DMS	1975d	Severe storm, Kariba, 12th December 1974
DMS	1976	Diurnal variations of selected climatic variables in Rhodesia. Clim Handbook Supp No 4
DMS	1977	Mean rainfall in Rhodesia. Rainfall Handbook Supp No 8
DMS	1978a	Climatological summaries, Rhodesia. Clim Handbook Supp No 5

BIBLIOGRAPHY OF REFERENCES FOR ZIMBABWE

AUTHOR	YEAR	TITLE OF REFERENCE
DMS	1978b	Diurnal variation of surface winds. Clim Handbook Supp No 6
DMS	1979	Aeronautical descriptive climatological memoranda
DMS	1981	Climate Handbook of Zimbabwe
Elseviers		World survey of climatology. Volume 10, climates of Africa
Elwell, MA	1978	Soil loss estimation: Compiled works of the Zimbabwean multi-disciplinary team
Euroconsult /Delft Hydraulics /RTI		Study on options and investment priorities in irrigation development
Fed Inst for Geosciences and Natural Resources		Lomagundi aquifier study. Groundwater use and groundwater potential, Chinhoyi-Umboe Mhangura farming area
Frere, A	1974	Weir design capacity. Internal paper, Ministry of Water Resources and Development
Gear, D	1976	Manner of occurrence of groundwater in Rhodesia. Internal paper, Ministry of Water Resources and Development
Gibb	1972	Report on power development on the Zambezi
Gibb	1980	Kariba power stations: hydraulic head losses
Government of Zimbabwe		Country report by the Government of Zimbabwe : International drinking water supply and sanitation decade 1980-1990
Government of Zimbabwe		First Five-Year National Development Plan, 1986-1990
Government of Zimbabwe		List of statistical publications currently available
Government of Zimbabwe		Zimbabwe 1:1000000 relief map, eighth edition
Grant, MA	1973	Statistical approach to flood estimation in Rhodesia. Proc. Rhod. Inst. Engrs 11, 86-92
Hattle, JB		Wayward winds
Hattle, JB	1962	Zonal index long waves and associated Southern Rhodesia rainfall variations
Hattle, JB	1979	Final Report - Guti Project
Hindson, LL	1962	Groundwater in the Sabi valley. Internal paper, Ministry of Water Resources and Development
Hindson, LL	1966	Exploratory drilling in alluvial and sedimentary formations in Rhodesia. Internal paper, Ministry of Water Resources and Development
Hindson, LL /Dennis, S	1962	Groundwater provinces of Southern Rhodesia. USGS Wat. Supply Paper. 1757-D
Hindson, LL /Wurzel, P	1963	Groundwater in the Sabi alluvial plain. Rhod. J. Agric. Res. No. 1(2), 99-104
HMSO		Weather in the Indian Ocean. Volume 1
Hydraulics Research	1985	Sediment studies, Sabi River, Zimbabwe. Report No EX 1294
Hydraulics Research	1986	Model calibration of River Sabi at Chivirira Falls, Zimbabwe. Report No EX 1437
Hydraulics Research	1986	Sedimentation studies, Sabi river, Zimbabwe. Report No EX 1377
Hydraulics Research		River flow measurement, Zimbabwe. Inception Report
Interconsult / NAID		Application of the Thermos 3d package for analyzing sedimentation in reservoirs in Zimbabwe
Interconsult / NAID	1985a	National Master Plan for rural water supply and sanitation. Volume 1, executive summary
Interconsult / NAID	1985b	National Master Plan for rural water supply and sanitation. Volume 2.1, hydrology
Interconsult / NAID	1985c	National Master Plan for rural water supply and sanitation. Volume 2.2, hydrogeology
Interconsult / NAID	1985d	National Master Plan for rural water supply and sanitation. Volume 3, rural water supply programme
Interconsult / NAID	1985e	National Master Plan for rural water supply and sanitation. Volume 3.2, soil and water conservation
Interconsult / NAID	1985f	National Master Plan for rural water supply and sanitation. Volume 3.3, inventory of existing water supply situation

BIBLIOGRAPHY OF REFERENCES FOR ZIMBABWE

AUTHOR	YEAR	TITLE OF REFERENCE
Interconsult	1986	National Master Plan for rural water supply and sanitation for Zimbabwe
International Fund for Agr Development		Report of the general identification mission to Zimbabwe. Main Report. Number 0072-zi
Kabell, TC	1962	Flood estimation in Rhodesia. Internal paper, Ministry of Water Resources and Development
Kabell, TC	1974	Philosophy of reservoir and operational systems for the maximum utilization of water resources. Rhod. Engr. 12, 153-159
Kabell, TC		Proposed programme for dam construction in Zimbabwe
Kabell, TC	1972	Assessment of the surface water resources of Rhodesia
Kabell, TC	1979	Effect of small dams on potential catchment yield
Kabell, TC	1984	Assessment of surface water resources of Zimbabwe and guideline for development planning. Internal paper, Ministry of Water Resources and Development
Kabell, TC	1988a	Assessment of design flood parameters in Zimbabwe. ICOLD, San Francisco - 16th Congress on Large Dams, Vol IV, pp 479-491
Kabell, TC	1988b	Sedimentation and yield of small dams. MEWRD Seminar on Water Resources, Conservation and Development
Kelly, WL	1963	Investigation into Southern Rhodesia rainfall
Kidd, GCH /Torrance, JD	1962	Seasonal and mean monthly rainfall deficities, October to April
Kreft, J	1972	Composition of Rhodesian rainfall
Kriel, JP	1963	Discharge coefficients for angle iron gauging weir crests. Civ Eng in S Africa. 5 (10)
Lange, H	1952	Borehole water resources in Southern Rhodesia. MSc thesis, Natal Univ.
Law, AB	1967	Prediction of the occurrence of frost over Rhodesia
Lineham, S	1968	Incidence of hail in Rhodesia
Lineham, S	1972	Evidence of a mid-season break in the rains in Rhodesia
Lineham, S	1978	Onset and end of the rains in Rhodesia
Louw, AK	1957	Occurrence of hail over Rhodesia
MacDonald /Stewart Scott		Mayfair and Claw dams. Feasibility of gated spillways. Draft Report
McNaughton, DL	1970	Calendar singularities in Rhodesian precipitation
Ministry of Local Government Rural & Urban		Rural water supply and sanitation programme. Annual sector report 1987/88. National Coordination Unit
Ministry of Power, Rhodesia and Nyasaland		Kariba project. A brief description of the Kariba hydro electric project in the Zambezi river in the Federation of Rhodesia and Nyasaland.
Ministry of Water Resources and Development		Hydrological year book 1978-79 for the year ended 30th September,1979.
Ministry of Water Resources and Development		Hydrological year books 1956/57 - 1977/78
Ministry of Water Resources and Development		Some notes on water pollution in Zimbabwe
Ministry of Water Resources and Development	1970a	Hydrological summaries 1970
Ministry of Water Resources and Development	1970b	Map of hydrological zones
Mitchell, TB	1965	Reservoir yield probability as applied in Southern Rhodesia. Proc. Instn Civ. Engrs 30, 171-184
Mitchell, TB	1967	Guide to reservoir yield. Internal paper, Ministry of Water Resources and Development
Mitchell, TB	1974	Study of Rhodesian floods and proposed flood formulae. Rhod. Engr 12(6), 199-203
Mitchell, TB	1975	Zambezi - run-off at Livingstone
Mitchell, TB	1976	Yield of an average dam in Rhodesia
Mitchell, TB	1977	Reservoir yield using the TPM method. J. Hydraul. Div. ASCE

BIBLIOGRAPHY OF REFERENCES FOR ZIMBABWE

AUTHOR	YEAR	TITLE OF REFERENCE
		103(HY2), 133-150
Mitchell, TB	1978	Method of estimating the approximate yield of multiple dams using the Moran model. J. Hydrol. (37), 67-80
Mitchell, TB	1982	Potential water yield in semi arid regions
Mitchell, TB	1987	Yield from irrigation dams of low storage ratio. Zimb. Eng. 25(2) 627-630
Nugent, C	1986	Historical changes in the behaviour of the Zambezi River at Nyamauomba. Zim. Science News 20 (9/10)
Prentice, AA	1965	Potential evaporation in Rhodesia
Rhodesia Government		Water (effluent and wastewater standards) regulations, 1977. Act 41/76. Rhodesia Government Notice No. 687 of 1977.
Roberts, RH	1934	Recent remarkable rains in Southern Rhodesia with certain deductions as to probable maximum floods. Proc. Instn. Civ. Engrs
Santa Clara, JMA	1988	Hydrological operation of the Kariba hydroelectric scheme: past, present and future. ICOLD, San Francisco - 16th congress on large dams Vol IV pp 4
Sellick, NP	1953a	Barometric pressure and weather in Southern Rhodesia
Sellick, NP	1953b	Intensity-duration curves for rainfall in Rhodesia
Sellick, NP	1956	Upper air temperatures over Salisbury
Sellick, NP	1965	Non-periodic variation of surface pressure in Rhodesia
Sellick, NP /Kidd, GCH	1959	Sunshine at Salisbury
Shand, IHR	1962	Use of cetyl alcohol in evaporation suppression. Rhod. J. Agric. 57(3), 186-191
Shaw, DN /Rhod, M	1977	Guide to design and construction of medium-sized earth dams in Rhodesia
Stocking, A /Elwell, HA	1973	Soil erosion hazard in Rhodesia. Rhod. Agr. Journ. 70: 93-101
Tilbury, MRR	1953	Trends in the rainfall of Southern Rhodesia, period 1901-59
Torrance, JD	1959	Incidence of dry spells during the rainy season in Rhodesia and Nyasaland
Torrance, JD	1962	Agricultural climates of Rhodesia
Torrance, JD	1964	Effect of cloudiness on evaporation
Torrance, JD	1971	Empirical evaporation formula based on temperature data
Torrance, JD	1972	Radiation over Rhodesia
Torrance, JD	1974	Availability of atmospheric water
Torrance, JD	1976	Upper winds of Rhodesia
Torrance, JD	1979	Changes in rainfall in the vicinity of lake Kariba
Torrance, JD /McNaughton, EJ	1970	Weekly evaporation rates
Torrance, JD /Shaw, MP	1960	Variability of upper air humidity in a tropical region
UNDP		Development cooperation Zimbabwe. 1987 Report
UNDP		Zambezi Valley Master Plan Study. Summarised terms of reference.
UNESCO		Lecture notes of the UNESCO/NORAD Third Regional Training Course for hydrology technicians, Kenya.
US Bureau of Reclamation	1967	Water measurement manual - second edition
Wallis, WH	1948	Isopleth map of Rhodesia. Internal paper, Ministry of Works and Development
Ward, PRB	1979a	Long term sediment yields from short data records. Proc. IAHS Canberra Symposium on the Hydrology of Areas of Low Precipitation
Ward, PRB	1979b	Seiches, tides and wind set-up on Lake Kariba. Limnol. Oceanogr. 24 (1) 151-157
Ward, PRB	1978	Water surface fluctuation in Lake Kariba. Rhod. Engr 16(3), 86-92
Ward, PRB /Wurzel, P	1965	Investigation into the application of radio tracers to river flow gauging with particular reference to injection and sampling techniques. Report to International Atomic Energy Agency of Research Contract, RB 301
Ward, PRB /Wurzel, P	1968a	New enrichment and multiple sampling processes to investigate radioactive tracer mixing in a small river. J. Hydrol. 5(1), 265-276

BIBLIOGRAPHY OF REFERENCES FOR ZIMBABWE

AUTHOR	YEAR	TITLE OF REFERENCE
Ward, PRB /Wurzel, P	1968b	Model tank investigations to calibrate groundwater velocity determinations by the point dilution method. Atomikernegie 13, 449-454
Ward, PRB /Wurzel, P	1968c	Gas counting of tritium with particular reference to counter background. Int. J. Rad. & Isotopes 19, 529-533
Ward, PRB /Wurzel, P	1968d	Measurement of river flow with radioisotopes, with particular reference to the method and time of sampling. Bull. IASH. XIII(1), 40-48
Weather Bureau		Monthly climatic data for the world, 1949 -
Weather Bureau		World weather records, 1911 -
White, WR	1983	Novel loose boundary model for investigating sedimentation problems at an intake. Zim. Eng. 21(4) 433-440
Whitlow, JR	1983	Hydrological implications of land use in Africa with particular reference to Zimbabwe. Zim. Agr. Journ. 80 (5) 193-211
World Bank		Zimbabwe agricultural sector study. Report No. 4401-zim. Eastern Africa Projects Department, Southern Agriculture Division
World Bank		Zimbabwe land subsector study. Report No. 5878-zim. Eastern and Southern Africa Projects Department, Southern Agriculture Division.
World Bank		Zimbabwe: Issues and options in the energy section. Report No. 3765-zim. Report of the joint UNDP/World Bank Energy Sector Assessment Program.
Wurzel, P	1971a	Some brief comments on a large scale evaporation suppression experiment in Rhodesia. Rhod. Sci. News 15(5), 146-152
Wurzel, P	1971b	Radio isotopes in underground water investigations in Rhodesia. Trans. S. Afr. Geol. Soc. LXXV, 98-109
Wurzel, P	1971c	Discussion on the hydrological investigation of fissure flow by borehole logging techniques. Quart. J. Eng Geol. 4(4), 121-125
Wurzel, P	1973	Radio isotopes in Rhodesian hydrology. P. 198, South African Atomic Energy Board spec. publ.
Wurzel, P	1974	Porosity measurements with radioactive isotopes. Atomikernergie 33(4), 364-368
Wurzel, P	1981	Groundwater in Zimbabwe - development aims for 1980's. In: Groundwater '81 (Kuala Lumpur, Malaysia), 56-69
Wurzel, P	1984	Tritium as a tracer for underground water. In: Methods of instrumentation for the investigation of groundwater systems (Proc. UNESCO Symp., the Hague)
Wurzel, P	1987	Hydrology in Zimbabwe - the past and the future. Proc. of the Rome Symposium, IAHS publication No 164
Wurzel, P /Anderson, JM	1970	Dilution method in stream flow measurement. In: S. Afr. Water Year Int. Conf. (Pretoria), p 215
Wurzel, P /Ward, PRB	1968	Preliminary measurements of the movement of groundwater in the Sabi Valley alluvial plain, using the point dilution method. Rhod., Zambia, Malawi, J. Agric. Res. 6(1), 87-93
Wurzel, P /Ward, PRB	1969	Groundwater studies in the Sabi Valley, Rhodesia, with natural tritium. J. Hydrol. III(1), 48-58
Wurzel, P /Ward, PRB	1982	Flood flow gauging with tritium in Southern Africa. In: Advances in hydrometry (Proc. Exeter Symp., July 1982), 119-128. IAHS Publ. No 134
Zimbabwe Banking Corporation		Economic review
Zimbabwe Electricity Supply Authority		1987 annual report and accounts

APPENDIX F

MEWRD STANDARD BOREHOLE FORMS

REPORT ON COMPLETION/ABANDONMENT OF WELL OR BORE-HOLE

Date of receipt

THE SECRETARY FOR WATER RESOURCES AND DEVELOPMENT,
P.O. BOX 8132,
CAUSEWAY.

For the attention of the Chief Hydrological Engineer

1. (a) Report by *(insert full name)* .....
   (b) Address .....
   (c) Registered name of property .....
   (d) Area of property *(in hectares)* .....
   (e) District .....Intensive conservation area .....
   (f) State whether owner, tenant or occupier .....

2. *Location of well/bore-hole**

   Please attach, if not previously submitted—

   (a) a portion of a 1 : 50 000-scale map with the location of the well/bore-hole marked therein; or

   (b) a tracing of (a); or

   (c) a drawing showing—

      (i) permanent points (e.g., dwelling, cross-roads, beacon, etc.);
      (ii) distance of well/bore-hole from (i);
      (iii) bearing of well/bore-hole from (i).

   N.B.—The Chief Hydrological Engineer will supply a copy of the relevant 1 : 50 000 map upon request. On (a), (b) and (c), whichever is supplied, please give the bearing and distance to the nearest known pump-equipped bore-hole, whether or not on the applicant's property. The map or plan must be signed and dated.

3. *Details of well*/bore-hole*

   (a) date of completion/abandonment* .....
   (b) well/bore-hole* sited by .....
   (c) type of machine used (air, percussion, etc.) .....
   (d) name of contractor (or self, if applicable) .....
   .....
   (e) if abandoned, give reasons for abandonment and complete this form as far as possible .....
   .....
   .....
   (f) depth of completed well/bore-hole* ..... metres
   (g) diameter/s of well/bore-hole* ..... metres/millimetres*
   ..... metres/millimetres*
   (h) depth from surface at which water first encountered .....
   ..... metres
   (i) depth from surface of main supply ..... metres

(j) tested yield of well/bore-hole* ..... cubic metres per hour during ..... hours less of continuous pumping

(k) test-pump depth ..... metres

(l) Maximum capacity of test-pump at depth in (k) ..... cubic metres per hour

(m) depth of water from surface before test ..... metres

(n) greatest depth from surface to which water is lowered during pumping .... metres

(o) type of screen installed (if applicable) .....

(p) diameter/s of screen installed (if applicable) ..... millimetres ..... millimetres

(q) length of screen installed (if applicable) ..... metres

(r) diameter/s of casing ..... metres/millimetres* ..... metres/millimetres*

(s) length of plain casing installed ..... metres

(t) quality of water: fresh/brackish*

(u) brief details of rock formations penetrated, and depths .....

.....

.....

.....

.....

4. *Proposed use*

(a) primary—

domestic/dip-tanks/stock-watering*

for stock-watering, state number of livestock units .....

(b) secondary—

irrigation of ..... hectares of ..... *(crop)**

..... hectares of ..... *(crop)**

..... hectares of ..... *(crop)**

fish-farming ..... hectares*

hotel/boarding-house/guest-farm/mission-school*

5. *Abstraction*

(a) average rate of pumping, or intended pumping ..... cubic metres per hour

(b) average number of hours to be pumped per 24 hours .....

(c) average number of days to be pumped per year .....

**Delete the inapplicable.*

I certify that the above information is correct, to the best of my knowledge and belief. I attach hereto a copy of the journal of the progress of the work.

Signature .....

Date .....

G.P. & S. 16298-R.

IRR 9

L № 0404

MINISTRY OF WATER RESOURCES AND DEVELOPMENT

BOREHOLE COMPLETION REPORT

PROVINCE . . . . .

NAME OF APPLICANT . . . . . NAME OF PROPERTY . . . . . NATIVE DISTRICT . . . . . WORKS No. . . . . .

BOREHOLE No. . . . . G.P. SITE No. . . . . DATE OF LEAVING PREVIOUS SITE . . . . . DATE COMPLETED INCLUDING DISMANTLING . . . . . .

DRILL No. . . . . TRAILER No. . . . . CARAVAN No. . . . . TRACTOR No. . . . . VEHICLE No. . . . . .

Depth in metres From	To	Formation bored

Depth drilled . . . . . metres

Total depth of borehole . . . . . metres

Depth from surface at which water first struck . . . . . metres

Depth from surface of main supply . . . . . metres

Continuous bailer test of . . . . . hours, gave a yield of . . . . . m³/hr.

(Inuous pump test of . . . . . hours, gave a yield of . . . . . m³/hr.

Depth of water from surface before test . . . . . metres

Greatest depth to which water was lowered during test . . . . . metres

Does water return to original level after test? . . . . .

Diameter of unlined portion of borehole below casing . . . . . mm

Quality of water (state fresh or brack, etc.) . . . . .

Casing left in dud borehole . . . . . metres

Amount of casing perforated . . . . . metres

State reason . . . . .

Remarks . . . . .

TRANSPORT—Did applicant transport:
Drill and equipment (Yes or No) . . . . .
Water (Yes or No) . . . . .
Casing (Yes or No) . . . . .

Ref.	Details of mileages	Vehicle miles	Tractor Hours	Tractor Miles
	*Speedometer reading at start of move from previous site, rathead or point determined			
	Moving drill and equipment to: (1) First site on property			
	(2) Successive sites on same property			
	Cartage of water			
	Transport of stores			
	Sole move of vehicle and/or tractor with drill, where applicant provides own transport			
	Other journeys (give details)			
	Number of tractors engaged on moves			
	Reg. No. of tractor(s) above			
	Number of trips performed by tractor(s)			
	Reg. No. of C.M.E.D. vehicle assisting in move			
	*Speedometer reading on completion			

*If meter out of order report and give estimate

Site to site mileage . . . . .

Actual mileage . . . . . miles

Stock receipts	Quantity	I/V, No., etc.
125 mm casing		
150 mm casing		
200 mm casing		
Dieseline		
OH		
Shot		
Pump units complete		
51 mm galvanised piping		
16 mm rods		

Stock reports—

	Casing 125 mm	Casing 150 mm	Casing 200 mm	Diesel Litres	OH Litres	Shot Kg
Stock first day						
Receipts as above						
Receipts ex Dr.						
Total						
Usages drill						
Total						
Usages tractor						
Total						
Transfers to Dr.						
Stock last day						

	Pump units complete	51 mm piping (metres)	16 mm rods (metres)
Stock first day			
Receipts as above			
Total			
Usage			
Stock last day			

STOCK CERTIFICATE

I certify that the stocks on hand at . . . . . have been physically checked by me and that they are in accordance with the stocks shown against "Last Day" on this completion report.

Date . . . . . Signature . . . . . Drill Foreman

This completion report was compiled by:

Date . . . . . Signature . . . . . Drill Foreman

and checked by:

Date . . . . . Signature . . . . . Boring Inspector

REMARKS BY APPLICANT

Date . . . . . Signature . . . . .

(The applicant is required to sign this report in terms of the Regulations for the Use of Govt. Drills.)

Ref Sect.	Ref Sub.	Statement of Account	$	c
		CHARGES—		
		Drilling . . . . . m @ . . . . . per metre		
		Drilling . . . . . hours @ . . . . . per hour		
		Delays . . . . . hours @ . . . . . per hour		
		Casing—125 mm . . . . . m @ . . . . . per metre		
		Casing—150 mm . . . . . m @ . . . . . per metre		
		Casing—200 mm . . . . . m @ . . . . . per metre		
		LABOUR—		
		Carriage of water and fuel		
		Additional labour . . . . . days @ . . . . . per day		
		TRANSPORT—		
		Master unit . . . . . kms/hrs. @ . . . . . kms/hrs.		
		First move—Fixed charge per move		
		Other moves . . . . . kms/hrs. @ . . . . . kms/hrs.		
		Cartage of water . . . . . kms/hrs. @ . . . . . kms/hrs.		
		Transport of stores @ . . . . . per metre		
		Recovery of casing		
		Excess (over 9½ hrs) . . . . . hrs. @ . . . . . per hour		
		Total		
		BUSH PUMPS—		
		. . . . . complete units @ $ . . . . . per unit		
		. . . . . metres 51 mm piping @ $ . . . . . per metre		
		. . . . . metres 16 mm rods @ $ . . . . . per metre		
		TOTAL		
		Total value of invoice		

I certify that when I visited drill No . . . . . on . . . . . 19 . . .

the following stocks were on hand:

125 mm casing . . . . . metres — OH . . . . . litres

150 mm casing . . . . . metres — Shot . . . . . kg

200 mm casing . . . . . metres — Bush pump units Complete . . . . . .

Dieseline . . . . . litres — 51 mm piping . . . . . metres

16 mm rods . . . . . metres

Signature . . . . . Boring Inspector

Date of visit 19

APPENDIX G

DETAILS OF PROPOSED HYDROMETRIC DEVELOPMENT PROJECTS

APPENDIX G

HYDROMETRY DEVELOPMENT PROJECTS FOR SADCC COUNTRIES

G1 INTRODUCTION

G1.1 Justification

As developing countries have striven towards managed economies, often relying on aid or international credit mechanisms, so budgetary considerations have become increasingly prominent, particularly in the public sector including water resources agencies. In the field of hydrometry, numerous technical assistance projects have attempted laudable contributions to the expansion of hydrometric activities, often in the form of capital (typically offshore goods and services), expert assistance and training for counterpart staff. But in general, technical assistance programmes have not taken full account of the capacity of local water development agencies to absorb and sustain work particularly those initiated on a project footing. In spite of many short term projects in SADCC countries which have addressed and sometimes solved specific technical problems, the overriding constraints on the monitoring and assessment of national and regional water resources are financial and managerial. In simplistic terms, most developing countries, especially in Africa, have neither the money nor the manpower to monitor their water resources properly.

Water resources monitoring services in the SADCC countries are generally operating at very low levels of efficiency. Few countries now have services which can be compared favourably with those existing 10-20 years ago. No country yet has a service which is adequate as a basis for sustaining the many water developments which can be expected in the region in coming decades. This situation would be serious even for countries with stable populations, but in many SADCC countries the populations are expected to double every 20 years. Water scarcity will become a major constraint on development and the raising of health standards. The combined effects of the population eplosion in Africa and the likely influence of global warming on the water resources of this continent should be viewed with the utmost concern.

There is a stark contrast between the hydrology services and the improving status and efficiency of meteorological services in the region which are being significantly upgraded through the FINNIDA/SATCC/WMO Meterological Project and other projects. The reasons for this include:

- the perception created by the media and aid funding agencies that the current drought of the 1970s and 1980s was simply manifest as reduced rainfall. Its effects on water resources, river flows and groundwater, have not yet been digested;

- the decline of FAO dominance in water resources studies and funding since the 1970s has not been fully replaced by any other agency, including WMO, whereas WMO has provided and continues to provide firm and increasing support to meteorological services.

- hydrological services in the SADCC countries are generally subordinate components of sectoral agencies such as Ministries of Public Works or Agriculture; they are perceived as having low national priority at times of financial constraint whereas meteorology generally enjoys a higher profile, particularly with regard to aviation, agriculture and disaster relief.

Proper monitoring and management of water resources is a demanding task requiring commitment and competence at all levels. It is unfortunately the case, and is likely to remain so, that working environments in water agencies in developing countries are generally unattractive, particulary in terms of pay, job satisfaction and opportunities for advancement. Although there is a slow trend towards thinning civil service establishments, concentrating skills and improving individual rewards and incentives by the more efficient use of public funds, a general shortage of motivated skilled manpower is likely to persist in the foreseeable future. We believe the best prospect for more effective monitoring and management of water resources lies in computerised data management/processing, carefully tailored training programmes and urgent support, in terms of money and manpower of field and data processing activities.

The SADCC Hydrometry Development Programme has been formulated from this perspective and all the recommendations that follow are aimed at equipping water resources monitoring agencies to fulfil their functions effectively on a planned and sustainable basis. A period of 5-10 years of committed direct assistance is needed with large and systematic infusions of capital goods, expertise and training, designed to meet the needs of each country. Our recommendations cover all aspects for water resources monitoring from basic field procedures, data management, data processing, data presentation and applications of the data. Throughout, we have been mindful of the financial and administrative implications for each country and therefore improved management and planning is frequently stressed.

The programme will comprise a series of country projects which are carefully designed to strengthen weak spots and to achieve accepted standards of operation. They are also aimed at standardising data management and processing procedures within the SADCC region so that member states may freely exchange ideas, discuss problems together, exchange data and software as and if the need arises, and generally promote regional co-operation.

In addition to the country projects, a regional coordination programme is recommended in order to support and monitor progress. From an early stage the coordination programme would seek a consensus on hydrometric procedures particularly with regard to the management and processing of data. Wherever practicable, it would encourage uniformity of computer hardware and software. In recognition of the fact that many hydrometric services in the region are under-staffed or have limited computer expertise, the regional programme could offer for example an archiving service in order to clear as quickly as possible backlogs of historical data not yet stored by computer. Archiving preferably would be carried out in the country concerned depending on local staffing arrangements, but could also be undertaken in the offices of the coordination unit.

These proposals are elaborated in the following sections. The coordinating programme is discussed in Section G2 and the national proposals follow, in Sections G3 and G5. Financial estimate for the projects are summarised in Section G4 while more detailed costs are discussed in Section G5.

G1.2 Objectives

The objectives of the Hydrometry Development Programme are:

(i) to assist in the review, repair and rehabilitation of the hydrometric data collection networks;

(ii) to build-up the ability of the data collection agencies to carry out all necessary field work systematically to accepted standards;

(iii) to preserve hydrometric data collected to date by providing or upgrading computerised storage and archiving facilities in each country;

(iv) to encourage the use of standard computerised data quality control procedures;

(v) to encourage the use of standard computerised data management and data processing procedures leading to timely distribution of statistical summaries;

(vi) to develop a capacity for applied hydrometeorlogical analysis within each country in order to underpin development planning and water project design.

The outcome will be effective national hydrometric data collection agencies that will ultimately become self-sufficient in well-trained manpower and technical know-how, providing tailored information necessary for the implementation of water development and other related projects. The agencies will be characterised by up-to-date operational hydrometric databanks freely compatible throughout the region, simplifying data exchange and compilation of basin-wide hydrometric data;

Again it must be stressed that to develop water resources effectively and efficiently a satisfactory level of continuous data collection is required. In Africa the situation is critical. In many countries lack of funding is resulting in the run down of hydrometric services. When this is viewed together with the doubling of population every 20 years and a forecast reduction in water resources due to global warming, a crisis of dire proportions is facing many African countries.

G1.3 Preliminary SADCC and Country Activities

(i) Review of recommended projects and production of project documents for submission to potential donors.

(ii) Recruitment of consultants and experts.

(iii) Consultative visits to member countries to finalise country and regional projects, co-ordinate counterpart staffing and formulate standards and purchasing requirements for field operations, data management and processing.

(iv) Development of work plans.

(v) Phased commencement of country and regional projects.

(vi) Monitoring and review of country projects by the country agencies and donors concerned and by the Programme coordination unit.

G2 REGIONAL PROJECTS

G2.1 General

Four regional projects are foreseen. The first is designed to establish a small coordination unit for the Hydrometry Development Programme with the purpose of providing a continuing presence of technical expertise within the region for a period of 5-10 years. The experts will contribute directly to country projects by advising and assisting on aspects of water resources monitoring. It is envisaged that they will spend considerable periods of time in member countries. An important role for the team would be to support the third regional project and ensure the satisfactory installation and operation of the newly installed database systems.

The second regional project aims to establish a regional training centre, offering regular technical courses mainly for hydrometric technicians. The centre would initially draw heavily on the expertise within the co-ordination unit, but increasing contributions from within the region would be desirable.

The third regional project's objective is the development of an advanced water resources database and analysis software package (similar in conception to the CLICOM system for meteorological data). This would be developed on a modular basis with all countries receiving certain core modules and choosing other modules appropriate to their needs. Support and training would be provided by the first regional project team.

The final regional project comprises a review of SADCC water resources, particularly of the international river basins, in relation to rapidly increasing populations and the projected effect of global warming on climate.

Summary details and estimated costs for the regional projects are shown in Table G2.1. Greater detail is included on the project definition sheets in Section G5. These projects are referred to as REG1 to REG4 in the Section G5.

TABLE G2.1

SADCC HYDROMETRY DEVELOPMENT PROGRAMME SUMMARY OF REGIONAL PROJECTS

REF	TITLE	EXECUTING AGENCY	OBJECTIVES	DURATION	EXPERTS	INPUTS COUNTERPARTS	VOLUNTEERS	COST US$ X 1.000 EXPERTS	EQUIPMENT	TRAINING
				months		man-months				
Reg1	Hydrometric Development in SADCC Countries	SADCC Soil, Water and Land Conservation Unit	To coordinate and monitor country projects aimed at strengthening hydrological services, and to facilitate regional hydrological cooperation through standardisation of data management and processing procedures	60	160	0	0	2695.0	475.0	75.0
Reg2	Hydrological Technicians Training Programme	SADCC Soil, Water and Land Conservation Unit	To establish a regional training facility for hydrology and hydrogeology technicians, complete with teaching and manpower resources	60	80	0	0	680.0	242.5	765.0
Reg3	Development of database for hydrology and hydrogeology	To be decided	To develop a data programme for micro-computers respecting international sdtandards	12	45	0	0	397.5	0.0	0.0
Reg4	The effect of population growth and global warming on water resources in SADCC countries	SADCC Soil, Water and Land Conservation Unit	To evaluate population growth and global warming on water resources SADCC countries and requirements for hydrometry data collection	12	48	0	0	685.0	175.0	0.0
						SUB-TOTAL S		4457.5	892.5	840.0
						TOTAL US $			6190	

G2.2 Hydrometry Development Programme Co-ordination Unit (REG1)

G2.2.1 Location

The Coordination Unit should be operated from within or in conjunction with the SADCC Soil, Water and Land Conservation Unit in Lesotho. It would have a limited lifespan of say 6 years initially with possible extensions of 2 years at a time depending on the outcome of periodic reviews. The unit would serve as a regional base for consultants and experts from which they would contribute to individual country projects.

G2.2.2 Staff

Expert staff would ideally be drawn from member countries but, almost by definition, suitable senior candidates are key figures in their own organisations and therefore could not be seconded for significant periods. The Programme would therefore be staffed primarily by expatriate experts who would spend considerable periods in member countries fulfilling inputs to country programmes. It would also be a distinct advantage if these experts were recruited from a single organisation and could draw on the technical managerial experience of that organisation. The experts would carry out the following functions:

Coordinator	- Planning, policy, strategy, coordination, country projects liaison (answerable to country directors), procurement, training and scholarships.
Data Processing/Computer Expert	- Training, hardware installation, software programming, country project inputs, special archiving service.
Hydrological Expert	- Training, field network development, operational procedures, country project inputs.
Hydrogeology Expert	- Training, monitoring procedures, country projects.

In addition a small number of local staff would be employed at the office of the Unit as computer operators, driver, secretary, administrator etc. The cost of the co-ordination unit is discussed in Section G4 and details of its objectives and activities follow.

G2.2.3 Objectives

The main objective of the coordination unit is to upgrade field operations, data management and data processing in the SADCC countries and to encourage the standardisation of water resource monitoring activities. This will be achieved through a series of projects and services.

G2.2.4 Main Activities

(i) Liaison with senior staff in member countries.

(ii) Produce standards for operation and maintenance of field stations and training of observers.

(iii) Installation or upgrading of computer database/processing systems. Liason between countries and the team developing software under project REG3

(iv) Establish methods/formats/priorities for data entry to system.

(v) Training in the use of the systems.

(vi) Produce standards for preliminary quality control of new data (and follow up remedial action in the field), loading of raw data into computer storage, further quality control, processing and infilling of gaps and archiving; customise software and hardware to individual country requirements in conjunction with the team involved in project REG3.

(vii) Produce standards for preparation of data summaries in the form of monthly bulletins, annual volumes etc.

(viii) Set up a historical data archiving service in order to rapidly digitise existing data from member countries.

(ix) Assist with planning and co-ordination of country projects and undertake inputs into selected country projects to carry out training, installation of computer hardware and software etc.

(x) Facilitate the purchase of spares and to provide an alternative channel for ensuring that equipment remains fully operational.

G2.3 Hydrometric Technicians Training Programme (REG2)

The Hydrometric Technicians' Training Programme would aim to establish a training centre within an existing academic/training institution in the region. The purpose of the centre would be to offer staff in technical grades, appropriate 3-4 month courses on various aspects of hydrology, meteorology, hydrogeology, sediment, water chemistry, water flow, data management and data analysis.

A variety of courses are envisaged ranging from generalised basic training in operational hydrology and hydrogeology to more detailed treatment of specific technical areas such as current meter measurements, sediment monitoring, laboratory procedures etc. Meteorological training, other than introductory material related to water resource development, is not included as this is already offered by the Institute of Meteorological Training and Research in Nairobi.

The range of topics to be offered by the proposed SADCC training centre are summarised in Table G2.2. These are closely modelled on the UNESCO 6th Regional Training Course for Hydrology Technicians to be held in Zimbabwe in early 1990.

At the outset, the centre would be staffed mainly by experts from the Hydrometric Development Programme co-ordination unit, but contributions from local experts would be actively sought and encouraged.

G2.4 Development of Hydrological Database and Analysis Software (REG3).

The meteorological services of the region have been greatly assisted by the recent introduction of a standardised software package, CLICOM. The principal aim of the REG3 project is to develop a similar package to standardise data processing techniques in the fields of hydrology and hydrogeology.

Most of the cost in the setting up of a data base is not in the computer hardware or the software, it is in the training of staff to become fully familiar with the operation of the programs, the long term support and maintenance of the programs, and the training of the staff who provide support and training to users. The use of an internationally recognised package such as CLICOM minimises these costs. Where data has to be transferred between countries this becomes easy if they use the same programs. An example of the benefits could be if two countries of the region bought a new type of logger. If they had different data systems the extra cost of modifying the systems would have to be paid twice. If they used the same system the cost could be shared.

A survey of currently available hydrological and hydrogeological data handling packages carried out in mid 1989 as part of the Hydrological Assessment Project revealed that the existing commercial software is too narrow in scope to cover all the needs of the SADCC hydrometric agencies. Needs which are increasing as such issues as water quality monitoring or abstraction licencing assume greater importance.

TABLE G2.2

Range of Topics to be Offered by SADCC Hydrometry Training Centre

1 Basic Subject

- Mathematics
- Statistics
- Surveying
- Map reading and air-photos

2 Introduction to Hydrology

- Subject of hydrology
- Hydrological cycle and hydrological processes
- Drainage basin characteristics
- Hydrological extremes
- Open channel hydraulics
- Modelling hydrological processes

3 Meteorology

- Introduction to meteorology
- Air circulation in the topical regions
- Meteorological observation site
- Precipitation
- Other climatic data
- Evaporation and evapotranspiration
- Representation on maps and graphs

4 Hydrometry

- Basic hydraulics
- Stream gauging
- Water level measurement
- Site selection
- Operation and maintenance of equipment
- Calibration of hydrometric equipment
- Discharge rating

5 Computer and Hydrological Data Analysis

- Control of transmitted data
- Data processing
- Missing data
- Data storage and retrieval
- Basic analysis
- Floods and droughts

6 Hydrogeology

- Introduction
- Basic hydrology
- Soils and soil water
- Groundwater movement
- Pumping test analysis
- Groundwater exploration
- Groundwater extraction
- Groundwater resources

7 Water quality

- Introduction
- Basic chemical definitions
- Physical characteristics
- Water quality parameters
- Chemical classification of waters
- Sampling and preservation
- Basic water analysis

8 Water resource development

- Hydrological data networks
- Water resources assessment
- Design floods
- Utilisation of water resources by man
- Water supply and sanitation
- Water resources management

The current packages do not take full advantage of key recent computer developments such as networking, use of graphics/digistising tablet to select options from maps or menus - powerful new tools which can significantly improve what can be offered to users.

Since the water resource agencies in the region have at present a diversity of types of field equipment, processing procedures, level of computerisation, etc. it is proposed that the software should be designed to operate as a fixed core with a number of modules. Countries could then select modules appropriate to their current needs in the knowledge that further modules could be added as their requirements change. The core software will be entirely developed in languages which conform to international standards to ensure maximum flexibility. An interface to CLICOM will be standard and interfaces will be provided to other commercial software systems including those hydrometric processing systems already in place in the region.

The software development will be run in conjunction with the project REG1. The REG1 team liasing on country specifications (eg menus to be in Portuguese, etc) and handling all training in the use of the new system.

G2.5 Effect of Population Growth and Global Warming on Water Resources (REG4)

A regional study is proposed as the most appropriate way of examining the consequences of rapid population growth and rising demand on water resources in the SADCC countries where international basins are of particular importance to each country's development. This study would also evaluate the effect of global warming on surface temperatures (increasing evaporation losses) and rainfall distribution. Many of the SADCC countries have limited water resources which will come under severe stress in the next few decades. This project is seen as essential for establishing the urgent need for the collection of reliable data on water resources.

G3 COUNTRY PROJECTS

G3.1 General

The SADCC "Hydrological Assessment of Sub-Saharan Africa" project has revealed several problem areas in the hydrometric activities of member countries and has identified potential projects. General considerations involved in the project identification are summarised below while more detailed descriptions are to be found summary sheets in Section G5. Financial aspects are discussed in Section G4.

G3.2 Summary of Projects

The projects identified are summarised in Table G3.1. In some cases, several projects are proposed for a single agency. There is a danger that local staff resources will be inadequate to support and benefit from the proposals and therefore careful management and phasing of the projects by local directors, with assistance from the coordination unit is a prerequisite.

To be effective, the proposed projects should be built into the workplans of the agencies involved and counterpart staff should be identified and committed from the outset. Potential clashes with existing workplans and training arrangements must be identified and allowed for before new projects commence. This is no easy task as the gestation period of many projects is typically 2-3 years in which time staffing arrangements and commitments within the agencies are apt to change.

For this reason, coordination of assistance to the agencies and training opportunities, particularly as they affect the availability of counterpart staff, is seen as essential. Effective coordination should be based on development plans for the agencies over periods of, say, 5 years. New proposals should be considered in relation to these development plans rather than be treated in isolation irrespective of existing projects and staff commitments.

The common aim of the projects identified here is to promote effective water resources monitoring and management services in member countries. They necessarily include major training components and considerable inputs from experts. The inputs will be mostly technical assistance and the duration of the TA visits will vary from country to country.

In each case, the inputs will cover some or all of the following items:

- purchase of computer hardware;
- provision of software;
- assistance with the adaptation of software to the local environment, training in its use and establishment of data quality control procedures;
- purchase of equipment for rehabilitation and development of data collection network;
- purchase/hire of vehicles to strengthen field operations.
- training in hydrological techniques;
- training in hydrological data processing.
- training of technicians in sound hydrometric practice;

TABLE G3.1

SADCC HYDROMETRY DEVELOPMENT PROGRAMME SUMMARY OF COUNTRY PROJECTS

-ZIMBABWE-

REF	TITLE	EXECUTING AGENCY	OBJECTIVES	DURATION	INPUTS EXPERTS	INPUTS COUNTERPARTS	INPUTS VOLUNTEERS	COST US$ X 1.000 EXPERTS	COST US$ X 1.000 EQUIPMENT	COST US$ X 1.000 TRAINING
				months		man-months				
Zim1	Provision of Transport for Hydrometeorological Network Maintenance	Department of Meteorology	To provide the means for regular inspection of raingauge and climate stations, which will enable proper control over compilation of station histories and assessment of data reliability, plus the opportunity to effect instrument maintenance and repair, and observer training	12	0	0	0	0.0	25.0	0.0
Zim2	Rehabilitation of Hydrological Branch	Ministry of Energy and Water Resources Development	To revitalise the Hydrological Branch	18	10	x	0	85.0	250.0	100.0
Zim3	Improved Electronic Data Processing for Hydrology	Ministry of Energy and Water Resources Development	To provide new equipment, software and training for hydrological data processing	6	4	54	0	34.0	50.0	55.0
Zim4	Improved Sediment Monitoring	Ministry of Energy and Water Resources Development	To expand the current sediment monitoring programme to achieve a more detailed insight into patterns of land erosion, transportation of sediment in rivers and the influence of changing land use	48	12	124	36	224.4	300.0	40.0
			x -all available staff			SUB-TOTAL S		343.4	625.0	195.0
						TOTAL US $			1,163,400	

Each country would normally be expected to provide:

- office accommodation and local transport for short term consultants and experts;
- secretarial assistance;
- candidates for training;
- counterpart staff to work with experts and consultants;
- fuel and maintenance of project vehicles.

G3.3 Personnel

In the project summaries given in Section G5 an indication of the field of expertise of the experts is given. It is not at this stage possible to produce a detailed job description for each post but a few general points apply:

- breadth of experience is of as much importance as skill in the particular area specialisation;
- a minimum of 5 years relevant experience will normally be required;
- in projects with more than one expert the team leader should have 10 years relevant experience;
- all experts should have a good command of English and in the Lusophone countries knowledge of Portugese would be an advantage.

G4 FINANCIAL ESTIMATES

The total cost of the Hydrometry Development Programme for the nine SADCC countries will be in the region of US$ 24 million. This seemingly high value must be judged against the costs of major projects in the region which rely heavily on water resources data at the design stage. The Lesotho Highlands Water Project (LHWP) for instance is expected to cost about US$ 1.7 billion. The initial lack of an adequate rainfall database and disputes as to the reliability of rating curves had an important impact on the execution of certain aspects of the LHWP. Considerable priority effort has had to be made to achieve acceptable rainfall statistics for project purposes in the time available, this effort was quite beyond the capacity of the agency charged with rainfall monitoring, and it has therefore been done on an emergency basis by the LHWP authorities. The cost implications of errors in yield estimation due to lack of data outweigh by several order of magnitude the cost of data collection. The Kariba project, were it being constructed now would cost about US$ 2 billion. The cost of adequate hydrometry in each country to support major engineering and development projects is extremely small in project terms. Hydrometry must of course be undertaken as a routine national operation either drawing on scarce national funds or supported by international funding. It not possible to estimate reliable resource yields solely on a project basis over a short study period.

The Coordination Unit would be funded primarily by donor agencies although it may be possible to find office accommodation within existing SADCC institutional arrangments. Possibly as much as 50% or more of the expert's time would be spent in member countries.

An illustrative budget is indicated in Table G2.1 based on a nominal 5-year period. The budget includes expert inputs to country projects but not capital and recurrent costs of the country projects which are costed separately. Those costs are discussed in the project summaries in Section G5.

It should be noted that all experts have been costed at nominal rate of $US 8 500 per month regardless of their seniority. This is because pay variations relating to seniority are often smaller than those due to such factors as local cost of living allowance, country of origin, or policy of funding agency.

G5 PROJECT SUMMARIES

PROJECT SUMMARY SHEET: REG 1

Project Title: **The Hydrometric Development Programme for SADCC Countries**

Executing Agency: **The SADCC SWLCU, Maseru, on behalf of member countries**

Objectives:

The aims are to provide a regional programme to strengthen the capabilities of all national hydrometric agencies, particularly in the field of data processing, to promote regional hydrological co-operation, and to develop standard regional data handling procedures and formats to allow rapid exchange amongst the member countries.

The hydrology branches of all member countries have suffered in recent years through shortages in resources, particulary in comparison with meteorological departments. A regional programme to develop hydrometry will enable resources to be allocated to develop appropriate computer software and will introduce standard processing techniques vital for the development of basin-wide hydrometric networks for the major international river systems such as the Zambezi.

Main Activities:

- Assistance in network review, data review and preparation of data for entry onto computer database
- Procurement of computer equipment, and its installation
- Development of specialised software
- Training in use of the system
- Development of quality control procedures within each country
- Supply of hydrometric equipment and transportation
- Training and fellowships
- Establishment of Hydrometric Technicians' Training Centre

Project Period: 5 years minimum

Estimated Costs:		**US$**
Experts	Fees, mobilisation, allowances, insurance, freight, superannuation	2 270 000
Experts	Local accommodation	195 000
Experts	Regional travel & subsistence	230 000
Trainees	Regional travel & subsistence	75 000
Local Staff	Salaries	140 000
Office	Routine operations	105 000
Vehicles	Purchase & running costs	180 000
Computers	Hardware & software	50 000
	TOTAL US$	3 245 000

Counterparts:

No formal allocation of counterparts is required for the programme as there will already be extensive interactions through the country projects.

Notes:

1 A more complete project description is given in Section 2.2 above.

2 The experts would be:

Co-ordinator	10+ years experience is hydrology and water resources.
Data processing/ computer expert	5+ years experience in computerised processing of hydrometric data.
Hydrometeorologist	5+ years experience of setting up and managing networks.
Hydrogeology	5+ years of experience in evaluation of groundwater.

PROJECT SUMMARY SHEET: REG 2

Project Title: SADCC Hydrometric Technicians Training Programme

Executing Agency: The SADCC SWLCU, Maseru, on behalf of member countries

Objectives:

Modelled on the forthcoming UNESCO "6th Regional Training Course for Hydrology Technicians", the aim is to provide facilities to allow regular training of technicians in the fields of meteorology, hydrometry, hydrogeology and data processing. This should be achieved through the expansion and strenghthening of an existing institution in the region. As an initial step it could draw some of its manpower requirements from the SADCC Hydrometry Programme Coordination Unit in order to offer annual residential courses of 3-4 months duration.

Technician training is currently carried out on a piecemeal basis, varying widely from country to country. The establishment of regional facilities specifically formed to conduct such training should greatly improve technician performance, and consequently data reliability. Savings would occur by not having to send technicians outside the region for appropriate training.

Main Activities:

- Formation of regional training institutes for meteorology, hydrometry, hydrogeology and data processing
- Equipping and staffing the training facilities
- Support and resources to conduct appropriate training courses.

Project Period: 5 years minimum

Estimated Costs:	**US$**
Experts	680,000
Equipment	242,500
Training	765,000
TOTAL US$	1,687,500

Counterparts:

All hydrometric technicians should attend on a phased basis.

Notes:

1 A more complete project description is given in Section 2.3 above.

2 Much of the training would be given by experts from project REG1. Additional experts would be required for short period to cover subjects beyond the field of expertise of REG1 experts including: statistics, basic science, water chemistry, sediment measurements, water resources management, sewage treatment.

PROJECT SUMMARY SHEET: REG 3

Project Title: **Development of Hydrological Database and Analysis Software**

Executing Agency: To be decided.

Objectives:

The aim is to introduce a data management and analysis system for water resources comparable to the WMO 'CLICOM' package for meterological services. (In keeping with this analagy the proposed project REG1 is comparable to the current FINNIDA/SATCC/WMO project which is implementing 'CLICOM' in the region). A survey of currently available hydrological and hydrolgeological data handling packages carried out mid 1989 revealed that the existing software is too narrow in scope to cover all the needs of the SADCC hydrometric agencies. The current pacakages do not take full advantage of key recent computer developments such as networking, use of graphics/digitising tablet to select options - powerful new tools to improve what can be offered to users.

The objective is to initate or improve computerised data management using microcomputers and in particular to provide the professional hydrologist with more opportunity for analysis and greater job satisfaction.

The system to be developed in this project would be a 'core' sytem which would be installed in each member country. The instllation of the programs and long term support would be handled within REG1.

The system will be written in languages which conform to internationally recognised standards (ISO, ANSI) to ensure maximum compatibility with existing and future software and hardware. Interfaces with CLICOM and other currently available commercial software eg LOTUS, dBASE, HYDATA, etc, will be provided to ease data transfer from other agencies or earlier processing procedures in the same agency.

The system will be capable of operating as part of a network or as an individual unit in a regional office.

Main Activities:

- Obtain country feedback on reports of the current project for Hydrological Assessment of the SADCC countries.

- Develop a specification based on reports and user feedback.

- Develop the programs to provide a framework for establishing, updating and interrogating the data base.

- Develop the user interface modules which would be applicable to all data types. As far as possible this would be based on selection of an item from a menu or a map display using 'arrow' keys or a 'mouse'. The user interface would initially be developed using English and Portuguese but would be open to other languages.

- Develop the module for digitising maps.

- Develop the modules for data presentation, includes use of VDU, plotters and printers. This module would be of importance for analysis of data and quality control.

- Develop the hydrometric data module. This would include components for current meter calculations, rating curve fitting, entry of river level data by typing tabulated values, digitising charts or importation from other formats, and quality control of levels and flows.

- Develop the hydrogeologic data module. This would include components for well logs, pumping test analysis and Durov diagrams.

- Develop the water quality module. This would include components for recording quality parameters including sediment.

- Develop the analysis module. This would allow for techniques such as serial correlation, trend analysis, cross correlations, multiple regression and flow duration.

- Draft user manual to be circulated for comments and use during program testing.

- Test the programs at selected sites in the region.

- Produce definitive versions of program user manuals and documentation for program support.

Project Period:	12 months	
Estimated Costs:		US$
	Experts 45 m/m	382 500
	Travel	5 000
	Software	10 000
	TOTAL US$	**397 500**

Notes:

(1) A more complete project description is given in section 2.4 above.

(2) The experts would be:

Hydrologist	10+ years experience in hydrology and computerised analysis
Hydrogeologist	10+ years experience in hydrogeology and computerised analysis
Computer Expert	10+ years experience in computer use for water resource applications.
Programmers	Appropriate experience in use of SQL for databases and development of modular computer programs.

(3) Installation of the programs and long term support would be handled by REGI. Extra modules of interest to more than one country would also be handled by REGI. Modules of interest to one country only would come under individual country projects.

PROJECT SUMMARY SHEET: REG 4

Project Title: **Effect of Population Growth and Global Warming on Water Resources in SADCC Countries**

Executing Agency: The SADCC SWLCU, Maseru on behalf of Member Countries

Objectives:

To highlight the importance of hydrometric data collection necessary for water development in order to meet the rapidly increasing population of SADCC countries and the potential reduction in available water resources due to global warming. The population of most SADCC countries will double in the next 20 years, increasing significantly, demands for irrigated crops to meet food shortages.

The stage has now been reached where general atmospheric circulation models are capable of predicting changes in rainfall and temperatures due to global warning. It would be cost effective to undertake such a study on a regional basis where large river basins such as that of the Zambezi river are concerned.

The influence of rainfall and potential evapotranspiration would be evaluated for selected river basins in each SADCC country to evaluate quantitatively changes in both surface runoff and groundwater recharge.

Main Activities:

- Review data on population growth, future water demands and future water development plans;
- Evaluate the influence of global warming scenarios on temperature and rainfall;
- Model selected catchments in each country to evaluate effect on surface runoff and groundwater recharge;
- Compare national water resources relative to future water demand scenarios.

Project Period: 12 months

Estimated Costs:

		US$
Experts	48 m/m @ $8 500	408 000
Subsistence		160 000
Travel expenses, allowance, insurance, freight etc		30 000
Regional travel		25 000
Vehicle & running costs		120 000
Computer hardware		80 000
Reporting		20 000
Miscellaneous		17 000
	TOTAL US$	**850 000**

Note:

The Experts required are:

Project Manager	10+ years experience in hydrology
Climatologist	10+ years experience in climatology
Hydrologist	5+ years expereince in hydrology
Water Resources Engineer	5+ years expereince in water resouce assessment
Climate Modeller	5+ years expereince of general circulation modelling
Groundwater Expert	5+ years expereince in hydrogeology
Assistant Engineer	

PROJECT SUMMARY SHEET: ZIM 1

Project Title:	**Provision of Transport for Hydrometeorological Network Maintenance.**	
Executing Agency:	**Department of Meteorology, Ministry of Transport.**	
Objectives:	To enable regular inspection of raingauges and climate stations to be carried out, which will result in proper control over compilation of station histories and assessment of data reliability, and will provide the opportunity to effect instrument maintenance and repair, and train observers. At present, with minimal transportation resources, very little is known of the station histories, instrumentation, instrument exposure and observer reliability. These can only be complied objectively through regular inspections, which in turn are achievable only through provision of transport facilities.	
Main Activities:	- Procurement of vehicles - Compilation of site visit reports	
Project Period:	1 year	
Estimated Costs:		**US$**
Vehicles	10 @ $25 000	250 000

Counterparts:

No counterparts are required specifically for this project, but obviously drivers and maintenance personnel will be required.

PROJECT SUMMARY SHEET: ZIM 2

Project Title: **Rehabilitation of the Hydrological Branch.**

Executing Agency: **Ministry of Energy and Water Resource Development.**

Objectives:

To create a revitalised, dynamic organisation capable of meeting the rigorous demands for hydrological data within a country facing stiff competition for its water resources.

Staffing and resources allocated to the Hydrological Branch over the last decade or so have seriously declined, putting a fine hydrometric network at risk. Replacement of skilled manpower, new equipment and data handling techniques are urgently required to arrest this slide towards decay.

Main Activities:

- Detailed review of recruitment policies, reorganisation of Branch and recruitment of new staff
- Provision of fellowships for postgraduate study abroad
- Provision of training staff to run local courses for hydrology technicians
- Development of an in-house training facility for technicians and field staff
- Provision of transport
- Provision of basic flow gauging equipment, including cableways and current meters
- Provision of equipment for the "moving boat" gauging technique
- Consultancy to advise on improved data handling techniques and organisation

Project Period: 3 years

Estimated Costs:		**US$**
Expert 10 man-months (Hydrology)		85 000
Fellowships	6 @ $15 000	90 000
Local training		10 000
Equipment		250 000
Total		**$435 000**

Counterparts:

Graduates	84 man-months
Technicians	As many as possible

PROJECT SUMMARY SHEET: ZIM 3

Project Title: **Improved Electronic Data Processing for Hydrology**

Executing Agency: Hydrological Branch, Ministry of Energy and Water Resource Development

Objectives: The computer resources currently available to the branch are inadequate to meet its requirements. The provision of some new equipment, software and training will greatly increase the efficiency of the branch, and the effective supply of information to data users.

Main Activities:

- Review of resources available to the branch, including both hardware and software
- Specification and procurement of additional computer hardware
- Procurement of commercial software, and the tailoring of software to meet the needs of the Branch.

Project Period: 6 months

Estimated Costs:		**US$**
Expert 4 man-months (Data processing)		34 000
Hardware and software		50 000
Fellowships	3 @ $15 000	45 000
Local Training		10 000
Total		**$139 000**

Counterparts:

Graduate hydrologists	3 @ 6 months	18 man-months
Technicians	6 @ 6 months	36 man-months

PROJECT SUMMARY SHEET: ZIM 4

Project Title: **Improved Sediment Monitoring**

Executing Agency: Hydrological Branch, Ministry of Energy and Water Resource Development

Objectives:

To expand the current sediment monitoring programme, with the aim of permitting a more detailed insight into patterns of land erosion, transportation of sediment in rivers, deposition in reservoirs, and the influence of changing land use on this behaviour.

Water resource development in Zimbabwe relies heavily on the construction of small dams on the country's many rivers. A major parameter in the design of these structures is the volume of sediment trapped - a process as yet poorly understood. Major concerns have also been voiced over the effect changing land use patterns have on dam storage.

Main Activities:

- Detailed review of data collected and studies previously undertaken
- Selection of sites for inclusion in an expanded monitoring programme
- Procurement of equipment for measurement of suspended sediment loads and for monitoring sediment deposition in reservoirs
- Provision of transport for increased field activity in this sector
- Provision of laboratory equipment for analysis of sediment samples
- Training in sediment measurement and analyses
- Periodic review of data collected and evaluation of results

Project Period: 4 years

Estimated Costs:		**US$**
Expert 12 man-months (Sediment and Monitoring)		102 000
Volunteer expert	36 man-months	122 400
Vehicles	2 @ $25 000	50 000
Equipment	Field & laboratory	250 000
Fellowships	2 x $15 000	30 000
Local Training		10 000
Total		**$564 400**

Counterparts:

Graduate	12 man-months
Technicians	112 man-months