

APPENDIX A

DESIGN RAINFALL ESTIMATION IN SOUTH AFRICA: USER MANUAL

A computer programme with a graphical user interface has been developed in Java to estimate design rainfall depths for any location in South Africa. This software implements the procedures detailed in Part A of this report which consists of Chapters 2 to 5. The objective of the first section in this chapter is to assist users with the installation and running of the software. The second section presents generalised maps of design rainfall in South Africa.

A. 1 User Manual

A. 1.1 Minimum system requirements

The minimum system requirements on a computer running the Windows operating system are:

- 32 Mb RAM,
- 140 Mb Hard Disk space, and
- Windows 98, or more recent Windows operating system.

A. 1.2 Installation of software

Three steps are required to install the software. These are:

- Step 1: Obtaining the software
- Step 2: Exploding zipped database file
- Step 3: Installing the Java runtime environment.

Step 1: Obtaining the software

The software may be installed from the CD which accompanies this report. Alternatively, the current version of the software may be downloaded from the following site:

<http://www.beeh.unp.ac.za/HydroRisk/>

and follow the “Design Rainfall” option.

The following files are contained on the CD or may be downloaded from the web site:

- rainfall2.jar (~ 1.4 Mb)
- sagrid.zip (~ 12.7 Mb)
- j2re-1_4_0-win-i.exe (~ 11.6 Mb)

It is suggested that these files be saved in the *C:\design_rainfall* directory, as the instructions in this chapter will assume that the files are at that location. However, any user specified directory can be used and the relevant path will need to be substituted in these instructions.

Any updates or changes to the installation procedure will also be available at this web address.

Step 2: Unzip the zipped database file

Unzip the Sagrid.zip file to create a Sagrid.dbf file.

Step 3: Installing the Java runtime environment

The Java runtime environment needs to be installed on the computers running the Windows operating system. This is performed by doubling clicking on the j2re-1_4_1_0-win-i.exe from Windows Explorer and following the instructions.

For computers not using the Windows operating system (e.g. Linux), the relevant Java runtime environment can be downloaded from <http://java.sun.com> and installed on the computer.

A. 1.3 Running of software

Once the Java runtime environment has been installed, the design rainfall software can be executed by running (double clicking) the Rainfall2.jar file. A graphical user interface as shown in Figure 81 should be visible.

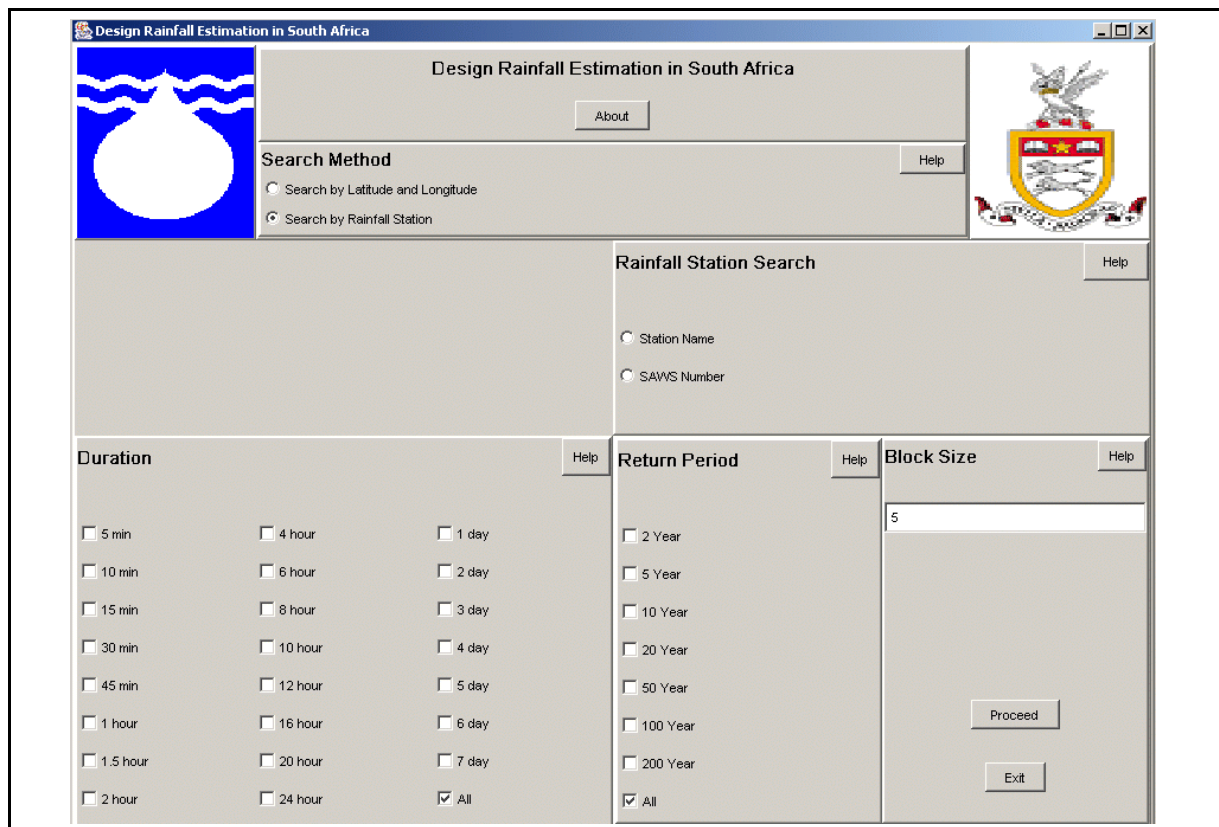


Figure 81 Graphical user interface for the estimation of design rainfall in South Africa

In order to specify the location for the design rainfall estimate, a user has two options (SEARCH METHOD). A user may either select to input the location by latitude and longitude or to search for the location of a daily rainfall station. If the latitude and longitude option is selected, a user may input the location either in decimal degrees, degrees and minutes or as minutes. Further options for searching for a rainfall station are by means of the South African Weather Service (SAWS), formerly known as the South African Weather Bureau (SAWB), station number (e.g. 0239482) or by entering a station name (e.g. Cedara). The user is required to input the duration of the design rainfall by selecting the appropriate check boxes, or by selecting the “ALL” check box which indicates that the user wants design rainfall estimated for all durations. Similarly, the user is expected to select the required return periods. If no values are specified by the user, the program default is to calculate design rainfall for all durations and all return periods.

Utilising the procedures developed, design rainfall can be estimated at a spatial resolution of 1'x1' latitude and longitude for any grid point in South Africa. The user can also specify a “radius”, in minutes, from the point of interest and design rainfall will be estimated at each 1'x1' latitude and longitude point within this area. Thus the spatial variation of design rainfall within an area or catchment can be evaluated by the user. For example, if a block size of 2' is specified, then design rainfall will be estimated at a 1'x1' latitude and longitude grid consisting of 24 points surrounding the point of interest. If no value is specified by the user, the default block size (0) is used by the program.

Each panel in the interface has a “Help” button which provides a brief explanation of what information is required.

When all the information has been entered, the “Proceed” button must be activated. The program then checks that the user has input the minimum required information. If the minimum information has not been selected, a warning is issued and the user is returned to the initial screen.

After the input information has been checked, the user is prompted for the name of an output file. Thereafter, if the user has selected to search for a location using either a SAWS number or station name, a search for the desired location is performed. If more than 1 station meets the search criteria, the user is then supplied with the station numbers, stations names, latitude, longitude, altitude and mean annual precipitation (MAP) and is required to select a station before activating the proceed button. The results of the program are output to the user selected ASCII file, an example of which is contained in Figure 82.

The output file echoes the user selections and then lists the 1 to 7 day design rainfall depths for the selected station and the 5 closest daily rainfall stations to the site of interest. This is followed by the estimated design rainfall values for the specified location and each point in the specified block size. Ninety percent upper (U) and lower (L) bounds for all design rainfall values are also output. Examples of design rainfall, estimated using the programme are contained in Figures 83 and 84.

User selection has the following criteria:
 Station Name: cedara
 Durations requested: 5 m, 10 m, 15 m, 30 m, 45 m, 1 h, 1.5 h, 2 h, 4 h, 6 h, 8 h, 10 h, 12 h, 16 h, 20 h, 24 h, 1 d, 2 d, 3 d, 4 d, 5 d, 6 d, 7 d
 Return Periods requested: 2 yr, 5 yr, 10 yr
 Block Size requested: 0 minutes

Data extracted from Daily Rainfall Estimate Database File
 The station selected and the five closest stations are listed

Station Name	SAWB Number	Distance (km)	Record (Years)	Latitude (°)	Longitude (°)	MAP (mm)	Altitude (m)	Duration (m/h/d)	Return Period (years)	2	5L	5U	10	10L	10U				
CEDARA COLLEGE	0239482_W	0.0	40	29	32	30	17	876	1134	1 d	55.6	55.2	55.8	77.8	77.3	78.2	95.2	94.0	96.1
										2 d	70.0	69.4	70.6	98.5	97.6	98.9	122.1	120.5	123.7
										3 d	79.8	79.1	80.6	112.7	111.7	113.1	140.2	138.2	142.2
										4 d	87.4	86.5	88.2	123.1	122.0	123.7	152.6	150.0	154.9
										5 d	92.0	91.1	92.8	128.8	127.6	129.4	158.6	155.7	160.9
										6 d	99.0	98.1	100.0	138.1	136.7	139.0	168.9	165.8	171.3
										7 d	102.5	101.6	103.5	142.0	140.7	143.0	172.8	169.7	175.3
.																			
.																			
BOTANIC GARDENS - PMB	0239605_P	9.0	83	29	35	30	21	1001	882	1 d	57.0	56.1	57.5	83.0	82.0	83.5	104.7	102.8	106.7
										2 d	73.0	71.7	74.3	106.0	104.6	106.8	133.7	130.3	136.8
										3 d	84.0	82.2	85.7	122.3	120.5	123.4	154.4	150.0	158.0
										4 d	91.5	89.7	93.4	132.0	130.1	133.2	165.5	160.9	170.1
										5 d	98.4	96.4	100.3	140.2	138.3	141.7	174.4	169.6	178.6
										6 d	104.8	103.0	106.6	148.1	146.0	149.5	182.8	178.1	187.1
										7 d	110.7	109.0	112.6	154.9	152.9	156.4	190.3	185.6	194.6

Gridded values of all points within the specified block

Latitude (°)	Longitude (°)	MAP (mm)	Altitude (m)	Duration (m/h/d)	Return Period (years)	2	5L	5U	10	10L	10U
29	32	30	17	876	1134	5 m	11.5	7.4	15.6	16.1	10.3
						10 m	15.5	10.6	20.4	21.7	14.9
						15 m	18.5	13.5	23.5	25.9	18.8
						30 m	23.3	17.2	29.4	32.6	24.1
						45 m	26.7	20.2	33.2	37.3	28.2
						1 h	29.3	22.6	36.1	41.1	31.6
						1.5 h	33.6	26.1	41.1	47.0	36.5
						2 h	37.0	29.1	44.9	51.8	40.7
						4 h	42.9	34.8	51.0	60.1	48.8
						6 h	46.8	40.0	53.6	65.6	56.0
						8 h	49.8	44.0	55.7	69.8	61.5
						10 h	52.3	47.5	57.0	73.2	66.4
						12 h	54.4	50.3	58.3	76.2	70.5
						16 h	57.1	53.5	60.5	79.9	74.9
						20 h	60.7	57.5	63.8	85.0	80.4
						24 h	63.1	59.8	66.4	88.4	83.6
						1 d	53.6	43.0	64.1	75.0	60.2
						2 d	66.1	61.2	70.8	92.5	85.7
						3 d	74.7	67.7	81.6	104.6	94.7
						4 d	81.2	72.7	89.6	113.7	101.7
						5 d	86.6	76.6	96.6	121.3	107.2
						6 d	91.3	79.6	102.9	127.9	111.5
						7 d	95.5	82.3	108.7	133.7	115.1

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Figure 82 Example of design rainfall output

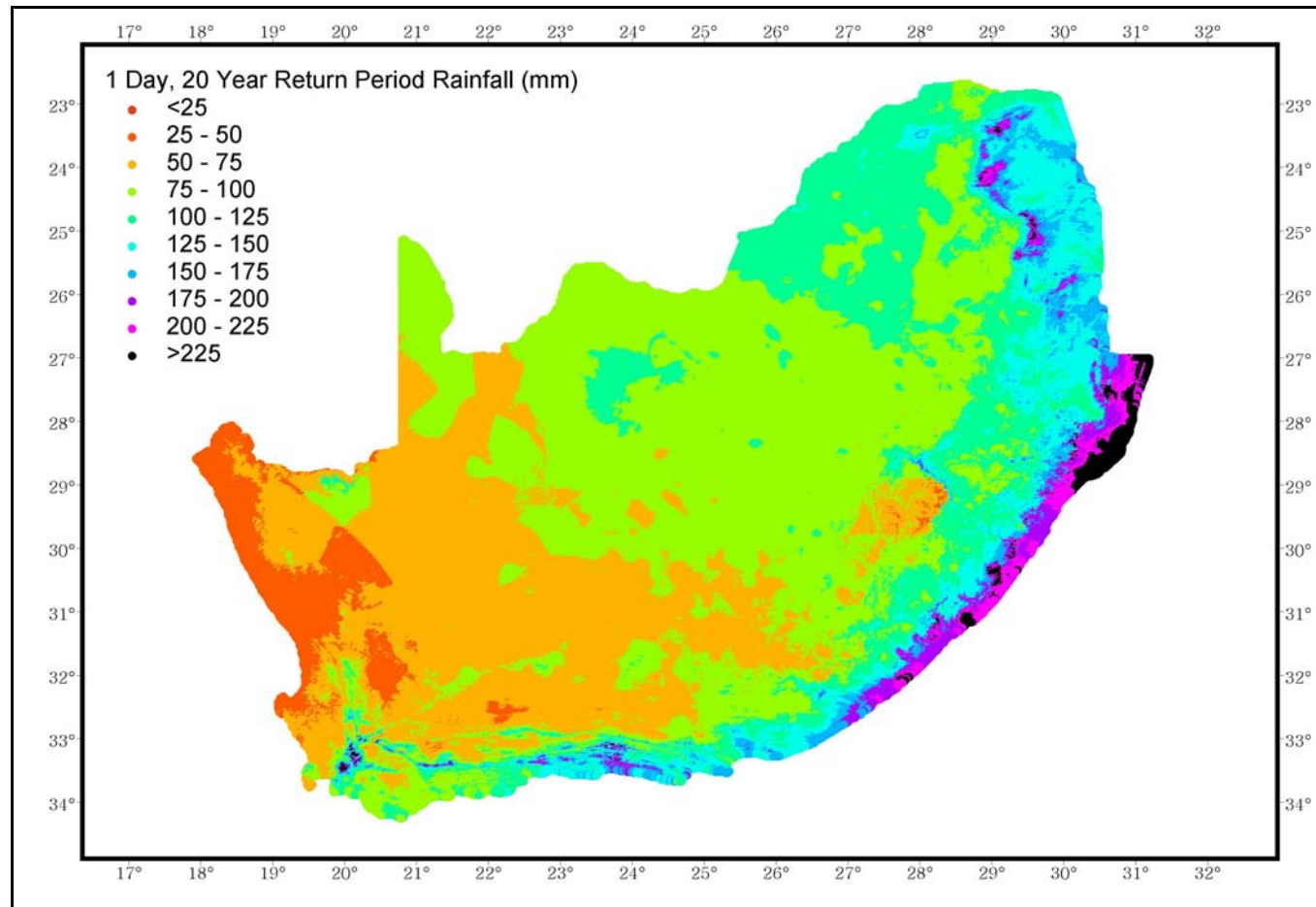


Figure 83 Colour map of 1 day, 20 year return period design rainfall in for South Africa

