1. Introduction

During 2002-2005 complaints were received regarding declining water levels and excessive water use by irrigation water users south of Kuruman. The Department investigated the groundwater status in the area and reported with REPORT GH 4030. VAN DYK 2005. STATUS OF GROUNDWATER RESOURCES AND WATER USE IN THE KURUMAN TO MOUNT CARMEL AREA. The report concluded that the semi arid summer rainfall drive the availability of water as graphically represented by the precipitation at Wonderwerk measuring station and also the flow at the Kuruman eye. After major rainfall seasons like 1973-1976 and 1988 the flow at Kuruman eye is 200-400 l/s for a few months after which it gradually decline. During dry spells the flow decline to less than 100 l/s as reported in 2005.

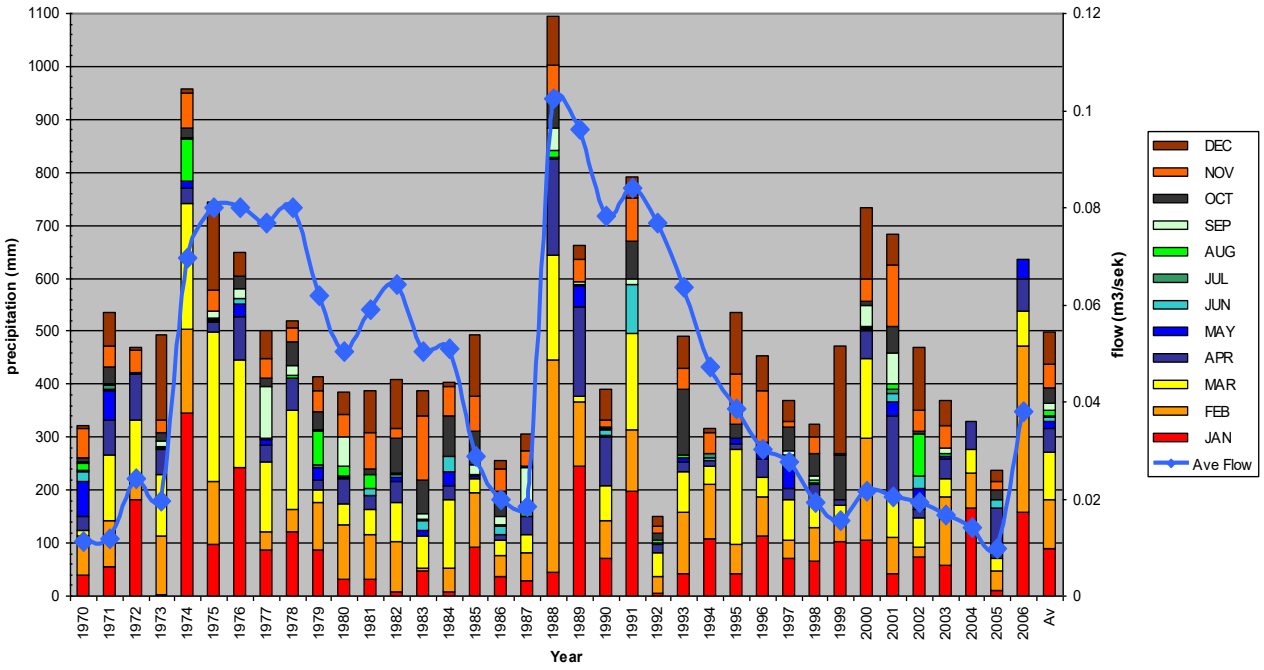

Figure 1. Precipitation as measured at Wonderwerk station (SAWB)

The waterlevels in boreholes would also decline during dry periods. The updated rainfall record in Figure 2 indicate that 2015 was a very dry year and therefore flow in the Kuruman eye declined and water levels in boreholes also declined. From this graph it is evident that the precipitation is erratic on an annual basis with dry cycles 1970, ’86-87, ’92, ’98, ’04-’05. These were followed by wet cycles 1974-’76, ’88-’91, ’01-’02 and 2006, 2009/10 and now in 2017 in progress. The precipitation also vary considerably laterally and range from 480 mm to 380 mm over the area of investigation as depicted by the contoured rainfall from measuring stations (Wiegmans 2006). There would be a major recovery of water levels in 2017 due to the high rainfall.

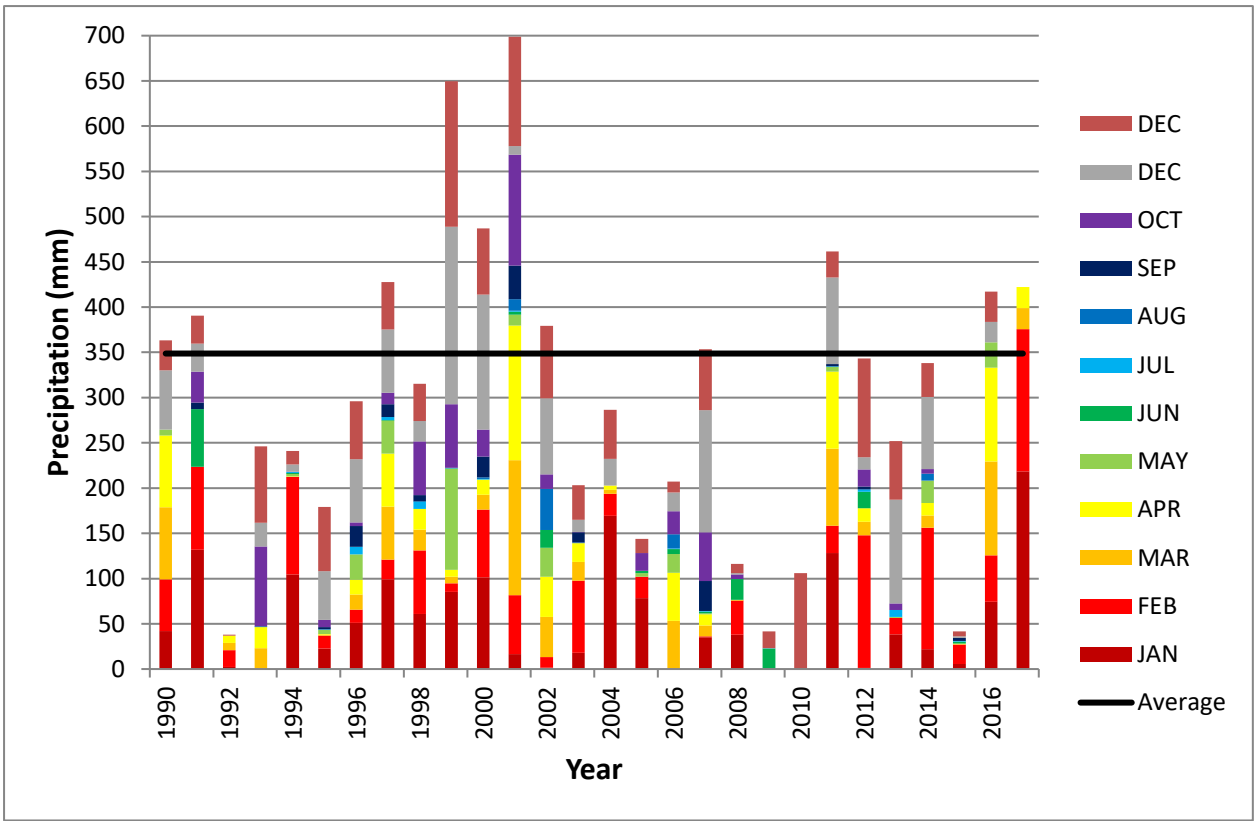

Figure 2 Precipitation as measured at the Kuruman rainfall station

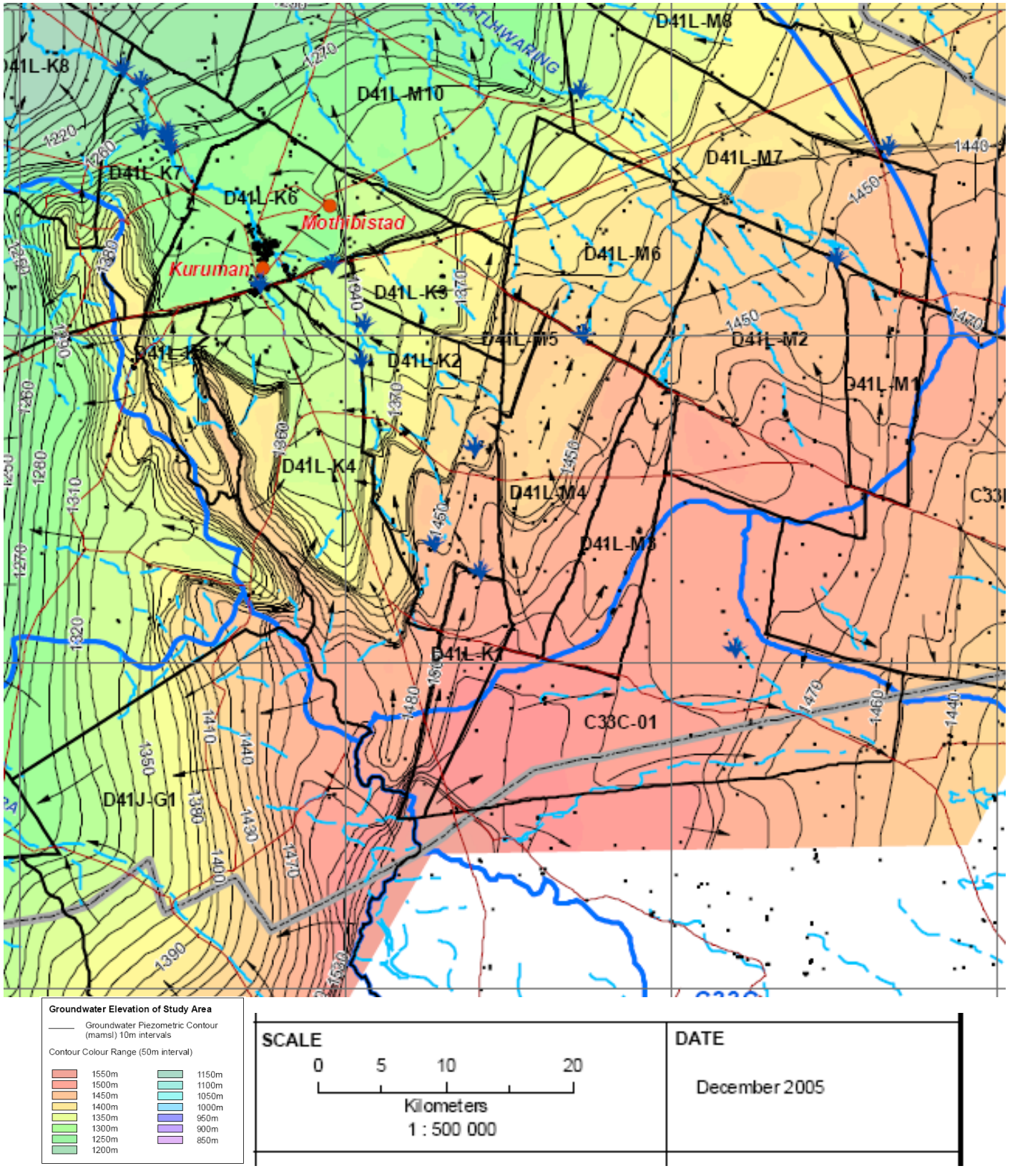

Figure 3. Groundwater management units (GWMU), elevation contours and compartments. (Wiegmans 2006).

Wiegmans (2006) calculated with the Chloride Mass Balance method (CMB) combined with the Cumulative Rainfall Departure (CRD) the recharge to groundwater in each GWMU from rainfall. With the recharge and area of each unit the sustainable volume available from each unit over the long-term (5 to 10 years) was calculated. In Figure 3 the water management units are mapped with the total volume available in each and water use from each in unit is estimated in Table 1.

Quaternary Surface Catchment Area	Groundwater Management Unit (GMU) Number	Name	Median Mm3/a	Median l/s	Available Vertical Inflow	Lateral Inflow	Total Available Water Use	Muni-cipal	Com-mercial
D41L-K: Upper Kuruman River Groundwater Management Area (GMA)									
D41L	D41L-K1	GrootKono	1.01	32	0.480	0.000	0.480	0.018	
D41L	D41L-K2	Kuruman B Eye	3.47	110	1.635	0.646	2.281	0.100	
D41L	D41L-K3	West Derby	1.14	36	0.541	0.000	0.541	0.202	
D41L	D41L-K4	Kuruman A Eye	10.84	344	4.950	1.639	6.588	1.665	0.630
D41L	D41L-K5	Kuruman Hills	3.25	103	1.462	0.000	1.462	0.016	
D41L	D41L-K6	Mothibistad	2.45	78	1.162	5.050	6.212	1.183	
D41L	D41L-K7	Batlharos	2.02	64	0.954	5.029	5.983	0.968	
D41L	D41L-K8	Gamopedi	1.13	36	0.574	5.016	5.589	0.169	
D41L	D41L-K9	Maipeng	0.47	15	0.282	5.330	5.612	0.184	
D41L	D41L-K10	Gasese	0.15	5	0.098	5.428	5.526	0.035	
TOTAL	10		25.92	822	12.138		40.275	4.539	0.630

Table 1 indicate that there is major difference in the median volume available in each wmu mainly due to size differences. It also indicate that there is large volumes that flow into most of the downstream wmu. This water originate from upstream wmu's and in times of extended dry cycles these upstream wmu's can effectively be drained. The volumes are indicated in Table 1 and there could be water shortages in some water management units during drought. Spring flow can reduce and dry up, water levels can decline (2-5 m), boreholes can dry up and sinkholes can form. In areas of excessive water use water levels can decline with more than 10 m.

The only commercial water use is from the Kuruman A eye water management unit as irrigation of land from borehole water . The volume was estimated as 630 000 M m3/a in 2005. The registered volumes in 2016 (WARMS) are mapped in figure 4 and the total 1 320382 M m3/a indicate this volume increased significantly the last 10 years. The bulk of this irrigation however is outside the D41L-K4 or Kuruman A eye groundwater management area. It is therefore not impacting on the large abstraction volumes of approximately 4 600 000 m3/a abstracted for municipal purposes in Kuruman area. This abstracted volume for municipal purposes is 65% of available volume (6 588 000 m3/a) and in drought there can be water level decline that could influence municipal boreholes.

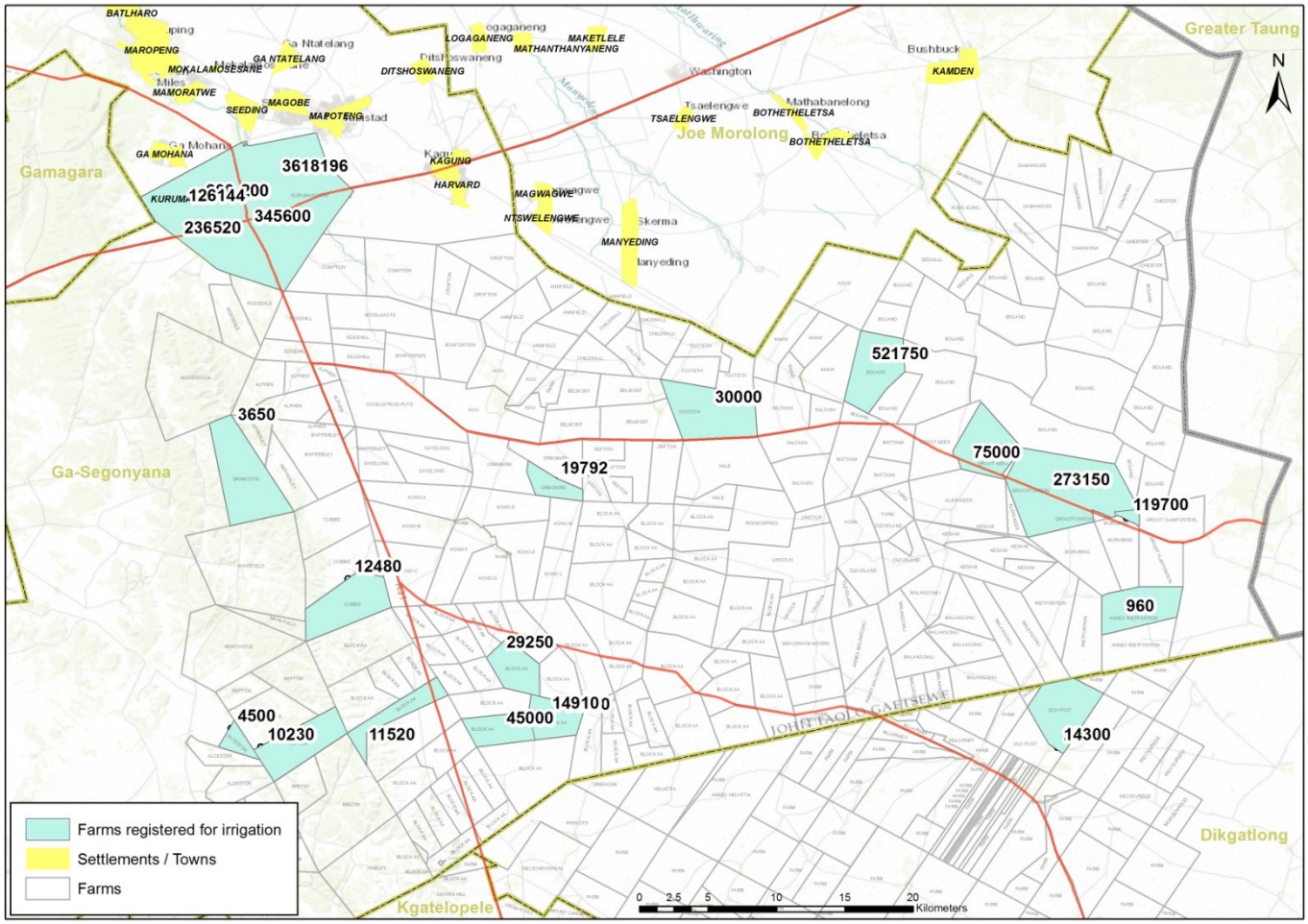

Figure 4. Locality and volume abstracted from the Kuruman area.