GH REPORT 3447

THE WATER SUPPLY SITUATION CURRENTLY PREVAILING IN KOSTER, WESTERN TRANSVAAL

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DIRECTORATE OF GEOHIDROLOGY

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CONTENTS

1. INTRODUCTION

This report comprises a first-phase follow-up to a request from the Rustenburg-Marico-streekontwikkelingsvereeniging, dated 19 October 1984, for an investigation into the ground-water potential of the areas around Koster and Swartruggens.

The investigation comprised a short field-trip (± 2 days) involving discussions with the persons responsible for the town's water supply, as well as a survey of the well field serving Koster. In addition, information concerning the recent water supply history of Koster was obtained. For details of location see Figure 1. At this stage, no attempt was made to conduct a hydrocensus on the private boreholes in the town.

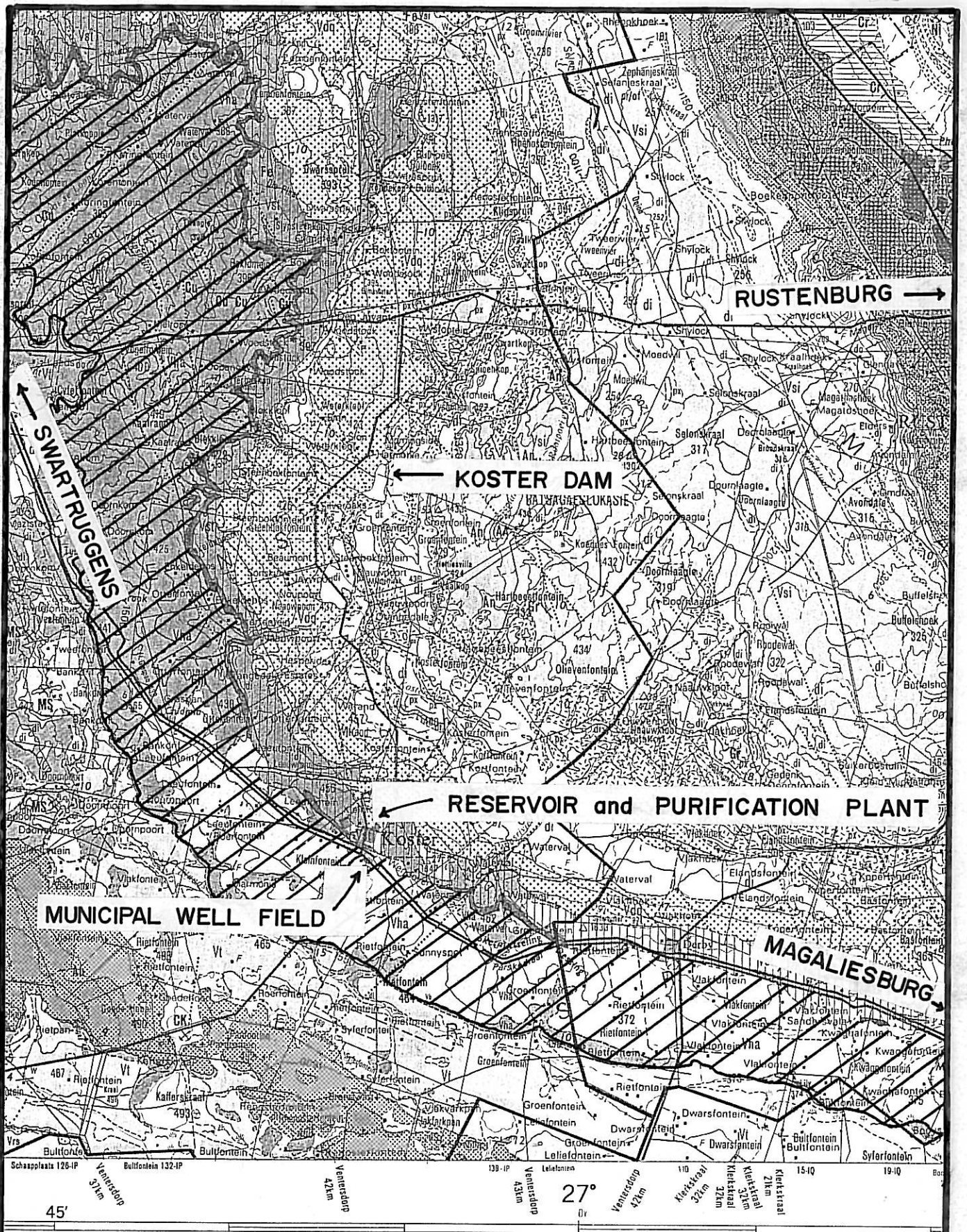
2. BACKGROUND INFORMATION

The low rainfall experienced in the early 1980's (see Figure 2) has led to a drastic decrease in the water available to Koster from the municipal dam. With this in mind the Rustenburg-Marico-streekontwikkelingsvereeniging approached the Department of Water Affairs with a view to obtaining water for both Koster and Swartruggens from the dolomites to the south. (See correspondence contained in Appendix 1.) In reply, the Director: Geohydrology mentioned that the distances involved in making use of dolomite water were likely to be large (25 - 30 km), and suggested that a survey in the immediate vicinity of both towns may prove to be adequate for the selection of borehole sites aimed at supplementing the towns' present water supply.

Although no further correspondence with regard to Koster has been exchanged to date, the availability of manpower prompted the Director: Geohydrology to instigate a preliminary investigation into ascertaining exactly what the present and recent past water supply situations of the two towns were. To this end a meeting was arranged with the Town Clerk: Mr Bergh. Owing to a last minute cancellation by Mr Bergh, discussions were carried out with Mr Bester the town's medical officer under whom the monitoring of water supplies falls.

3. PAST AND PRESENT WATER SUPPLY TO KOSTER

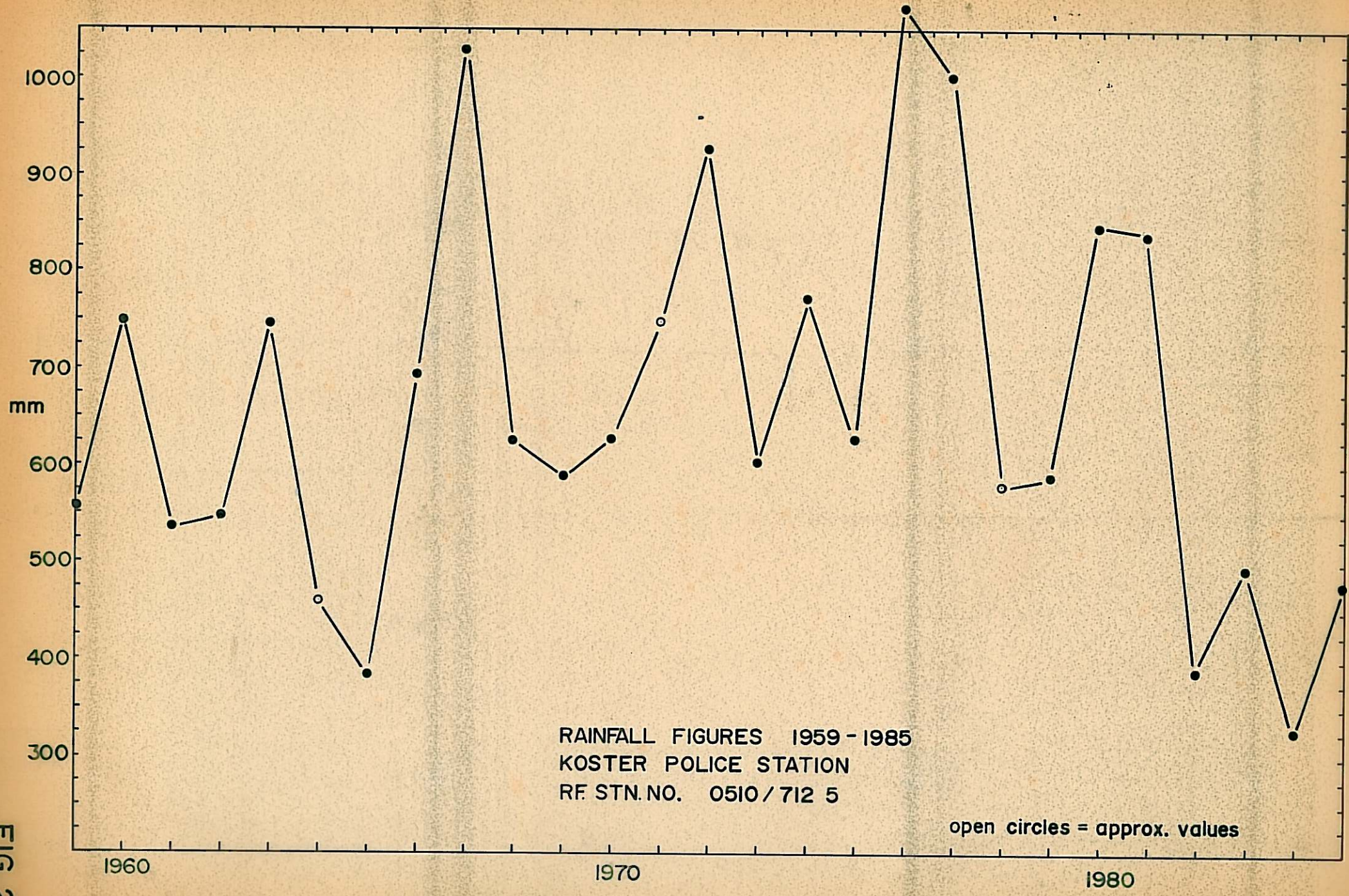
Prior to November 1983, all Koster's municipal water requirements were provided by the dam on the Koster River, 17 km north of the town. (Refer to Figure 1.) Towards the end of 1983, when the dam level fell to below 9 % of its full supply capacity (see Table 1), three boreholes previously used by the SAR, before the introduction of electric locomotives, (Nos 1, 2 and 3 on Figure 3) were taken over by the municipality to supplement the supply from the dam. Since then 10 other boreholes were drilled, five intersecting ground-water and five dry.



LOCATION MAP - KOSTER

Shaded area = Hekpoort Formation

FIG. 1


1000
900
800
700
mm
600
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400
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1960
1970
1980
RAINFALL FIGURES 1959 - 1985
KOSTER POLICE STATION
RF. STN. NO. 0510 / 712 5
open circles = approx. values

FIG. 2

FIG. 2

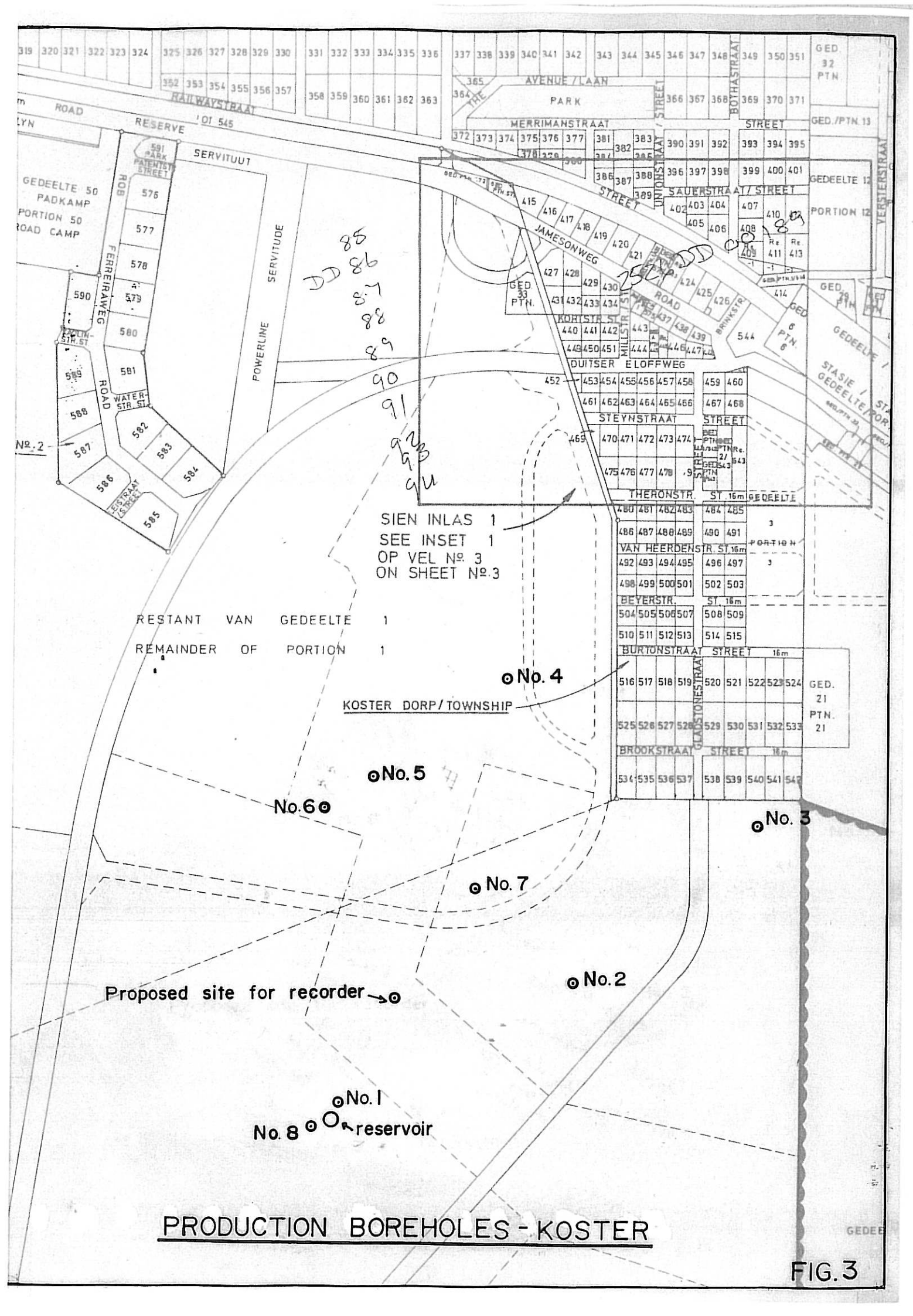
SIEN INLAS 1
SEE INSET 1
OP VEL Nº. 3
ON SHEET Nº.3
RESTANT VAN GEDEELTE 1
REMAINDER OF PORTION 1
KOSTER DORP/TOWNSHIP
No. 1
No. 2
No. 3
No. 4
No. 5
No.6
No. 7
No. 8
reservoir
Proposed site for recorder
PRODUCTION BOREHOLES - KOSTER
FIG. 3

Table 1: Percentages of municipal water supplied from dam and boreholes respectively, and monthly consumptions

Date	% water in dam	% dam	%boreholes	Consumption (m^3)
Nov. '83	8,8	80	20	19 500
May '84	7,2	58	42	10 100
Nov. '84	5,5	0	100	20 396
May '85	6,0	0	100	17 811
Dec. '85	4,1	1	99	20 280

Water restrictions were implemented in May 1984 explaining the initial, sudden decrease in consumption at that time.

4. HYDROCENSUS OF PRODUCTION BOREHOLES

Data relating to the production boreholes, even those fairly recently drilled, were extremely scarce. No information could be gained on borehole depths, ground-water strikes and lithologies intersected. Fortunately Mr Bester has kept records of borehole yields measured monthly, after the pump had been in operation for about 2 hours. (Refer to Table 3.)

The municipal well field is situated south of Koster in a low-lying "vlei" area. By inference from the 1:250 000 geological map it appears that the geology underlying the well field comprises andesitic lavas of the Hekpoort Formation of the Pretoria Group. North of the well field, underlying the town, slates and shales of the Strubenkop Formation form a positive topographic feature.

The 8 production boreholes i.e. the 5 drilled successfully since November 1983 plus the 3 taken over from the SAR are shown on Figure 3. All 8 holes have been given new numbers as the numbers allocated by the municipality refer to physical features associated with, or near to, each borehole. The numbers and old borehole names, and a description of their yields with time, are shown in Table 2:

Table 2: Old borehole names and description of changes in yield.

No	1	– Vlei	More or less constant. Rainfall has marked influence.
	2	– Middel	Presently at weakest acc. to records.
	3	– Bloekom	Slight drop at present. Rainfall has marked influence.
	4	– Rugbyveld	Constant so far.
	5	– Kleiduif	Was very constant. Now collapsed.
	6	– Karee	Dropped slightly since first drilled.
	7	– Vlakte	Dropping since first drilled (5,1 ℓ/s).
	8	– Dompel	Fell at first. Now constant.

Table 3: Changes in yield (ℓ/s) with time for production boreholes

Date	1	2	3	4	5	6	7	8
28/2/85	6,7	1,3	2,0	N.d.	5,1	N.d.	N.d.	1,7
31/7/85	6,1	1,1	2,2	N.d.	5,1	N.d.	N.d.	1,2
2/12/85	6,3	0,9	1,8	2,2	Coll.	N.d.	N.d.	0,9
14/2/86	6,5	0,9	1,9	2,2	Coll.	3,2	4,3	1,0

N.d. - Not drilled
Coll. - Collapsed

The only other information that could be obtained was the pump equipment on each borehole and the rest ground-water level. Details are summarised below in Table 4

Table 4: Production boreholes - equipment and water levels

Borehole No	Type of equipment	RWL below surface
1	Waterbok turbine pump 7,5 kW motor	Not measurable
2	National D9 power head. 3HP motor	9,50 m
3	Waterbok turbine pump 4 kW motor	Not measurable
4	Waterbok turbine pump 4 kW motor	11,20 m
5	None	10,70 m
6	Submersible pump	9,97 m
7	Waterbok turbine pump 7,5 kW motor	10,20 m
8	Submersible pump	7,30 m

All the borehole pumps are powered by electric motors. Water from each hole is piped to a collecting reservoir between boreholes 1 and 8. From here it is pumped by means of a centitrugal pump powered by a 22 kW electric motor to the main reservoir and purification works situated on a high point north of the town.

Each borehole is pumped in shifts of about 12 hours. The main reservoir has a capacity sufficient to last the town for 2 days if no water is received from the well field.

An interesting fact to emerge was that the first 3 of the 10 boreholes drilled since November 1983 were sited by a consulting geologist and all were dry. The remaining 7 holes were sited by a diviner and 5 of them intersected ground-water of usable quantity.

5. DISCUSSION

According to Mr Bester, the present demand for municipal water (after the imposition of restrictions) is about 22 000 m^3 per month. For a 30 day month, 24 hours per day, this represents an average consumption of 8,7 ℓ/s. At present the 7 operating boreholes in the well field have a combined yield of 20 ℓ/s. If it is assumed that half of this amount (i.e. 10 ℓ/s) is

available at any one time while some of the boreholes are being rested, it is apparent that the well field is capable of supplying the needs of the town. This would not be the case, however, if restrictions were lifted, when consumption could be expected to double to over 17 ℓ/s. At present each household is limited to 40 m^3 a month at the normal tariff of 45 c/m^3. Above this figure tariffs increase to R2,00/m^3.

No records of water level fluctuations have been kept till now. For this reason it is not possible to judge the effects of the post - 1983 pumping on the local ground-water table. Reference to Figure 2 reflects the recent low rainfall, which has undoubtedly led to a decrease in the recharge to the aquifer. Local information reveals that rainfall events have a fairly sudden effect on borehole yields with boreholes 1 and 3 showing sharp increases within one month after good rains.

Mr Bester does not envisage pumping water from the dam until the quantity of water held therein approaches 25 - 30 %. However, as soon as it is possible to do so, the dam will revert to being the town's main supplier and the well field will be allowed to rest and recover.

A number of "unsuccessful" (less than 1 ℓ/s) boreholes have been drilled in the vicinity of the well field. Any one of these could easily be fitted with a ground-water level recorder enabling the monitoring of long-term fluctuations in ground-water level. It is suggested that one of the "dry" boreholes sited by the geologist be used for this purpose. The best situated of these lies between borehole Nos 7 and 1 and is indicated on Figure 3.

6. RECOMMENDATIONS

(a) Regular ground-water level measurements in and around the well field should be taken. This should give advance warning of any rapid depletion of the ground-water resource. In this regard it is considered a priority that a permanent ground-water level recorder be sited as indicated on Figure 3.

(b) The Koster Municipality should be responsible for the maintenance of the recorder and for the monthly changing of graph paper. If substantial lowering of the ground-water level is seen to occur the Directorate: Geohydrology should be approached with a view to selecting additional borehole sites away from the well field and preferably along the pipeline from the dam.

(c) A concerted effort should be made to reopen and re-equip borehole number 5 (kleiduif).

(d) The well field and immediate vicinity should be surveyed by a municipal surveyor and borehole collar elevations should be determined. This will facilitate interepretation of (a) above.

(e) The water restrictions currently in force in Koster should be maintained until such time as the dam water can be reincorporated into the municipal water supply system.

7. CONCLUSIONS

The recent period of low rainfall has led to an almost total depletion of surface water sources in the Koster area. The establishment of a well field south of the town has provided the town with sufficient water provided that the current restrictions remain in force. In order to safeguard the aquifer by ensuring that rapid depletion does not take place, regular monitoring of ground-water levels and borehole yields should be implemented. The results of the monitoring programme will determine whether it is safe to continue abstraction from the well field or whether an investigation aimed at delineating other borehole sites should be embarked upon.

A P P E N D I X

CORRESPONDENCE BETWEEN THE DEPARTMENT OF WATER AFFAIRS

AND THE

RUSTENBURG-MARICO-STREEKSONTWIKKELINGSVEREENIGING

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1984-11- 9

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ontwikkelingsvereniging
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RUSTENBURG
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Meneer

WATERVOORSIENINGSPROBLEME : SWARTRUGGENS EN KOSTER

Ek verwys na u skrywe gedateer 19 Oktober 1984.

Die Afdeling Geohidrologie van hierdie Departement beoog op die langtermyn om aandag te skenk aan die dolomietgebied ten suide van Swartruggens en Koster. Hierdie ondersoek sal egter nie binne die volgende jaar geskied nie.

Swartruggens en Koster lê onderskeidelik 30 en 25 km van die noordelike grens van die dolomietgebied en alhoewel daar goeie moontlikhede is om water vir die dorpe uit die dolomiet te kry, mag die afstand te groot wees. Dit word aanbeveel dat daar eers ondersoek ingestel word na moontlike grondwaterbronne nader aan die dorpe en indien dit nie slaag nie, daar na die dolomiet gekyk word.

Indien Swartruggens en Koster met bogenoemde akkoord gaan kan hulle by die Afdeling Geohidrologie van die Departement aansoek doen vir geohidrologiese ondersoeke nader aan hulle.

Die uwe

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DIREKTEUR GENERAAL

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PRETORIA
0001

Hoofingenieur (Beplanning)

Aandag : A.H.I. (B) N.

1984 -11- 6

WATERVOORSIENINGSPROBLEME KOSTER EN SWARTRUGGENS

Ek verwys na u nota op skrywe van die Rustenburg-Marico S.O.V. gedateer 19/10/84.

Die Afdeling Geohidrologie beoog op die langtermyn om aandag te skenk aan die dolomietgebied ten suide van Swartruggens en Koster. Die dorpe lê onderskeidelik 30 en 25 km van die noordelike grens van die dolomietgebied en alhoewel daar ongetwyfeld goeie moontlikhede is om water vir die dorpe uit die dolomiet te kry, mag die afstand te groot wees.

Daar word in die eerste plek aan die hand gedoen dat ondersoek ingestel word na moontlike grondwaterbronne nader aan die dorpe en indien dit nie slaag nie sou daar na die dolomiet gekyk kon word. Daar word op verdere versoek van u en SOV gewag.

J.R. Vegter

DIREKTEUR : GEOHIDROLOGIE

8/11/84

(B)

Mnr. v. Zyl
Gee dit so oor aan die SOV en sê as die dorpe daarmee akkoord is kan hulle aansoek doen vir ... ondersoek nader aan ...

524/10 B1/1.2.2

Rustenburg – Marico Streekontwikkelingsvereniging

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1984-10-23

19 Oktober 1984

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Departement van Omgewingsake en Waterwese
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Meneer

WATERVOORSIENINGSPROBLEME: SWARTRUGGENS EN KOSTER

Die plaaslike bestuur van Swartruggens ervaar ernstige probleme met watervoorsiening. Die voorsiening uit aanvullende boorgate wat onlangs gesink is, het gedaal en die dorp het slegs 301 854 liter water per dag vir verbruik beskikbaar. Die gemiddelde daaglikse verbruik in normale tye is 780 000 liter per dag.

In die geval van Koster is die watervoorsieningsprobleme nog nie akuut nie maar dit word voorsien dat daar op die langtermyn wel sulke probleme sal ontstaan.

Die Rustenburg-Marico Streekontwikkelingsvereniging het verneem dat die Direktoraat van Waterwese van voorneme is om 'n ondersoek te doen na die gebruik van dolomietiese water in hierdie streek. Indien dit so is word 'n versoek gerig dat die beskikbaarstelling van dolomietiese water aan die dorpe Koster en Swartruggens ook by die ondersoek ingesluit word.

Oor die ernstige probleme wat Swartruggens ervaar, word daar nou met die Direkteur van Plaaslike Bestuur onderhandel. Daarna sal verteenwoordigers van Swartruggens en die Rustenburg-Marico Streekontwikkelingsvereniging graag met dr Otto van die Direktoraat van Waterwese 'n onderhoud wil voer. Hieroor sal daar weer binnekort verder met u geskakel word.

Die uwe

C KOCH
SEKRETARIS
R-MSOV

AFD. GEOHIDROLOGIE ONTVANGS ERKEN 29-10-1984 RECEIPT ACKNOWLEDGED DIV. OF GEOHYDROLOGY

Direkteur: Geohidrologie
Kan u asb. my van inligting voorsien oor die genoemde ondersoek en of die twee dorpe daarby ingesluit kan word.

ONTVANGS ERKEN 1984-10-23 RECEIPT ACKNOWLEDGED

AHI(B)N 84.10.25