DEPARTMENT OF MINES AND ENERGY

SOUTH AUSTRALIA

REPORT BOOK NO. 85/59

KENMORE PARK, WATER SUPPLY

GEOLOGICAL SURVEY

by

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GROUNDWATER & ENGINEERING

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DME. 437/77

CONTENTS

TABLES

APPENDICES

FIGURES

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

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KENMORE PARK, WATER SUPPLY

ABSTRACT

Drilling at Kenmore Park has located small but adequate supplies of groundwater in fractured crystalline basement. Nitrate contents are unacceptably high, about 100 mg/L. Previous drilling has shown that nitrates are ubiquitous in this area, and that further drilling is unlikely to locate water of satisfactory quality.

The Department of Housing & Construction is to install a small reverse osmosis plant to provide drinking water.

Pump-testing of the wells showed that KP6 has a long term yield of about 1L/S, but KP7 is only suitable as a mechanical standby.

Regular monitoring of water levels and salinity is recommended.

Construction of a dam to increase recharge is proposed.

INTRODUCTION

This report discusses the results of water drilling around Kenmore Park up to March 1985.

HISTORY

Formerly Kenmore Park was a cattle station and was supplied from two wells now known as KP1 and KP2 (5343 WW 52 and 5345 WW 7).

In 1978 the station was purchased by the Department of Aboriginal Affairs.

In 1978 an additional water supply well KP3 (5345 WW 29) was drilled by the Department of Mines and Energy close to the homestead. This well's performance was disappointing and its salinity increased with time.

In 1982 KP4 (5345 WW 34) was drilled 3 km west of the homestead. This had only a small supply and has never been equipped.

In 1983 two wells were drilled in the Swamp Well area as a part of a wider search for good quality water in this area. Although yields and salinity were encouraging nitrate contents were excessive.

Well details are shown in Table 1.

TABLE 1

Well Details

Unit No *	Local No	Depth (m)	SWL (m)	TDS (mg/L)	Supply L/s*	Comments
52	KP 1	35	-	2 700	.6 P	Pump jack
7	KP 2	9		1 140	.1	Windmill
29	KP 3	11.6	5	1 070	1.5 A .8 P	Equipped with helical rotor pump
34	KP 4	28	8	570	.5 (A)	
46	Swamp Well No 1	43	5	820	2.5 A	
47	Swamp Well No 2	36	9	600	2.5 A	
66	KP 5	6	2	6 400	2.5+	
67	KP 6	31	6	730	1 A	
68	KP 7	36	9		.9 A	

* Add prefix 5345 WW

** A, airlift
T, pump-test
P, production experience

In 1985 it had been decided that the community was to remain in its present location. The existing well KP3 (5345 WW 29) not only has a small supply but is also close to the homestead and at risk of pollution by septic tank effluent. Drilling was

undertaken to find a water supply close to Kenmore Park. Because of the known occurrence of saline water in this area the Department of Housing and Construction accepted that desalination might be necessary.

1985 DRILLING

Three holes KP5, KP6 & KP7 (5345 WW 66, 5345 WW 67 and 5345 WW 68) were drilled. The last two wells were completed as production wells.

Reasons for siting each well are shown in Table 2.

DRILLING METHODS

All wells were drilled by the air-hammer method. The two successful wells were cased with PVC casing perforated with 10 mm diameter holes. Pump-testing indicates that this method was satisfactory. Slotting the casing with abrasive discs would provide a larger open area and is preferable.

TABLE 2

Reasons for siting wells

Unit No.	Local No.	Reason for siting	Results
5345 WW 66	KP 5	Near creek, on photo-lineament	Too saline Very fractured
" " 67	KP 6	Near straight creek	Success
" " 68	KP 7	To intersect E-W fault displacing a dolerite dyke.	Success

HYDROGEOLOGY

Kenmore Park lies near the eastern end of the Musgrave Ranges.

The area is underlain by gneisses and granulites of the Musgrave Complex, which are covered by thin surficial deposits to the south and east of Kenmore Park (Sprigg et al. 1955).

Aquifers are either fracture aquifers in the crystalline rocks or weathering aquifers derived from them.

The development of weathering aquifers is controlled by the presence of joints through which groundwater can circulate.

Hence both types of aquifer are localized in zones of better fissuring, and lineaments can be a useful guide for siting wells.

Neither type of aquifer is very extensive, and groundwater is compartmentalized.

Recharge to the aquifers would be local, either direct infiltration of rainfall through the soil or infiltration through the beds of small nearby water courses.

PUMP-TESTING

The two new production wells were tested by Pitantjatjara Council personnel and equipment. The results are discussed in Appendix B.

Predicted pumping performance is shown in Table 3.

TABLE 3

Production Well Details

Unit No.	5345 WW 67	5345 WW 68
Local No.	KP 6	KP 7
Depth (m)	31	36
SWL (m)	6	9
Casing (m)	31 (PVC)	36 (PVC)
Perforations (m)	12-24	24-30
Predicted yield (L/s)	1.2	0.35 L/s continuous or 0.45 L/s in 12 hour shifts

WATER QUALITY

Within the Musgrave Ranges salinities are generally around 1 000 mg/L. Under the plains and some of the adjoining foothills salinities are generally higher.

Kenmore Park lies on the boundary of the fresh and saline water areas. Under the plain to the south east salinities are consistently high.

Drilling to date has shown that saline water (7 700 mg/L) occurs to the north.

Waters of very different salinity occur fairly close together, showing the degree to which groundwater is compartmentalized. Major ion analyses are shown in Table 4.

Nitrates

Nitrate contents are excessive in all known groundwaters around Kenmore.

This is a common problem in this part of the State. In the writer's opinion nitrate levels of about 100 mg/L are normal in infiltrating water through soil in this area. In some places some nitrate may be subsequently removed in the aquifer.

Results to date suggest that most water close to Kenmore Park will have either excessive nitrate or TDS or both.

DISCUSSION

The wells drilled to date appear to be tapping compartments of limited extent. Their performance over the long term and through extended droughts cannot be guaranteed.

Water levels in these wells should be monitored so that their performance can be assessed.

If additional production wells are needed drilling on selected targets further up the valley would have a good chance of success. Careful geological selection of sites is advisable.

Both wells lie close to a small water course. Possibly recharge could be increased by building a low earth bank across the water course to dam water over the aquifer and increase the length of time for which there is water available to infiltrate to the aquifers.

This could be done relatively cheaply if earthmoving equipment were available in the locality. Care would have to be taken with the design of such a dam since a failure could endanger the homestead downstream.

APPENDIX A

GEOLOGICAL LOG

Contents

TABLE 4

Chemical Analyses

Unit	Local No.	TDS mg/L	Cond	Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}	Cl^{-}	SO_4^{2-}	HCO_3^{-}	NO_3^{-}	F^{-}	Date	Laboratory
5345 WW 7	KP 2	1 535	2 560	86	109	317	13	495	250	455	40	-	7/4/72	AMDEL
29	KP 3	1 070	1 822	64	83	217	7	253	135	418	83	-	13/10/78	AMDEL
34	KP 4	570	880	52	35	78	6	84	60	293	58	1.3	18/7/82	Water Division DTW*
46	Swamp Well No 1	820	1 320	56	52	137	5	180	88	293	90	1.4	12/12/83	Water Division DTW
47	Swamp Well No 2	600	920	53	46	73	3	85	50	301	70	.9	13/12/83	Water Division DTW
66	KP 5	6 400	11 300	70	275	2 300	32	3 370	1 290	517	54	1.1	10/4/85	State Water Lab EWS
67	KP 6	620	1 130	53	61	106	3.6	145	65	317	110	1.4	10/4/85	"
68	KP 7	588	935	56	47	77	3.5	90	59	300	96	1.4	10/4/85	"

* i.e. Water Division of the Northern Territory Department of Transport and Works.

CONCLUSIONS

1) Wells should be pumped as recommended in Table 3.
2) There is little chance of finding water with satisfactory nitrate levels within economical distance of Kenmore Park.
3) Every six months water samples should be taken for testing for TDS and nitrate contents, and water levels should be measured.
4) If needed further production wells should be developed up the valley from the existing wells.
5) KP3 (5345 WW 29) is at risk of pollution, but should be retained for garden use.
6) The possibility of a dam to increase infiltration to the aquifer should be considered.

R. E. Read

RER:AF

R.E. READ
SENIOR GEOLOGIST

REFERENCE

Sprigg, R.C., Wilson, B., and Coats, R.P., 1955. Ernabella map sheet, Geological Atlas of South Australia, 1:63 360 series. Geol. Surv. S. Aust.

PROJECT: KENMORE WATER SUPPLY

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

HOLE NO: KP7

UNIT / STATE NO: 5345WW68

DM

LOCATION OR COORDS:

SEC. HD. Out of

EL Surface m

EL Ref. Point m Datum

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
									W —

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
0	6		Weathered gneiss	Weathered coarse quartz felsapr gneiss.					
6	9		Gneiss	Weathered, epidotic.					
9	15		Gneiss	Quartz felspar gneiss, less weathered.					
15	18		Gneiss	Dark grey quartz felspar biotite gneiss.					
18	27		Gneiss	Felspar quartz gneiss.					
27	30		Dolerite	Dark grey.					
	30			END OF HOLE.					

REMARKS:

* NOTE: 110 kl / day = 1000gals / hr.

DRILL TYPE: Rotary Hammer

CIRCULATION: Air

SHEET 1 OF 1

COMPLETED: 29/3/85

LOGGED BY: R. Read

DATE: 29/3/85

APPENDIX B

PUMP-TESTING

Contents

Pump-Test on 5345 WW 67 (KP 6)

The well was pumped at 1.75 L/s for 24 hours. A semi-log plot of drawdown is shown in Fig. B-1.

Water levels were measured in 5345 WW 68 (KP 7), but no change was detected.

The semi-log plot of drawdown flattens out, having a final 'delta s' of about 0.4

At the test rate a suitable equation is

$$s = 4 + 0.4 \log t$$

which, neglecting Q^2 terms becomes

$$s = Q\,(2.3 + 0.23 \log t)$$

s = drawdown in metres
Q = discharge in litres per second
t = time in days

The depth to the top of the aquifer is uncertain, the available drawdown has been taken as the drawdown at the end of the test, that is 4 m.

An appropriate long term pumping rate is 1.2 L/s.

Pump-test on 5346 WW 68 (KP 7)

The well was pumped for 500 minutes, when the test was abandoned because the well was forking. The drawdown curve (Fig. B-2) shows that the well began to fork at about 40 minutes. The pumping rate up to this time was 1.19 L/s.

Because of the short pumping time only a very approximate prediction of well-performance can be made.

The recovery test and the performance of other wells in this area suggest that a semi-log extrapolation of drawdown may be realistic.

From the test the following equation is derived

$$s = Q\,(40.2 + 10.0 \log t)$$

s = is drawdown in metres
Q = is discharge in L/s
t = is time in days

Available drawdown is 20 metres. From this the 100 day yield is calculated to be 0.35 L/s for continuous pumping or .45 L/s for 12 hour shifts.

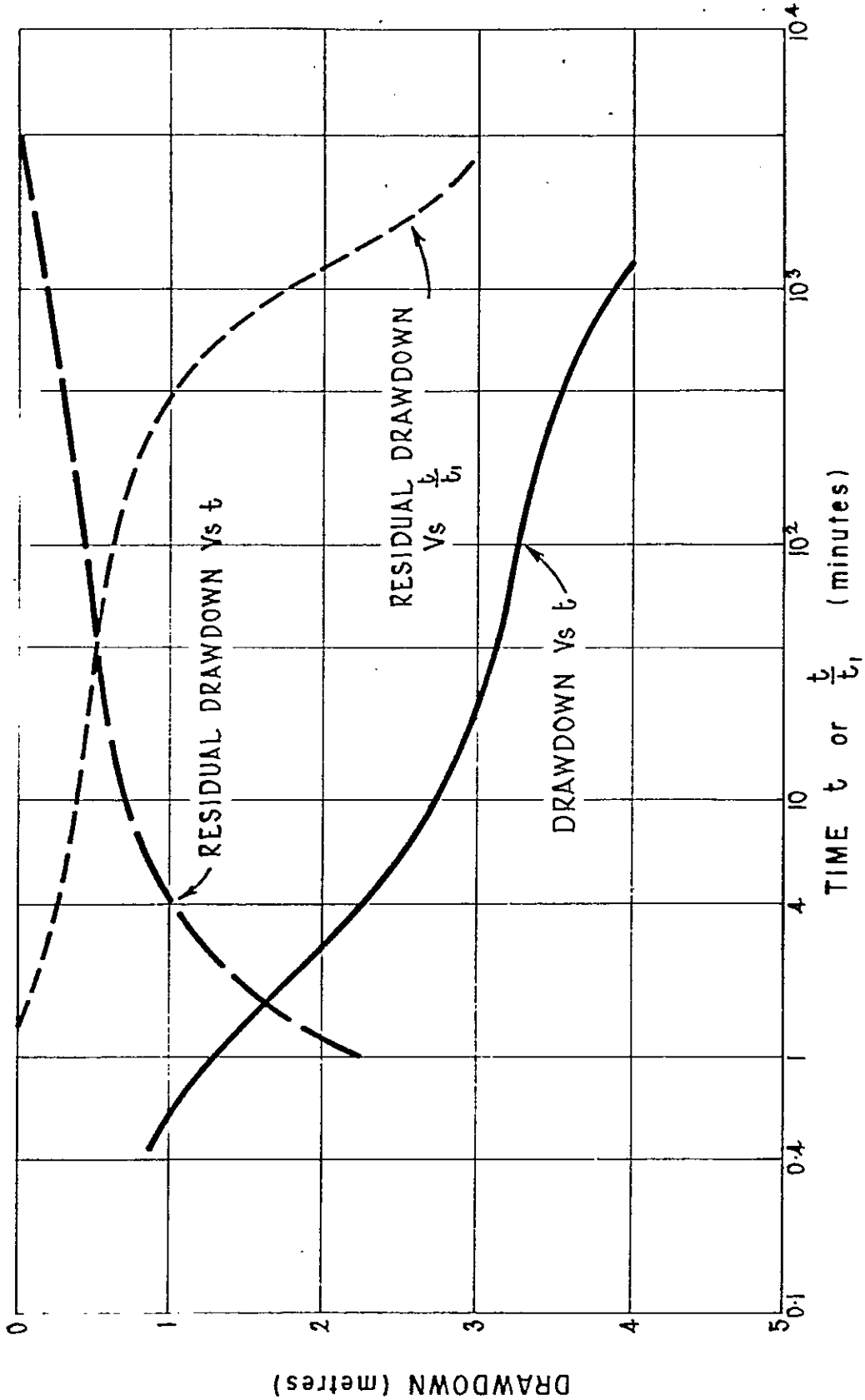


FIG..... B1

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED R.E.R.	CDO	4-12-85 DATE
KENMORE PARK WATER SUPPLY	DRAWN R.H.	SCALE	
WELL No. 5345000WW00067	DATE Oct. 1985	PLAN NUMBER	
WELL DRAWDOWNS (SEMI-LOG)	CHECKED	S18413	

3936

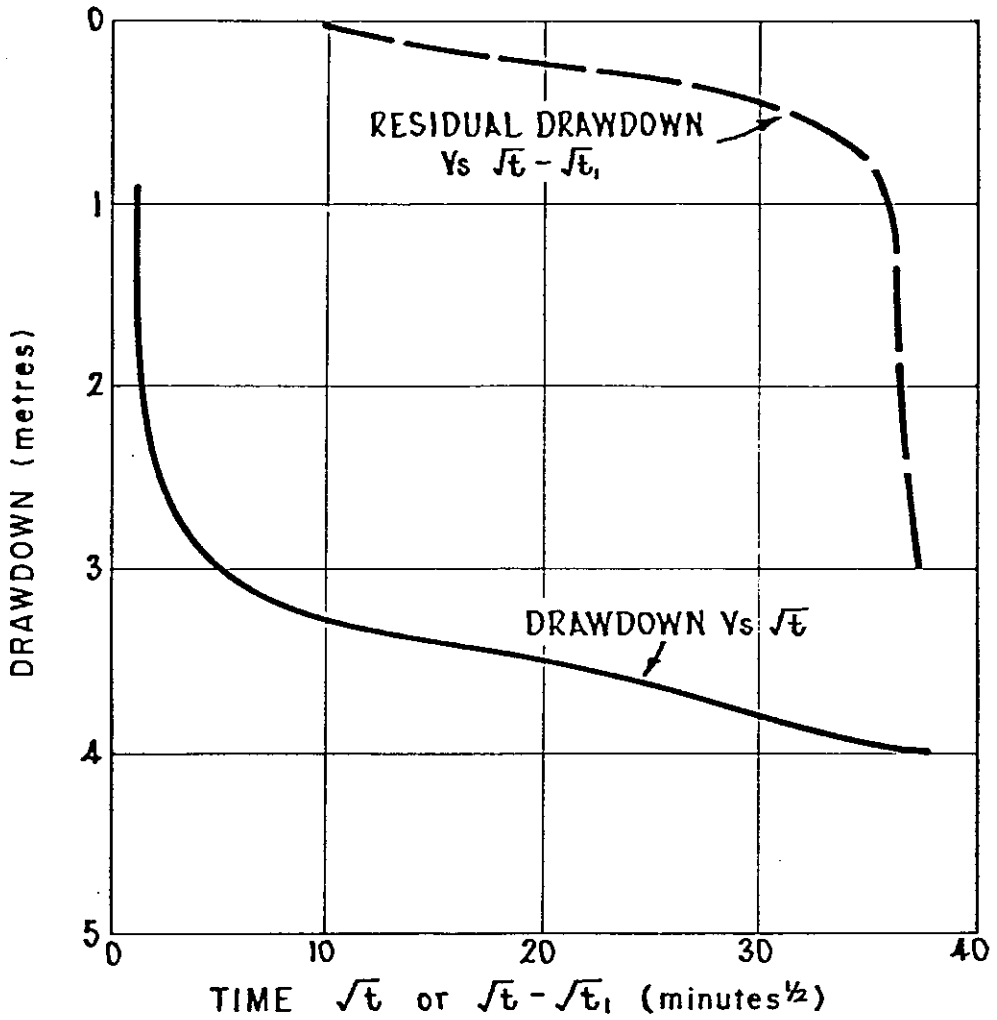


FIG..... B2

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

COMPILED R.E.R.

CDO 4-12-85 DATE

KENMORE PARK WATER SUPPLY

WELL No. 5345000WW00067

WELL DRAWDOWNS (SQUARE ROOT OF TIME)

DRAWN R.H.

SCALE

DATE Oct. 1985

CHECKED

PLAN NUMBER S18414

3936

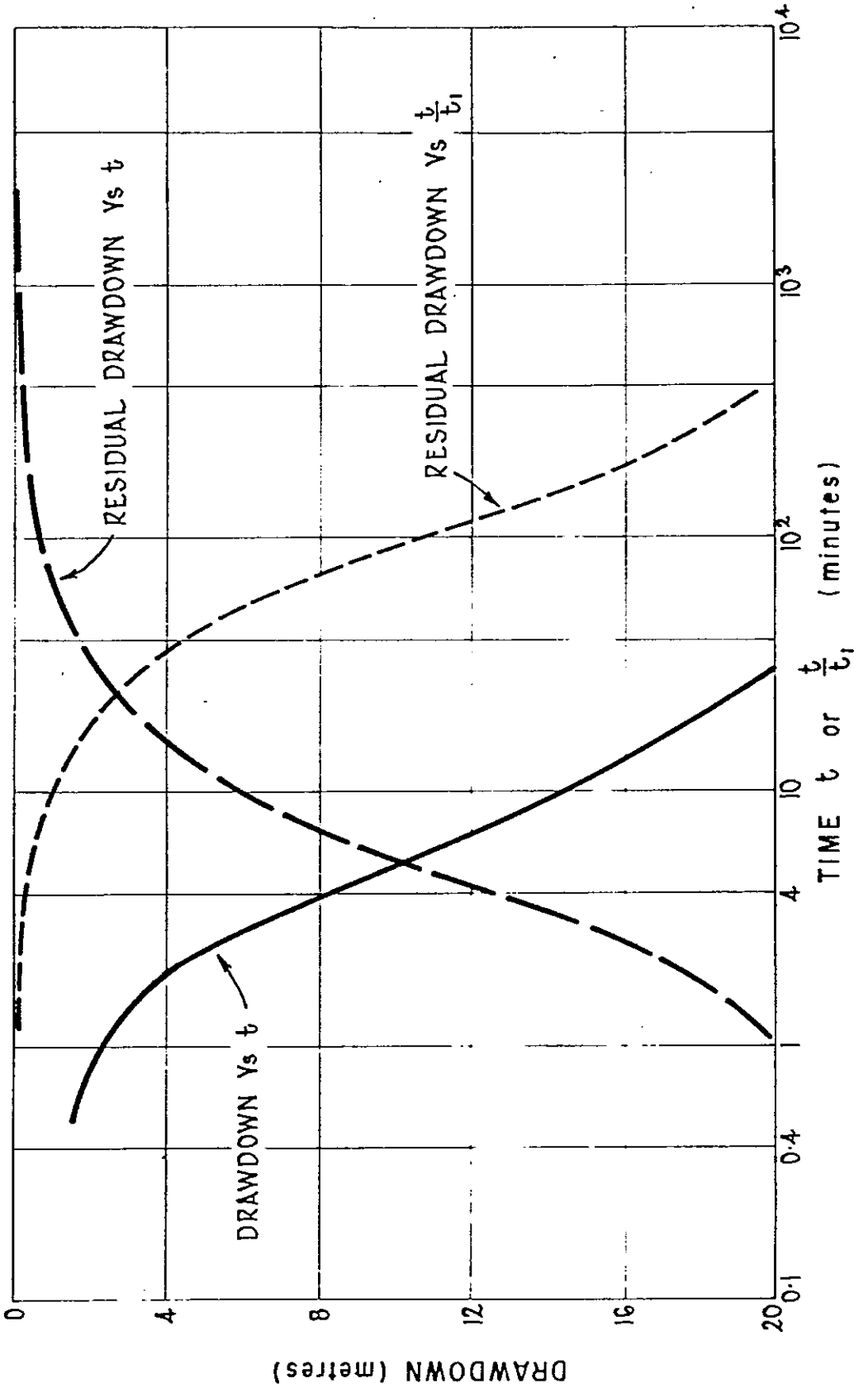


FIG.....B3

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA		COMPILED R.E.R.	CDO 4. 12. 85 DATE
KENMORE PARK WATER SUPPLY		DRAWN R.H.	SCALE
WELL No. 5345000WW00068		DATE Oct. 1985	PLAN NUMBER S18415
WELL DRAWDOWNS (SEMI-LOG)		CHECKED	

3936

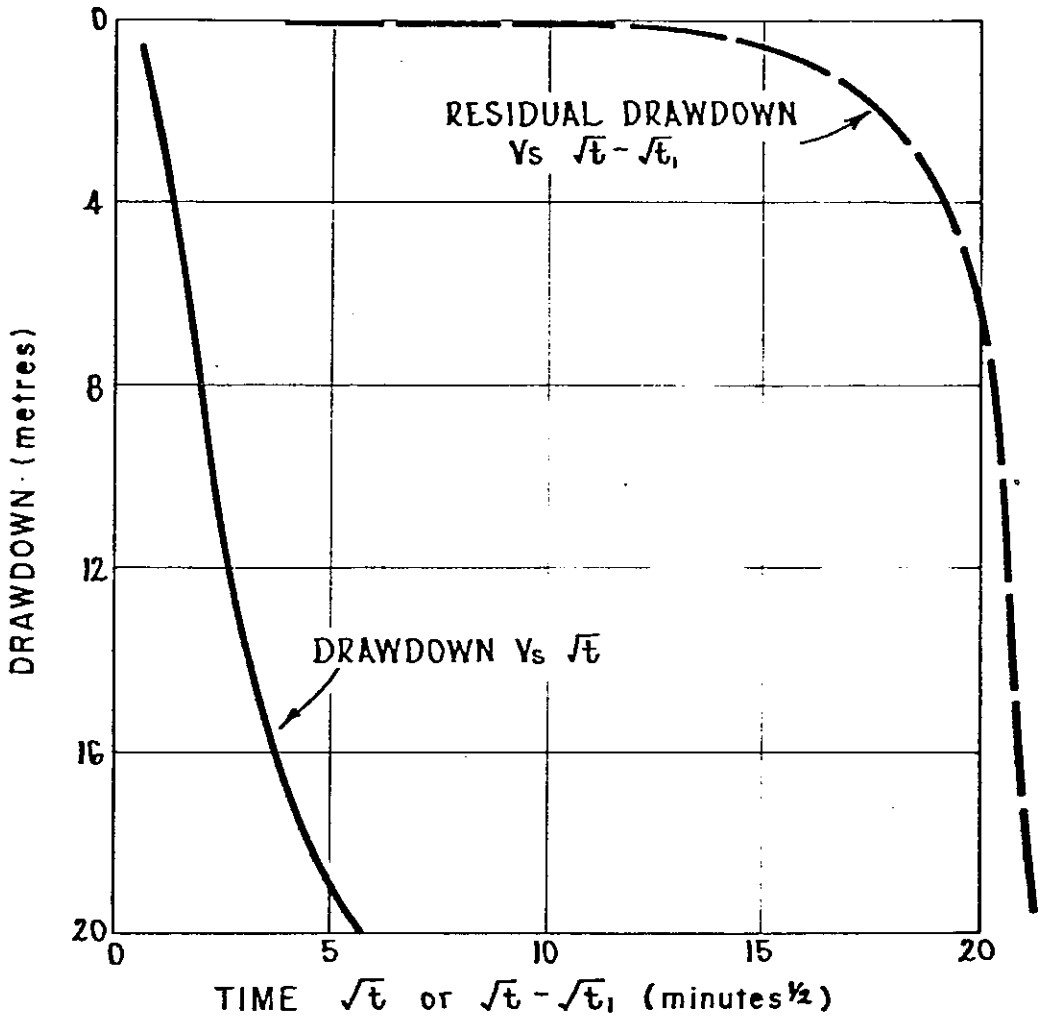


FIG.....B4

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED R.E.R.	CDO 4-12-85 DATE
KENMORE PARK WATER SUPPLY	DRAWN R.H.	SCALE
WELL No. 5345000WW00068	DATE Oct. 1985	PLAN NUMBER S18416
WELL DRAWDOWNS (SQUARE ROOT OF TIME)	CHECKED	

3936

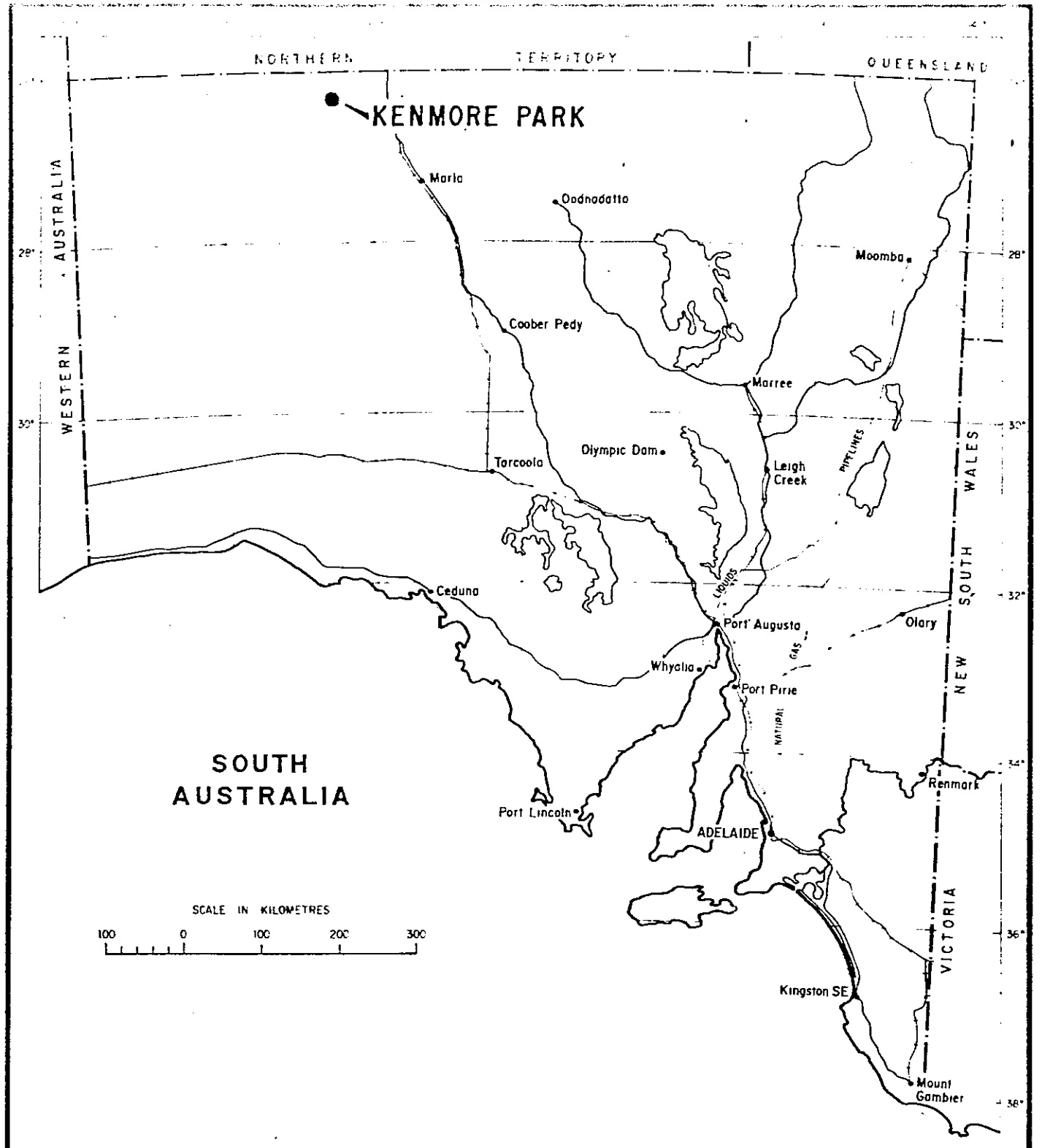


FIG.....1

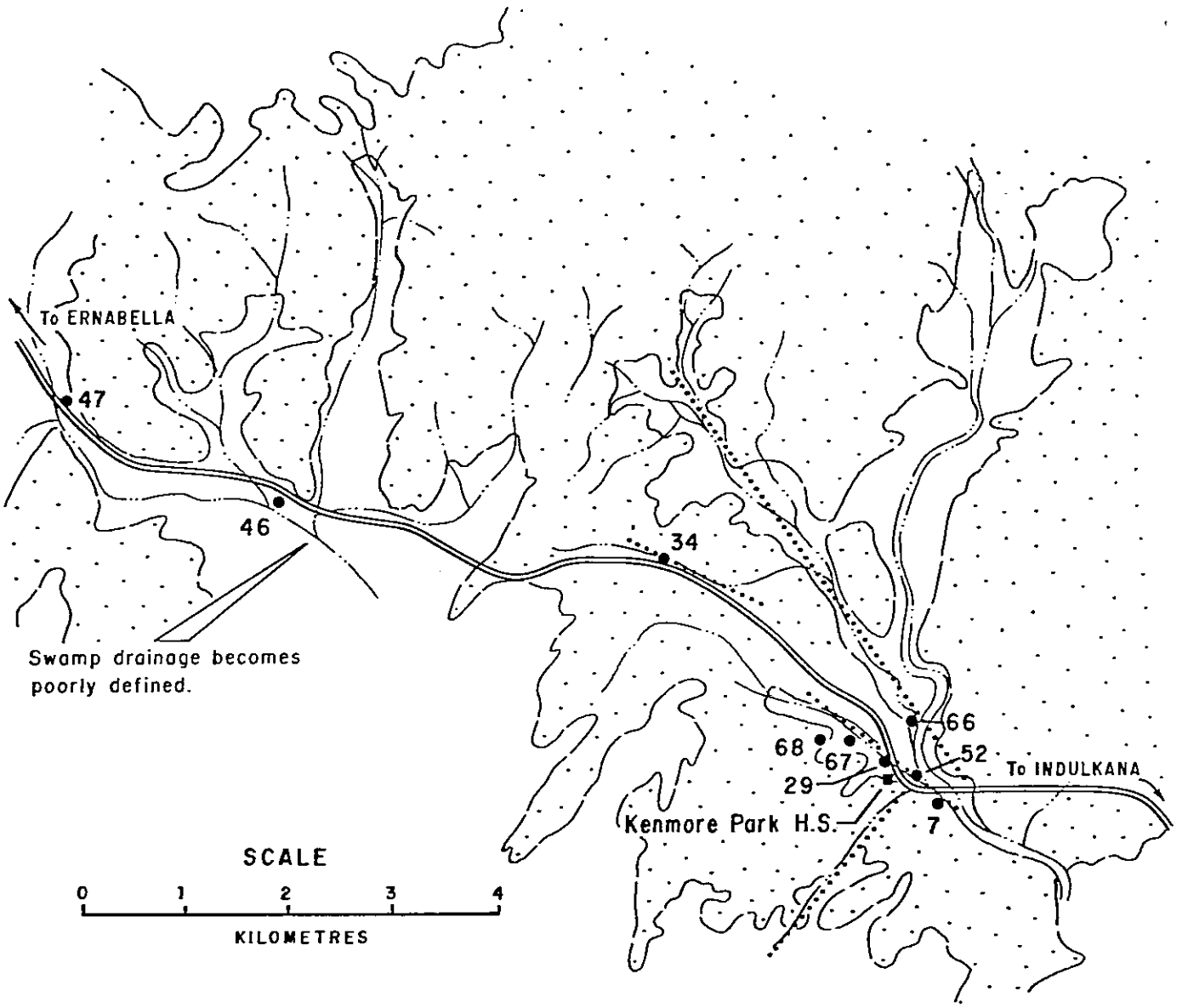
DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

KENMORE PARK WATER SUPPLY

LOCALITY PLAN

COMPILED R.E.R.	C.D.O. 4.12.85 DATE
DRAWN R.H.	SCALE As shown
DATE Oct. 1985	PLAN NUMBER S18411
CHECKED	

3936



68 ● Water Well with Unit No. (Prefix with 5345000WW)

..... Linear features (from aerial photos)

Outcropping crystalline basement

FIG.....2

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED R.E.R.	4-12-85 DATE
KENMORE PARK WATER SUPPLY	DRAWN R.H.	SCALE As shown
LOCATION OF WATER WELLS	DATE Oct 1985	PLAN NUMBER S18412
	CHECKED	

3936