GEOHYDROLOGICAL REPORT FOR THE PROOSED RETHUSHENG SNS SCHOOL AT MAMEHLABE VILLAGE, POLOKWANE LOCAL MUNICIPALITY, IN LIMPOPO PROVINCE.

Draft Report

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03 September 2025

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APPENDIX

ACRONYMS

AMSL	Above Mean Sea Level
BH	Borehole
DWS	Department of Water and Sanitation
DT	Drilling target
T	Traverse line

Declaration

We hereby declare:

- ✓ We have no vested interest (present or prospective) in the project that is the subject of this report, as well as its attachments. We have no personal interest with respect to the parties involved in this project.
- ✓ We have no bias with regard to this project or towards the various stakeholders involved in this project.
- ✓ We have not received, nor have we been offered, any significant form of inappropriate reward for compiling this report.

…… ……..

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1 INTRODUCTION

Naledzi Waterworks was appointed to conduct groundwater exploration for groundwater development at the proposed Rethuseng SNS site within Polokwane Local Municipality in Limpopo province.

This report summarizes the findings of the investigation.

2 SCOPE OF WORK

The scope of work completed as part of this investigation is detailed hereafter:

- ✓ Desktop study of, and collation of information pertaining to, the geohydrology of the area;
- ✓ Assessment of DWS-mapped structures in proximity to the site, in accordance with the regional geological map;
- ✓ Groundwater source development (drilling, pump testing, water sampling, and quality analysis);
- ✓ Preparation of a technical report detailing the results of the desktop study and risk assessment, including future utilization recommendations.

3 DATA/INFORMATION SOURCES

The following were used as sources of data/information during the formulation of this geohydrological investigation report:

- Maps:
  - Google Earth study area imagery
  - 1:50 000 2328 Topographical map
  - Geology of SA MAP

4 PROJECT LOCATION

The study area is located in Mamehlabe village, at the coordinates -23.5543 S and 28.95791 E (Figure 1). The area can be accessed via Juno Road from Tibane (Tibane Shopping Centre) to Ga-Mothapo village. It is located approximately 10 km northwest of Tibane, in the Polokwane Local Municipality of Limpopo Province.

Figure 1: Locality Map of the Proposed Site

5 Geology

According to the geology of South Africa, the study area is underlined by the Schiel Alkaline Complex, which comprises Syenite, quartz syenite, subordinate hornblende granite, phoscorite, and gabbro. The surrounding rocks within the study are Leucocratic, strongly migmatised biotite gneiss and greyish, weakly migmatised biotite gneiss; minor leucogneiss and dark grey biotite gneiss from Goudplaats-Hout River Gneiss (see Figure 2 below).

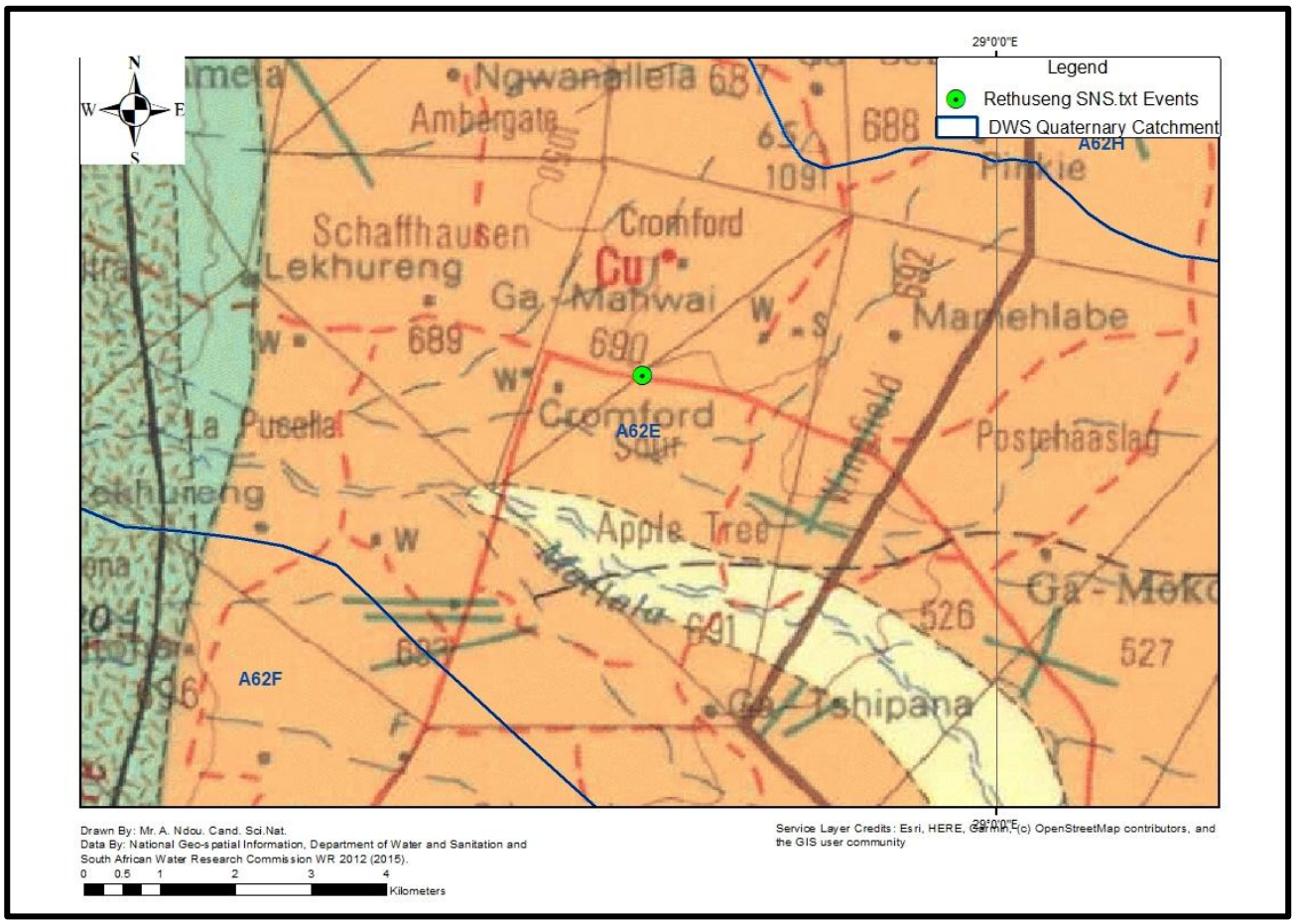


Figure 2: Geological Map of the Study Area

5. Groundwater exploration

5.1 Resistivity Method

Resistivity survey is a geophysical method used to investigate the subsurface conditions. The purpose of a resistivity survey is to determine the subsurface resistivity distribution by making measurements on the ground surface. From these measurements, the true resistivity of the subsurface can be estimated. The profile survey was undertaken perpendicular to the geological structures of the area of interest (see Figure 3). Ten- and five-metre intervals were used to record the resistivity of subsurface lithologies; resistivity results are shown in Figures 4, 6, and 8.

5.2 Magnetic Method

A magnetic survey is a geophysical method used to investigate the subsurface conditions. The purpose of a magnetic survey is to investigate subsurface geology based on the anomalies in the Earth's magnetic field resulting from the magnetic properties of the underlying rocks. The magnetic survey was undertaken perpendicular to the geological structures of the area of interest. Ten-meter intervals were used to record the Earth's magnetic field intensity; magnetic results are shown in Figures 5, 7, and 9.

Figure 3: Traverse line 1 – 3 and drilling targets

5.2.1 Geophysical Survey Results

Table 1: Drilling Targets

Target (T) and Traverse line (T)	Coordinates	Possible water-bearing structures in metres	Maximum borehole depth estimation in metres
T_1, T_3 (Priority 1)	-23.55684°, 28.95663°	**25 40, 50, 70, 90, 110, 120 m**	**150 m deep**
T_3, T_1 (Priority 3)	-23.55531°, 28.95703°	**30, 50, 80, 95, 110, 130 m**	**150 m deep**
T_2, T_2 (Priority 2)	-23.54980°, 28.94692°	**30, 40, 55, 70, 90, 110 m**	**120 m deep**

5.2.1.1 Traverse line 1

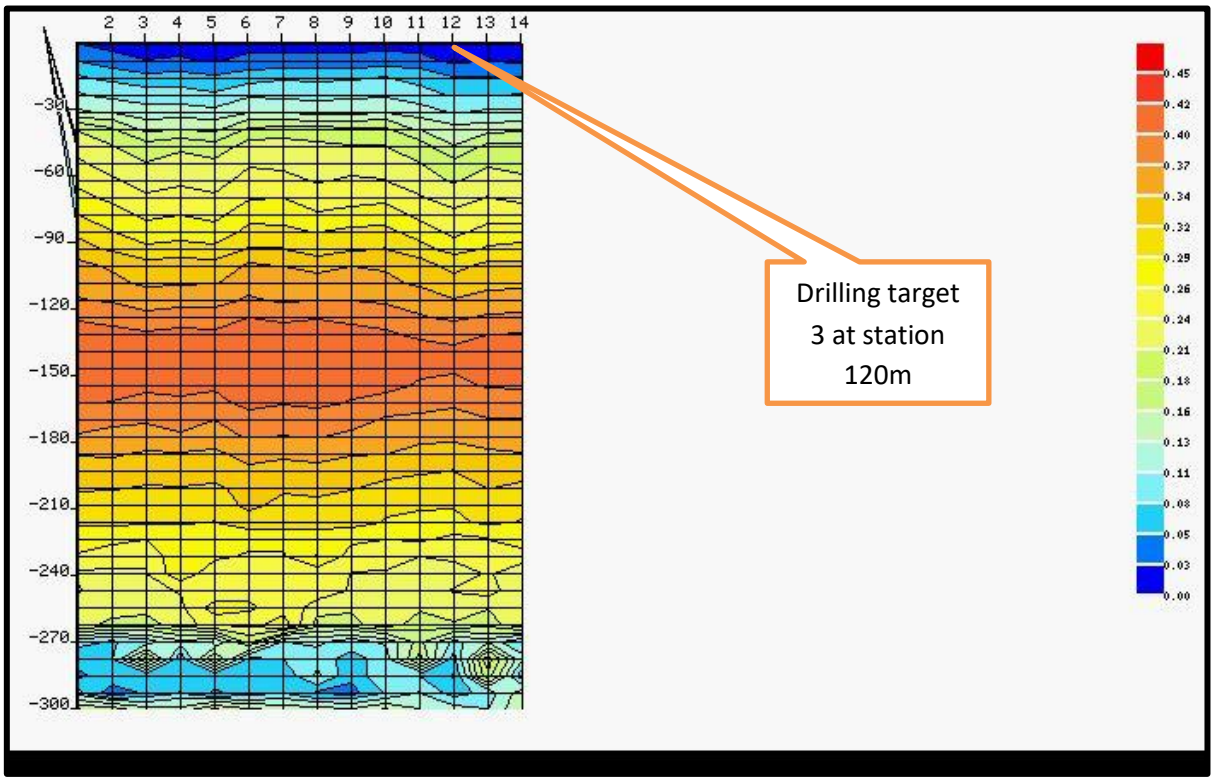


Figure 4: Resistivity Profile for Traverse line 1

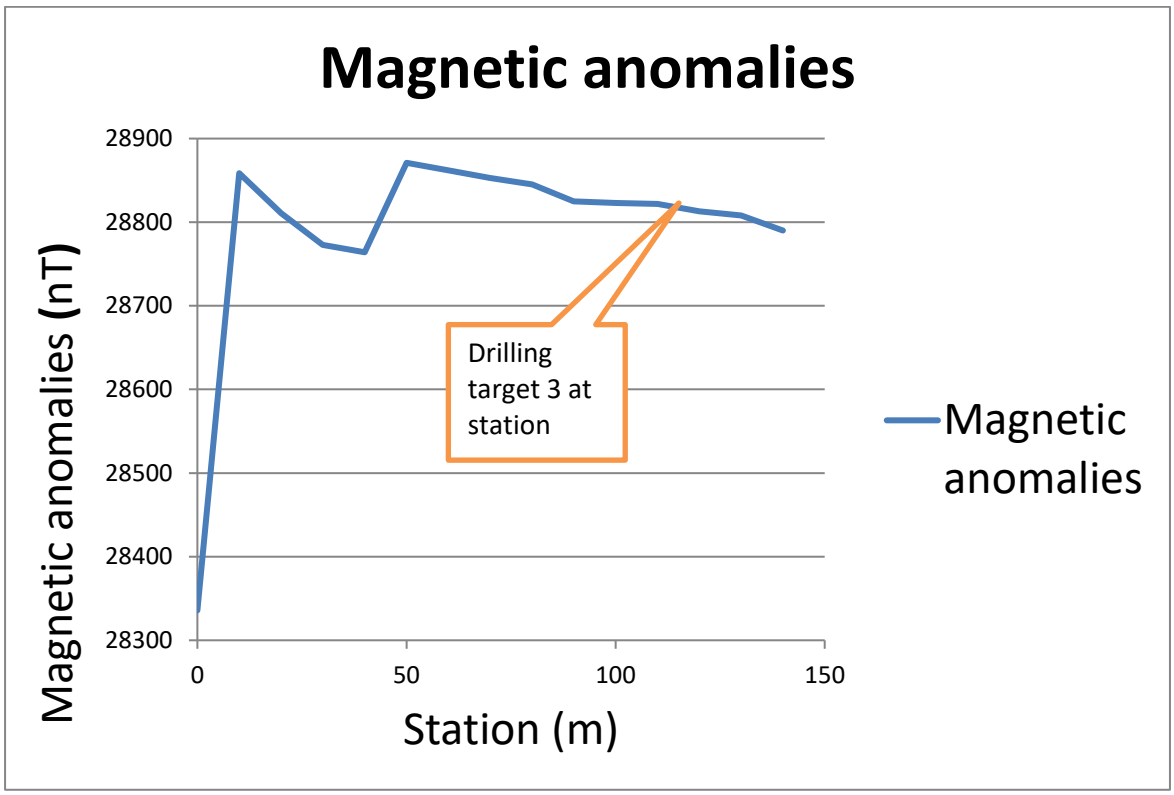


Figure 5: Magnetic Profile for Traverse line 1

5.2.1.2 Traverse line 2

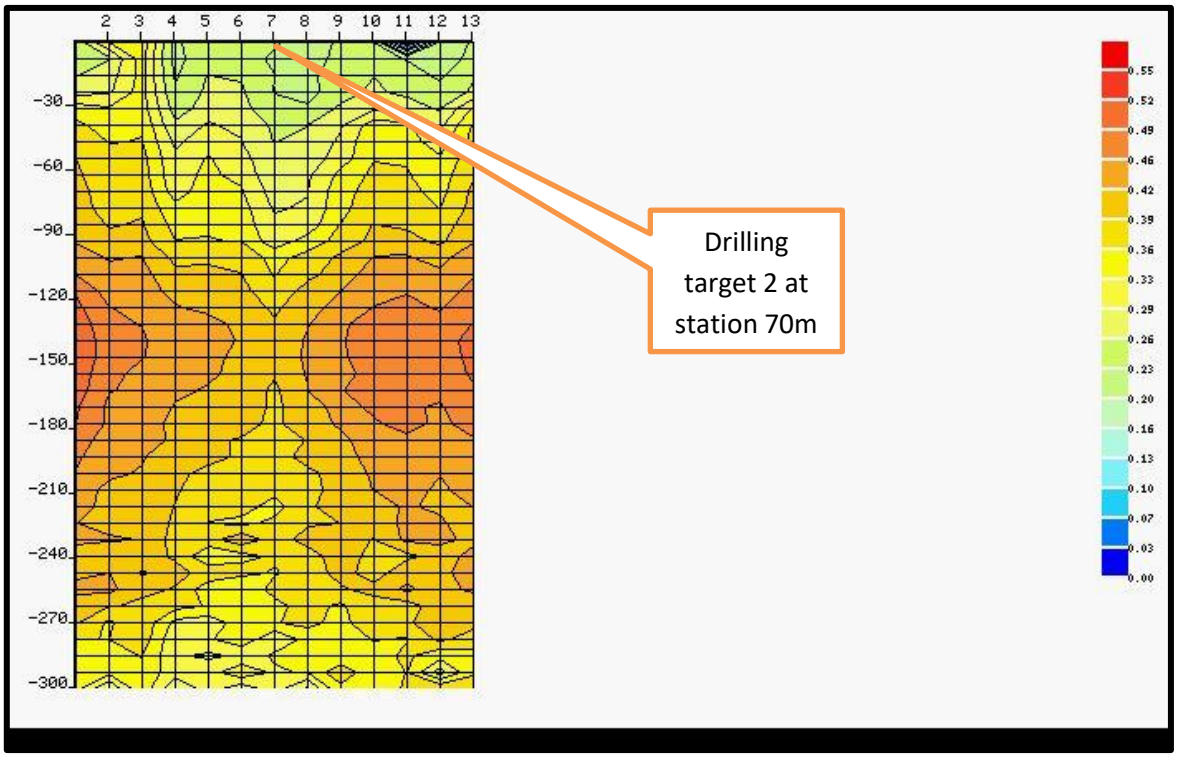


Figure 6: Resistivity Profile for Traverse line 2

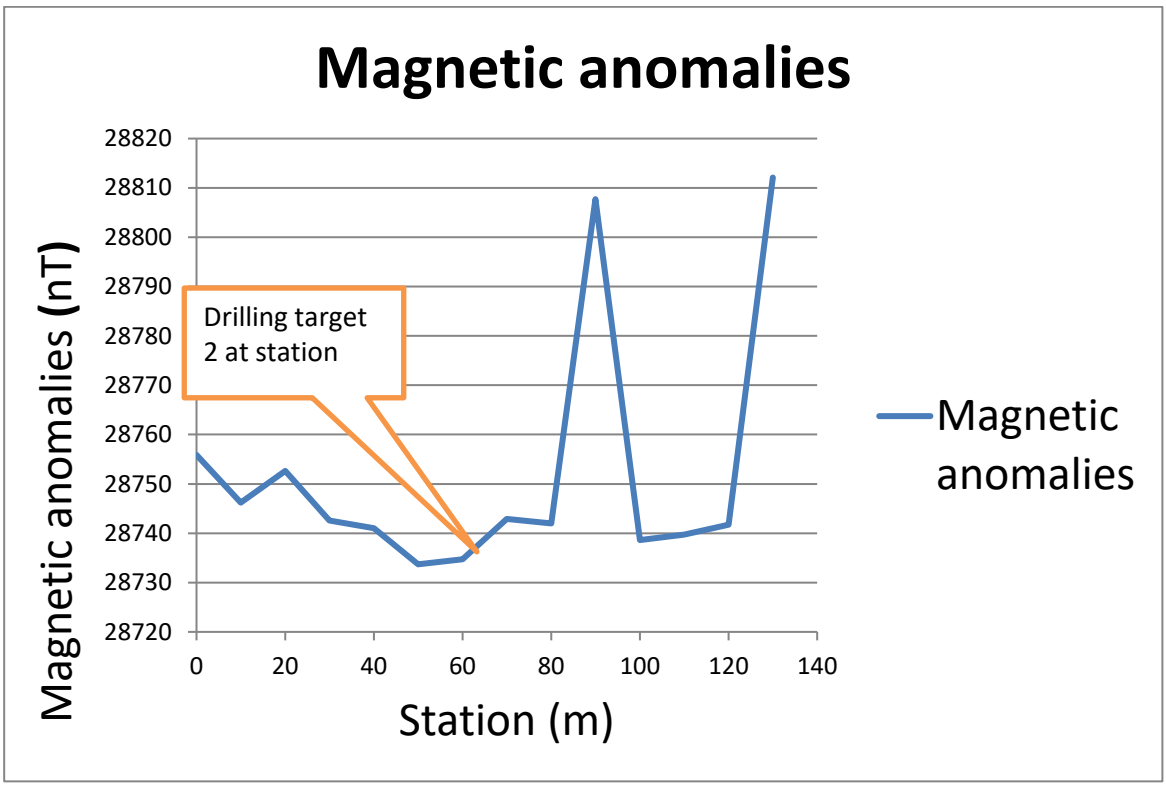


Figure 7: Magnetic profile for traverse line 1

5.2.1.3 Traverse line 3

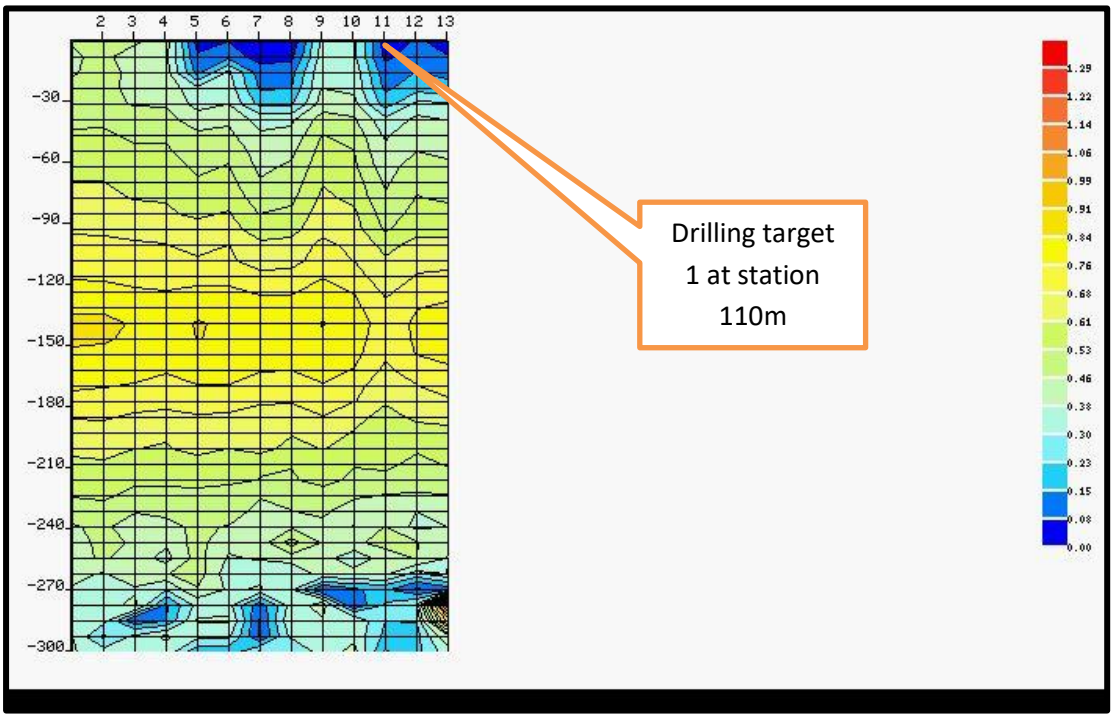


Figure 8: Resistivity Profile for Traverse line 3

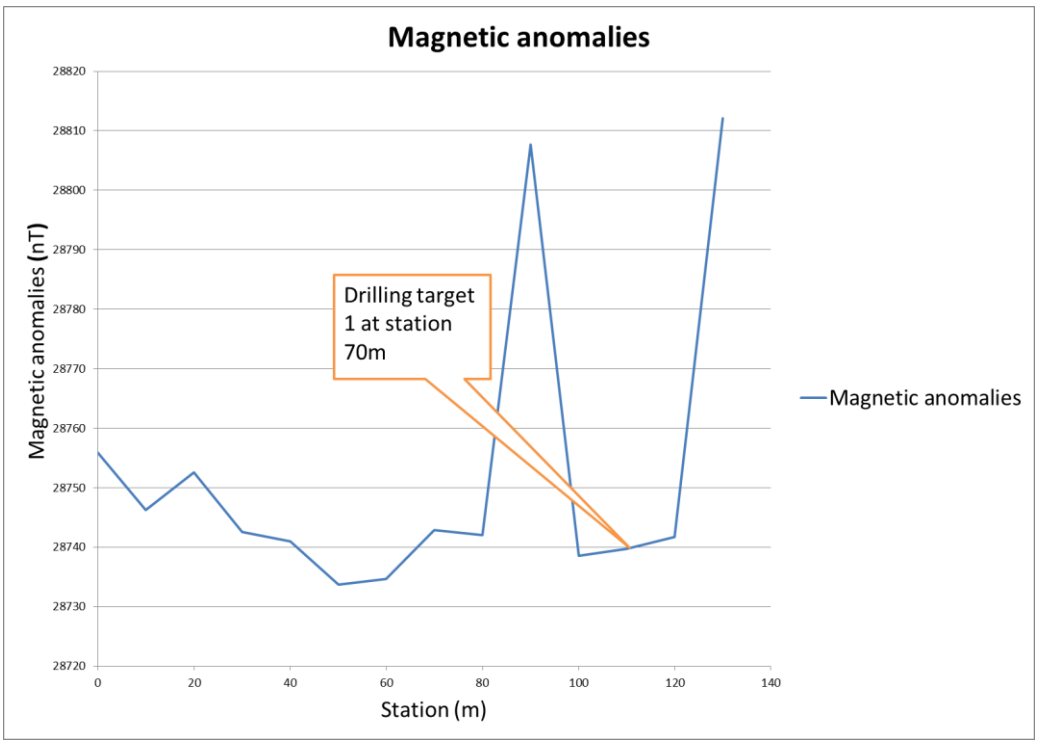


Figure 9: Magnetic Profile for Traverse line 3

6 Drilling of new boreholes

Three boreholes were drilled from August 23 to 26, 2025. Different Lithologies were encountered during the drilling process, including silty topsoil and coarse-grained biotite gneiss. Water strikes were encountered at 30, 60, and 90 m deep in boreholes 1 and 2. Drilled **borehole 1** was stopped at 120 m, while **borehole 2** was stopped at 100 m deep. The newly drilled borehole locality is shown in Figure 10 below.

Figure 10: New drilled boreholes within the proposed site

6.1 Borehole logging

The geologic formations penetrated by the drilling machine were recorded through the borehole logging. This was done to gain a better understanding of the subsurface conditions required for groundwater studies. Borehole logging results are shown below (Table 2-4):

Table 2: BH 1 log

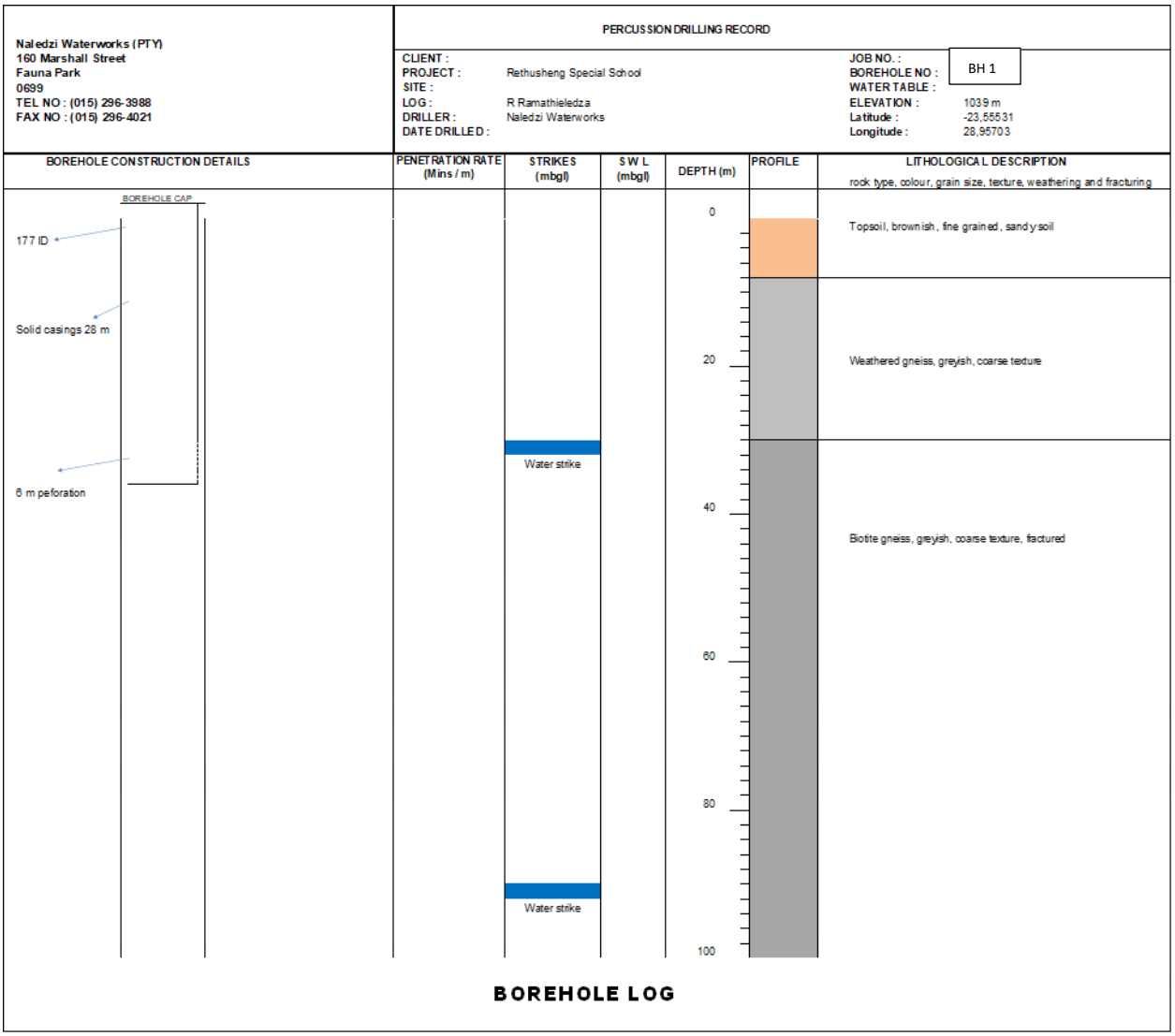


Table 3: BH 2 log

Naledzi Waterworks (PTY)
160 Marshall Street
Fauna Park
0699
TEL NO : (015) 296-3988
FAX NO : (015) 296-4021

PERCUSSION DRILLING RECORD

CLIENT :		JOB NO. :	
PROJECT :	Rethusheng special school	BOREHOLE NO :	BH 2
SITE :		WATER TABLE :	
LOG :	R Ramathieledza	ELEVATION :	1048 m
DRILLER :	Naledzi water Works	Latitude :	-23,55684
DATE DRILLED :		Longitude :	28,95663

BOREHOLE CONSTRUCTION DETAILS	PENETRATION RATE (Mins / m)	STRIKES (mbgl)	S W L (mbgl)	DEPTH (m)	PROFILE	LITHOLOGICAL DESCRIPTION rock type, colour, grain size, texture, weathering and fracturing
BOREHOLE CAP				0		
177 ID						Topsoil, brownish, fine grained, sandy soil
Solid casings 27 m				20		Weathered gneiss, greyish, coarse texture
		Water strike				
6 m peforation				40		Biotite gneiss, greyish, coarse texture, fractured
		Water strike		60		
				80		
				100		
				120		

BOREHOLE LOG

Table 4: BH 3 log

Naledzi Waterworks (PTY) 160 Marshall Street Fauna Park 0699 TEL NO : (015) 296-3988 FAX NO : (015) 296-4021	PERCUSSION DRILLING RECORD CLIENT : PROJECT : Rethuseng special school SITE : LOG : R Ramathieledza DRILLER : Naledzi water Works DATE DRILLED :	JOB NO. : BOREHOLE NO : BH 3 WATER TABLE : ELEVATION : 1052 m Latitude : -23,55531 Longitude : 28,95703

BOREHOLE CONSTRUCTION DETAILS	PENETRATION RATE (Mins / m)	STRIKES (mbgl)	S W L (mbgl)	DEPTH (m)	PROFILE	LITHOLOGICAL DESCRIPTION rock type, colour, grain size, texture, weathering and fracturing
BOREHOLE CAP				0		
177 ID						Topsoil, brownish, fine grained, sandy soil
				20		Weathered gneiss, greyish, coarse texture
				40		Biotite gneiss, greyish, coarse texture, fractured
				60		

BOREHOLE LOG

7 Pump testing

The test pumping includes:

- Multi-rate step Test of 4 x 60-minute steps at sequentially higher rates until pump suction is achieved.
- Recovery of the Step Test.
- Constant Discharge Test of 6 hours to 48 hours.
- Recovery of the Constant Discharge Test until at least 95% recovery.

A Step Test consists of pumping a borehole at different rates for one hour per step until the maximum rate the borehole can deliver. The water level is constantly monitored and noted during each step. This indicates the possible yield the borehole can sustain for a Constant Discharge Test. A step test also shows the aquifer's potential in the immediate area around the borehole. The Constant Discharge Test involves pumping a borehole at a specific rate for 6 to 48 hours, followed by a sudden switch-off of the pump after the pump cycle. A recovery test is conducted immediately afterwards. The Constant Discharge Curves were analysed.

7.1 Pump Testing results

Borehole yield testing was conducted on the existing borehole, and the pump testing results are discussed below (See Table 5 and Appendix B).

7.1.1 Pump testing results for BH 1

Three-step tests were conducted at various rates of 0.52 l/s, 1.02 l/s, and 1.52 l/s, reaching a final drawdown of 72.04 mbgl in 2 hours and 7 minutes. The constant discharge test was conducted at a rate of 0.50 l/s for 12 hours. The recovery from the continuous discharge test was good, reaching 99% after 12 hours of pumping.

7.1.2 Pump testing results for BH 2

Two-step tests were conducted at various rates of 0.72 l/s and 1.00 l/s, achieving a final drawdown of 62.70 mbgl in 1 hour and 15 minutes. The constant discharge test was conducted

at a rate of 0.50 l/s for 12 hours. The recovery of the continuous discharge test was good, at 97 % within 90 minutes after 12 hours of pumping.

Table 5: Pump Testing Results

Borehole Number	Constant Discharge (CD) Rate		Static Water Level (mbgl)	Borehole Depth (m)	Comments
	l/s for 12 hrs/day	in m^3/d			
BH 1	0.5	21.6	17.61	100	Moderate yield
BH 2	0.5	21.6	8.17	120	Moderate yield

8 Water quality results

Water samples will be collected and sent to the laboratory for chemical analysis. Water quality results will be presented when they become available from the laboratory.

9 Conclusion and Recommendations

Based on the findings from the site visit conducted on the 8th of August 2025, the following conclusions can be drawn after accounting for all the various factors and their limitations:

- Naledzi Waterworks was appointed to conduct a groundwater resource development for Rethusheng Primary School.
- A geophysical survey was conducted using resistivity and magnetic methods to understand the subsurface lithologies within the study area.
- The resistivity survey results indicated possible water-bearing structures at various depths below the ground level;
- The potential targets were selected based on the geology and the resistivity results, where high resistivity values indicated hard rocks and low resistivity values indicated soft rocks and weathered zones;
- Three boreholes are drilled, and the logs are presented in section 6.1 above.

- Based on the pump testing results, the following equipping details are recommended. Specific details are:

Borehole Number:	**BH 1**
Co-ordinates:	-23.55684 (Latitude) 28,95663 (Longitude)
Borehole Depth:	100 m
Diameter:	165 mm ID
Static water level:	17.61 mbgl (27/08/2025)
Recommended pumping rate :	0.50 l/sec for 12 hrs per day (21.6 m^3/day)
Pump Installation depth:	90 mbgl
Water Quality Class:	**Pending**

Borehole Number:	**BH 2**
Co-ordinates:	-23.54980 (Latitude) 28,94692 (Longitude)
Borehole Depth:	120 m
Diameter:	165 mm ID
Static water level:	8.17 mbgl (27/08/2025)
Recommended pumping rate :	0.50 l/sec for 12 hrs per day (21.6 m^3/day)
Pump Installation depth:	110 mbgl
Water Quality Class:	**Pending**

10 REFERENCES

Durov, S.A. (1948) Natural Waters and Graphic Representation of Their Composition. Doklady Akademii Nauk SSSR, 59, 87-90.

Johnson MR et al., 2006, Geological Society of South Africa.; Council for Geoscience (South Africa): Council for Geoscience; Johannesburg: Geological Society of South Africa and Council for Geoscience, Pretoria.

Piper, A.M. (1944) A Graphic Procedure in the Geochemical Interpretation of Water-Analyses. Eos, Transactions American Geophysical Union, 25, 914-928.

South African National Standards (SANS 241:2011)- Drinking Water. Part 1: Microbiological, physical, chemical, and aesthetic determinants. SABS Standards Division. Pretoria, South Africa, 14 pp.

11 Appendices

Appendix A: Magnetic survey

Table 6: Magnetic results for traverse line 1

Area	Rethuseng SNS	Date	08/08/2025
District		Operator	Naledzi Waterworks Pty (Ltd)
Traverse	1	Project No	
Map Ref		Client	
Latitude-Start	-23.55092	Latitude-End	-23.5498
Longitude-Start	28.94653	Longitude-End	28.94692
Station	Magnetic anomalies		
0	28335.8		
10	28858.7		
20	28 810.60		
30	28773		
40	28764		
50	28871		
60	28862		
70	28853		
80	28845		
90	28825		
100	28823		
110	28822		
120	28813		
130	28808		
140	28790		

Table 7: Magnetic results for traverse line 3

Area	Rethuseng SNS	Date	08/08/2025
District		Operator	Naledzi Waterworks Pty (Ltd)
Traverse	2	Project No	
Map Ref		Client	
Latitude-Start	-23.55591	Latitude-End	-23.55479
Longitude-Start	28.95686	Longitude-End	28.95663
Station	Magnetic anomalies		
0	28755.9		
10	28746.2		
20	28 752.60		
30	28 742.60		
40	28741		
50	28733.7		
60	28734.7		
70	28742.9		
80	28742		
90	28807.7		
100	28738.6		
110	28739.7		
120	28741.7		
130	28812.1		

Table 8: Magnetic results for traverse line 3

Area	Rethuseng SNS	Date	08/08/2025
District		Operator	Naledzi Waterworks Pty (Ltd)
Traverse	3	Project No	
Map Ref		Client	
Latitude-Start	-23.557182	Latitude-End	-23.55671
Longitude-Start	28.955542	Longitude-End	28.95713
Station	Magnetic anomalies		
0	28755.9		
10	28746.2		
20	28 752.60		
30	28 742.60		
40	28741		
50	28733.7		
60	28734.7		
70	28742.9		
80	28742		
90	28807.7		
100	28738.6		
110	28739.7		
120	28741.7		
130	28812.1		

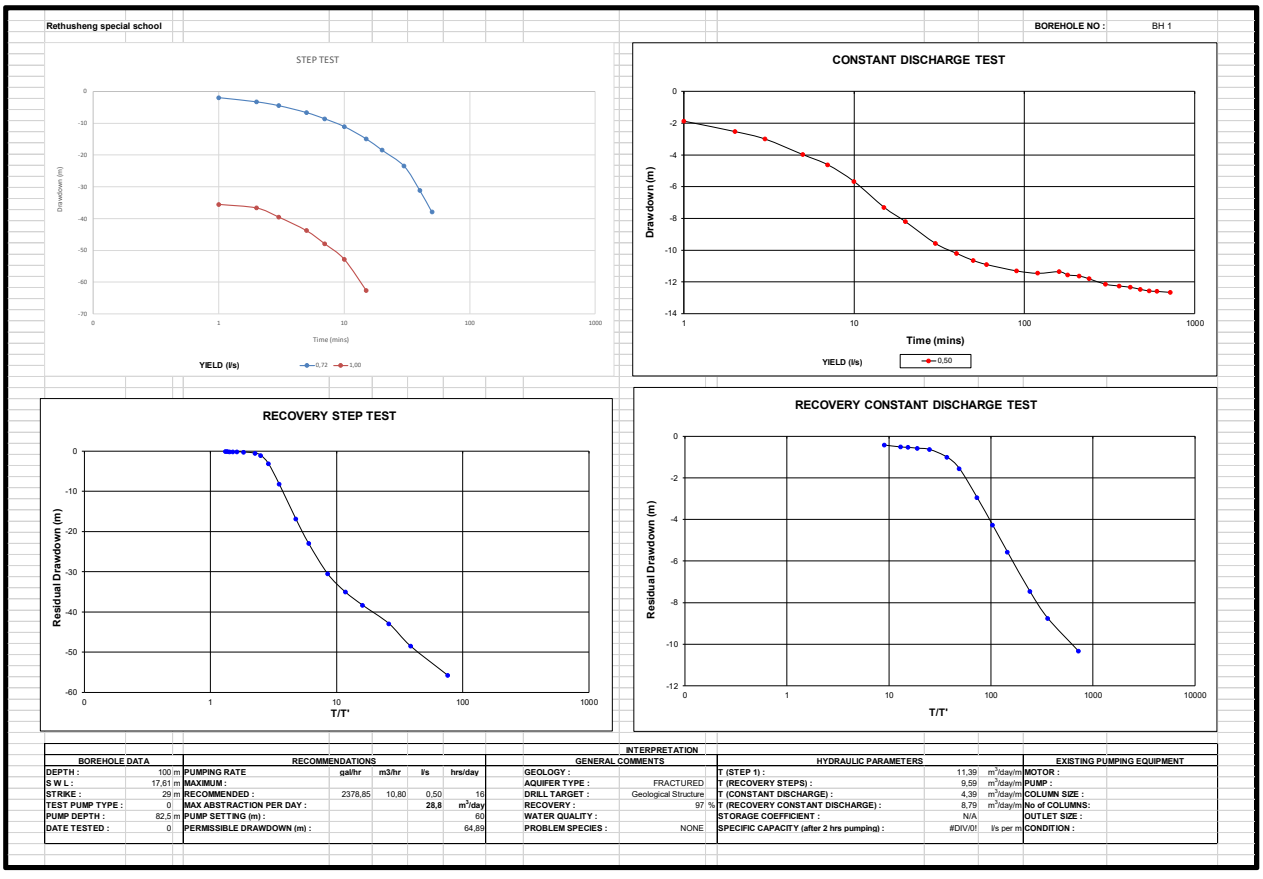
Appendices B: Site Pictures

Appendix B: Pump Testing Results

PROJECT	Rethusheng special school			**DATE**		24/07/2025			**TIME STARTED**	11:00:00 AM			
BOREHOLE No		BH 1		**AVAIL. DRAWDOWN**			64,89 m		**JOB NO**				
BOREHOLE DEPTH		100 m		**PUMP DEPTH**			82,5 m		**LAT**	-23,5553			
STATIC WATER LEVEL		17,61 m		**PUMP TYPE**					**LONG**	28,95703			
		STEP 1	**STEP 2**	**STEP 3**	**STEP 4**	**STEP 5**	**STEP 6**	**T/T'**		**RECOVERY**	**CD**	**T/T'**	**RECOVERY**
AVERAGE YIELD (l/s)		**0,72**	**1,00**							**0,42**	**0,50**		**0,50**
TIME(hrs)	**TIME(min)**												
	1,00	-1,95	-35,54					76,00	1,00	-55,73	-1,87	721,00	-10,34
	2,00	-3,27	-36,67					38,50	2,00	-48,44	-2,53	361,00	-8,76
	3,00	-4,46	-39,51					26,00	3,00	-42,89	-3,00	241,00	-7,47
	5,00	-6,64	-43,8					16,00	5,00	-38,27	-3,98	145,00	-5,57
	7,00	-8,61	-47,95					11,71	7,00	-35,02	-4,62	103,86	-4,28
	10,00	-11,04	-52,81					8,50	10,00	-30,53	-5,68	73,00	-2,95
	15,00	-14,93	-62,7					6,00	15,00	-22,97	-7,30	49,00	-1,56
	20,00	-18,45						4,75	20,00	-16,86	-8,20	37,00	-1,01
	30,00	-23,48						3,50	30,00	-8,16	-9,57	25,00	-0,64
	40,00	-31,12						2,88	40,00	-3,11	-10,20	19,00	-0,58
	50,00	-37,95						2,50	50,00	-1,06	-10,64	15,40	-0,54
	60,00	-42,07						2,25	60,00	-0,52	-10,90	13,00	-0,52
	90,00							1,83	90,00	-0,28	-11,30	9,00	-0,43
	120,00							1,63	120,00	-0,21	-11,45	7,00	
	150,00							1,50	160,00	-0,17	-11,35	5,50	
	180,00							1,42	180,00	-0,15	-11,55	5,00	
	210,00							1,36	210,00	-0,13	-11,62	4,43	
	240,00							1,31	240,00	-0,12	-11,80	4,00	
	300,00							1,25	300,00		-12,14	3,40	
	360,00							1,21	360,00		-12,25	3,00	
	420,00							1,18	420,00		-12,33	2,71	
	480,00							1,16	480,00		-12,46	2,50	
	540,00								540,00		-12,56	2,33	
	600,00								600,00		-12,59	2,20	
	720,00								720,00		-12,65	2,00	
	840,00												
	960,00												
	1080,00												

EXISTING EQUIPMENT

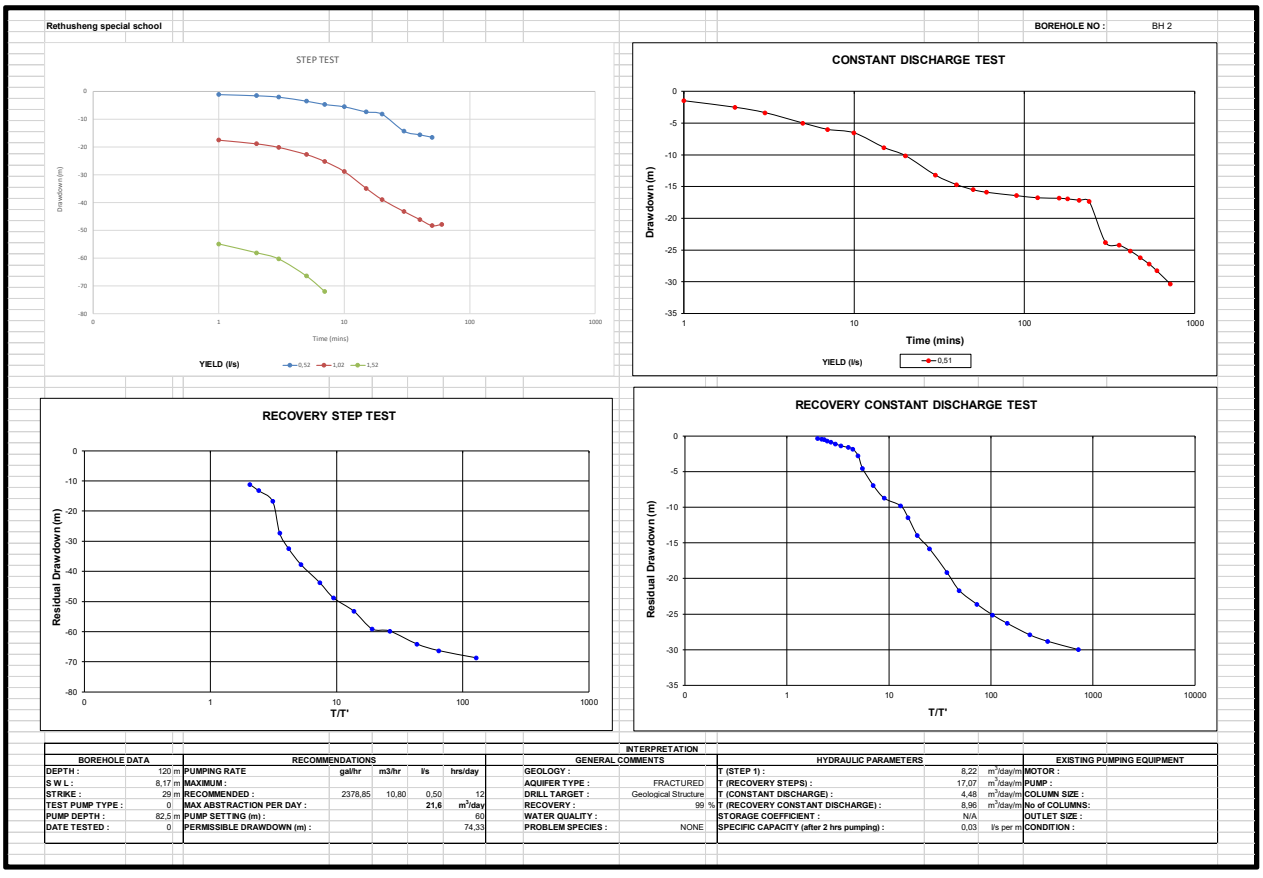
MOTOR :
PUMP :
CONDITION :
COLUMN SIZE :
No OF COLUMNS :



PROJECT	Rethusheng special school			DATE		27/08/2025			TIME STARTED	4:45:00 PM		
BOREHOLE No		BH 2		AVAIL. DRAWDOWN			74,33 m		JOB NO			
BOREHOLE DEPTH		120 m		PUMP DEPTH			82,5 m		LAT	-23,5498		
STATIC WATER LEVEL		8,17 m		PUMP TYPE					LONG	28,94962		
		STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	T/T'		RECOVERY	CD	T/T'	RECOVERY
AVERAGE YIELD (l/s)		0,52	1,02	1,52						0,76	0,51		
TIME(hrs)	TIME(min)												
	1,00	-1,07	-17,52	-54,90				128,00	1,00	-68,70	-1,49	721,00	-29,99
	2,00	-1,50	-18,85	-58,07				64,50	2,00	-66,30	-2,52	361,00	-28,83
	3,00	-1,99	-20,12	-60,30				43,33	3,00	-64,10	-3,37	241,00	-27,93
	5,00	-3,45	-22,7	-66,45				26,40	5,00	-59,81	-5,00	145,00	-26,32
	7,00	-4,65	-25,21	-72,04				19,14	7,00	-59,10	-6,00	103,86	-25,13
	10,00	-5,50	-28,8					13,70	10,00	-53,20	-6,55	73,00	-23,64
	15,00	-7,35	-34,9					9,47	15,00	-48,80	-8,86	49,00	-21,71
	20,00	-8,17	-38,9					7,35	20,00	-43,70	-10,14	37,00	-19,16
	30,00	-14,32	-43,24					5,23	30,00	-37,75	-13,20	25,00	-15,85
	40,00	-15,63	-46,1					4,18	40,00	-32,45	-14,70	19,00	-13,98
	50,00	-16,50	-48,3					3,54	50,00	-27,21	-15,50	15,40	-11,47
	60,00	-17,28	-47,85					3,12	60,00	-16,72	-15,90	13,00	-9,81
	90,00							2,41	90,00	-13,20	-16,43	9,00	-8,75
	120,00							2,06	120,00	-11,14	-16,77	7,00	-6,94
	150,00							1,85	160,00		-16,84	5,50	-4,56
	180,00							1,71	180,00		-16,95	5,00	-2,83
	210,00							1,60	210,00		-17,15	4,43	-1,85
	240,00							1,53	240,00		-17,35	4,00	-1,63
	300,00							1,42	300,00		-23,84	3,40	-1,41
	360,00							1,35	360,00		-24,23	3,00	-1,13
	420,00							1,30	420,00		-25,14	2,71	-0,86
	480,00							1,26	480,00		-26,21	2,50	-0,75
	540,00							1,24	540,00		-27,19	2,33	-0,51
	600,00								600,00		-28,28	2,20	-0,48
	720,00								720,00		-30,34	2,00	-0,37

EXISTING EQUIPMENT

MOTOR :
PUMP :
CONDITION :
COLUMN SIZE :
No OF COLUMNS :



INTERPRETATION

BOREHOLE DATA		RECOMMENDATIONS					GENERAL COMMENTS		HYDRAULIC PARAMETERS			EXISTING PUMPING EQUIPMENT
DEPTH :	120 m	PUMPING RATE	gal/hr	m3/hr	l/s	hrs/day	GEOLOGY :		T (STEP 1) :	8,22	m^2/day/m	MOTOR :
S W L :	8,17 m	MAXIMUM :					AQUIFER TYPE :	FRACTURED	T (RECOVERY STEPS) :	17,07	m^2/day/m	PUMP :
STRIKE :	29 m	RECOMMENDED :	2378,85	10,80	0,50	12	DRILL TARGET :	Geological Structure	T (CONSTANT DISCHARGE) :	4,48	m^2/day/m	COLUMN SIZE :
TEST PUMP TYPE :	0	MAX ABSTRACTION PER DAY :			21,6	m^3/day	RECOVERY :	99 %	T (RECOVERY CONSTANT DISCHARGE) :	8,96	m^2/day/m	No of COLUMNS:
PUMP DEPTH :	82,5 m	PUMP SETTING (m) :				60	WATER QUALITY :		STORAGE COEFFICIENT :	N/A		OUTLET SIZE :
DATE TESTED :	0	PERMISSIBLE DRAWDOWN (m) :				74,33	PROBLEM SPECIES :	NONE	SPECIFIC CAPACITY (after 2 hrs pumping) :	0,03	l/s per m	CONDITION :