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**HYDROGEOLOGICAL INVESTIGATION REPORT:
GROUNDWATER SUPPLY POTENTIAL FOR OORLOGSFONTEIN
45 KS AND PRUISSEN 48 KS WITHIN THE JURISDICTION OF
MOGALAKWENA LOCAL AND LEPELE-NKUMPI LOCAL
MUNICIPALITY**

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ON BEHALF OF:

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EXECUTIVE SUMMARY

High Definition Drilling (Pty) Ltd has appointed Aqua Pan Enterprise (Pty) Ltd to conduct a geophysical Survey at Oorlogfontein 45 KS and Pruisen 48 KS within the Mogalakwena Local and Lepele-Nkumpi Local Municipality and the preparation of a geohydrological report. The findings are presented in this technical report.

A desktop study was undertaken to gather the site's relevant geological and geohydrological information. A hydro-census followed the desk study to establish and gather relevant geohydrological information on current groundwater use in the area.

Based on the investigation, the following conclusions can be drawn:

- Based on the available information and the geophysical investigations, it is concluded that the Oorlogfontein 45 KS and Pruisen 48 KS is located in an area considered to have medium groundwater potential.
- According to the 1:250 000 Geological Map of 2428 Modimolle, published by the Council for Geoscience, the investigate site at Oorlogfontein 45 KS is regionally characterized by the Gabbro, norite belonging to RUSTENBURG LAYERED SUITE, while the Pruisen 48 KS investigated site is underlain is by Shale, quartzite, conglomerate, breccia, diamictite of the PRETORIAL GROUP.
- According to the 1:500 000 Hydrogeological Map 2328 Polokwane, the project area primarily consists of a combination of an Intergranular and fractured-type aquifer (d-type). The project area is underlain by a type d3 aquifer, meaning the mean borehole yields range from 2.0 – 5.0 l/s, although much higher yields are possible depending on the proper siting of boreholes.
- A geophysical field survey was performed with the aid of a G5 magnetometer, which was used to record the magnetic readings over traverses at the site of investigation. Based on the geophysical investigation, it does coincide with the information obtained from the desktop study performed at the site that there are mapped geological structures.
- This equipment was used to detail the selected stations on the magnetic profile. The equipment used was PQWT S-300. This equipment can measure up to 300 m depth.
- The survey reveals a lineament represented by low magnetic zones associated with dolerite dykes, which are of considerable importance for groundwater exploration as they serve as conduits and storage for groundwater.

- The magnetic survey identified three (NO. 03) possible drilling sites; however, no dolerite outcrops were found on site. The likely presence of a dolerite intrusion increases the groundwater potential.

Further recommendations drawn from this investigation are:

- To mitigate potential contamination of the aquifers underlying the project area, a groundwater management program needs to be developed and implemented as part of the environmental management program.
- As part of the groundwater management program, a groundwater monitoring program should be implemented. Should it become evident from the monitoring program that pollution of the groundwater occurs or anomalous lowering in static water levels occurs, corrective and remedial actions should be implemented.
- The borehole is to be drilled to a maximum depth of 120 mbgl.
- The borehole should be drilled in the presence of the geohydrologist.
- The geological conditions of the underlying formations, both in terms of lithology and depth extent, are very favorable.
- The line was pegged during the field investigations, and its coordinates were obtained using Global Positioning System (GPS).

1 INTRODUCTION

Aqua Pan Enterprise (Pty) Ltd was appointed by High Definition Drilling (Pty) Ltd to offer geohydrological investigations, which included a geophysical survey, to identify a potential drilling site and preparation of a geohydrological technical report at Oorlogsfontein 45 KS and Pruissen 48 KS within the Mogalakwena Local and Lepele-Nkumpi Local Municipality.

The main objectives of the investigations were to conduct geophysical investigations to determine the potential site for groundwater and the appropriateness of drilling the borehole, and to determine the borehole yield capacity and water quality.

2 SCOPE OF THE INVESTIGATION

The geohydrological consultant was tasked with providing the following information and activities. These include:

- I. Collate all borehole data, geological and hydrogeological information
- II. Conducting a geophysical survey for new borehole drilling and compiling a report
- III. Compile a geohydrological report on the work done.

3 METHODOLOGY

Groundwater resource development encompasses phases, namely:

- I. Geophysical investigation

3.1 GEOPHYSICAL INVESTIGATION

The hydrogeological conditions of the investigated site, in general, are considered to be fairly uniform, and the results of the magnetic survey are representative of the prevailing stratigraphy of the investigated site.

Total magnetic disturbances or anomalies are highly variable in shape and amplitude; they are almost always asymmetrical, sometimes appear complex even from simple sources, and usually portray the combined effects of several sources. An infinite number of possible sources can produce a given anomaly, giving rise to the term ambiguity.

The magnetic geophysical method proved to be an effective method for the detection of dolerite structures, which include dykes and sills. The normal magnetic field of the Earth can be visualized as a field of a bar magnet placed at the center of the Earth. Any changes in this "normal" magnetic field superimposed by dykes, for example, can be measured by a magnetometer. These measurements (changes) in magnetism can then, through the process of modeling, be interpreted in terms of the dip, strike, depth, and width of the body that causes the anomaly.

4 DESCRIPTION OF THE PROJECT AREA

4.1 SITE LOCATION

Oorlogsfontein 45 KS falls within the within the Mogalakwena Local Municipality, while Pruisen 48 KS falls within Lepele-Nkumpi Local Municipality. Oorlogsfontein 45 KS is located approximately 5 km southeast of Mokopane Town while Pruisen 48 KS is located 13 km southeast of Mokopane Twon. The locality map is presented below in **FIGURE 1**.

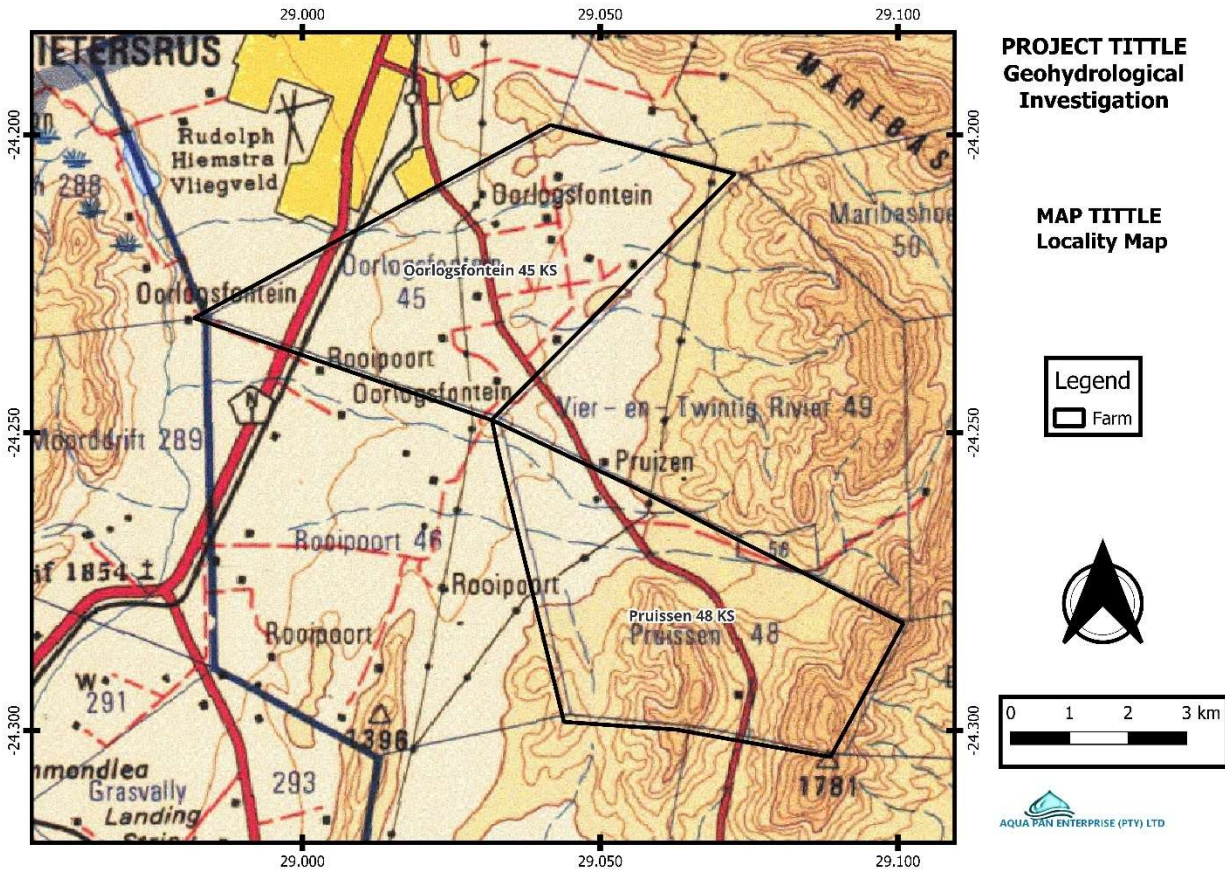


FIGURE 1 LOCALITY MAP

4.2 TOPOGRAPHY

Oorlogsfontein 45 KS and Pruisen 48 KS is located approximately 1100 m to 1733 m above sea level on a generally flat plain with low gradient slopes. Prominent features characterizing the area are topographic hills and rivers. The site is drained west into the Nyl River. Drainage on site is through sheet wash, with stormwater collected into the of the Nyl River.

4.3 LOCAL GEOLOGY

According to the 1:250 000 Geological Map of 2428 Modimolle, published by the Council for Geoscience, the investigate site at Oorlogsfontein 45 KS is regionally characterized by the Gabbro, norite belonging to RUSTENBURG LAYERED SUITE, while the Pruisen

48 KS investigated site is underlain by Shale, quartzite, conglomerate, breccia, diamictite of the PRETORIAL GROUP.

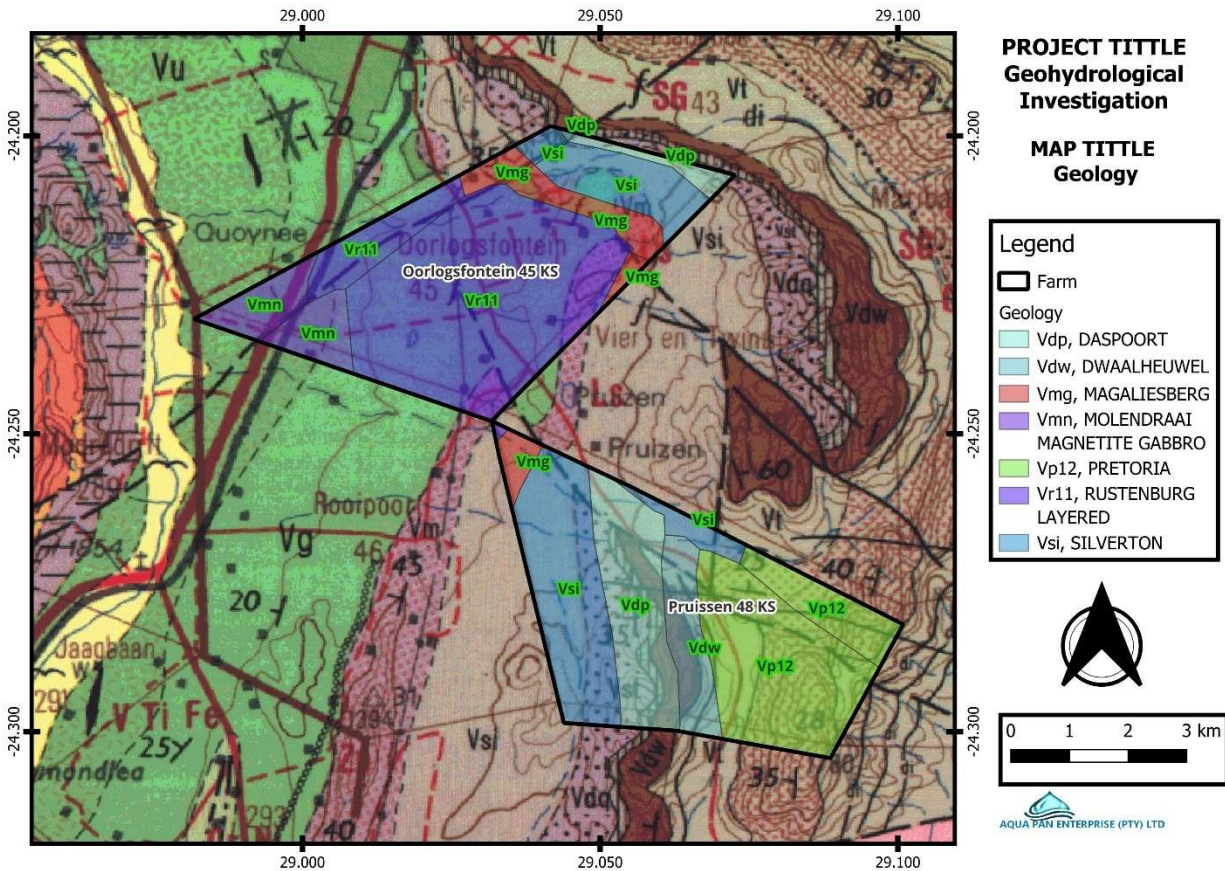


FIGURE 2 GEOLOGICAL MAP

4.4 REGIONAL HYDROGEOLOGY

Groundwater in this area occurs in both secondary (or fractured rock) aquifers and primary aquifers. The groundwater potentials in the study area are limited due to low permeability, storage, and transmissivity; however, secondary processes such as weathering, fracturing, and fault zones are required to enhance groundwater potential. These fractures are formed by faulting, cooling of magma outflows, intrusion of dolerite dykes, folding, and other geological forces.

4.4.1 Aquifer Description

According to the 1:500 000 Hydrogeological Map 2328 Polokwane, the project area primarily consists of a combination of an Intergranular and fractured-type aquifer (d-type).

The project area is underlain by a type d3 aquifer, meaning the mean borehole yields range from 2.0 – 5.0 l/s, although much higher yields are possible depending on the proper siting of boreholes.

The aquifer vulnerability and classification maps of South Africa classify the underlying aquifer as a minor, intergranular, and fractured aquifer with moderate vulnerability to contamination from surface activities.

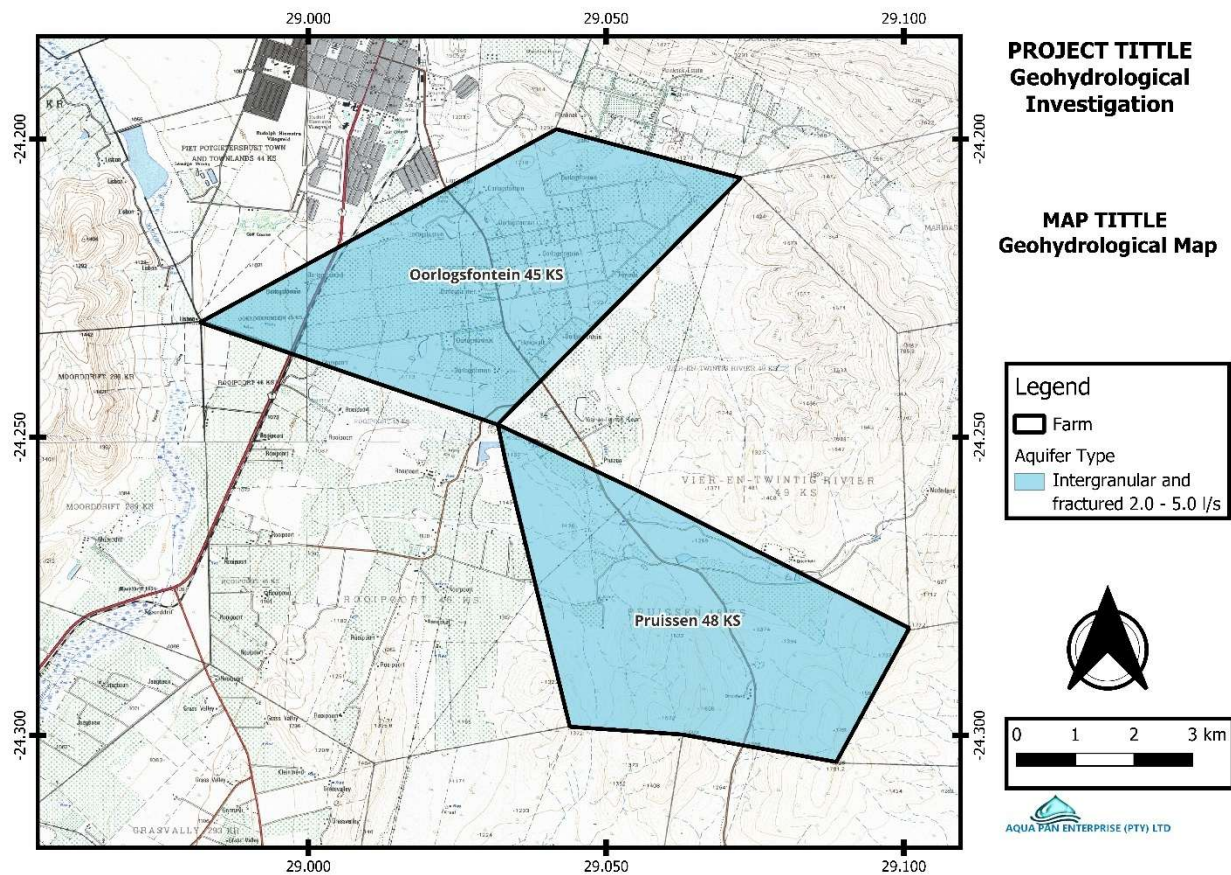


FIGURE 3 HYDROGEOLOGICAL MAP

4.4.2 Regional Groundwater Level

A key parameter influencing groundwater vulnerability to contamination is the depth of the water table below the surface. This level, coupled with soil type, lithology, the presence of structural lineament, and permeability characteristics, controls the movement of potential contaminants from the surface into the aquifer zone. Available static water level data for Oorlogfontein 45 KS range from 0.00 to 14.3 m and the static water level for Pruisen 45 KS ranges from 14.3 to 17.3 m (*Refer to Appendix B*).

5 FIELD INVESTIGATION

5.1 INTRODUCTION

A geophysical survey is considered one of the most cost-effective, non-intrusive methods to investigate subsurface properties. The geophysical survey includes a desktop study of the study area's geophysical properties, followed by a ground geophysical survey using the magnetic method.

The magnetic method is a passive method that uses the Earth's magnetic field as the source of energy to measure the relative magnetic permeability of different materials. Any magnetic material can become magnetized by the earth's magnetic field where it becomes an induced magnetic field, and will therefore be different than that of the earth's magnetic field. The differences in these magnetic fields are recorded in nT (nanotesla) and are referred to as anomalies (Roux, 1980).

Geological features such as dolerite intrusions have a high magnetic permeability and will, therefore, result in anomalies (Roux, 1980). Thus, the aim of using the magnetometer is to detect possible dolerite intrusions, which are ideal in the exploration of groundwater (Woodford & Chevallier, 2002).

According to Mariita (2007), geological features such as dykes, faults, and lava flows contain magnetic properties that cause magnetic anomalies as seen in **FIGURE 4**.

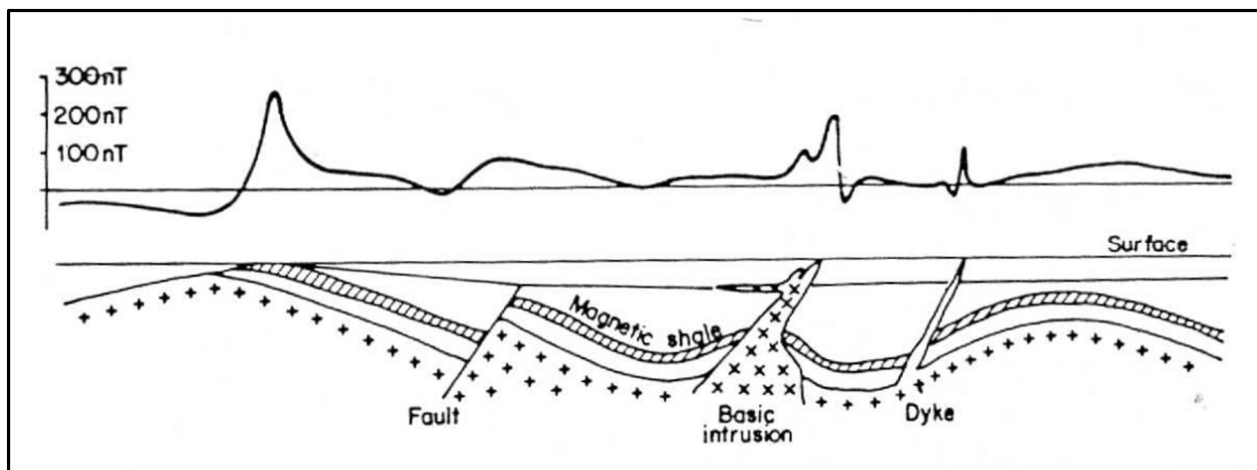


FIGURE 4 MAGNETIC ANOMALIES

5.2 MAGNETIC FIELD SURVEY

A Geophysical survey was conducted on the proposed site on 13 October 2025. The survey aimed to identify geophysical anomalies associated with possible localized geological structures (fractured zones in the underlying rock, weathered zones, geological contacts, etc.). The magnetic geophysical method was used to conduct the survey. A geophysical field survey was performed with the aid of a G5 magnetometer, which was used to record the magnetic readings over traverses at the site of investigation.

Traverse lines were laid out to confirm the geological structures, such as geological contact lineaments, identified. The zones of higher permeability, such as weathered and fractured zones associated with groundwater, were also targeted. The investigated area is underlain by an integrated and fractured aquifer.

The investigated area has a major geological structure mapped in the area; the traverse line was conducted targeting shallow aquifers associated with weathering and deeper aquifers associated with fracturing. This zone was deemed to be the primary target area and was targeted for the geophysical investigation. The traverse line and drilling site are presented in **FIGURE 8**.

5.2.1 Oorlogfontein 45 KS Traverse Line 01

It can be concluded from Traverse 1 one (No.01) significant anomaly was identified at station 170 m. The survey reveals that weathered and fractured zones were detected at stations 180 m. The provided potential zones of groundwater where boreholes can supplement the community water needs can be drilled.

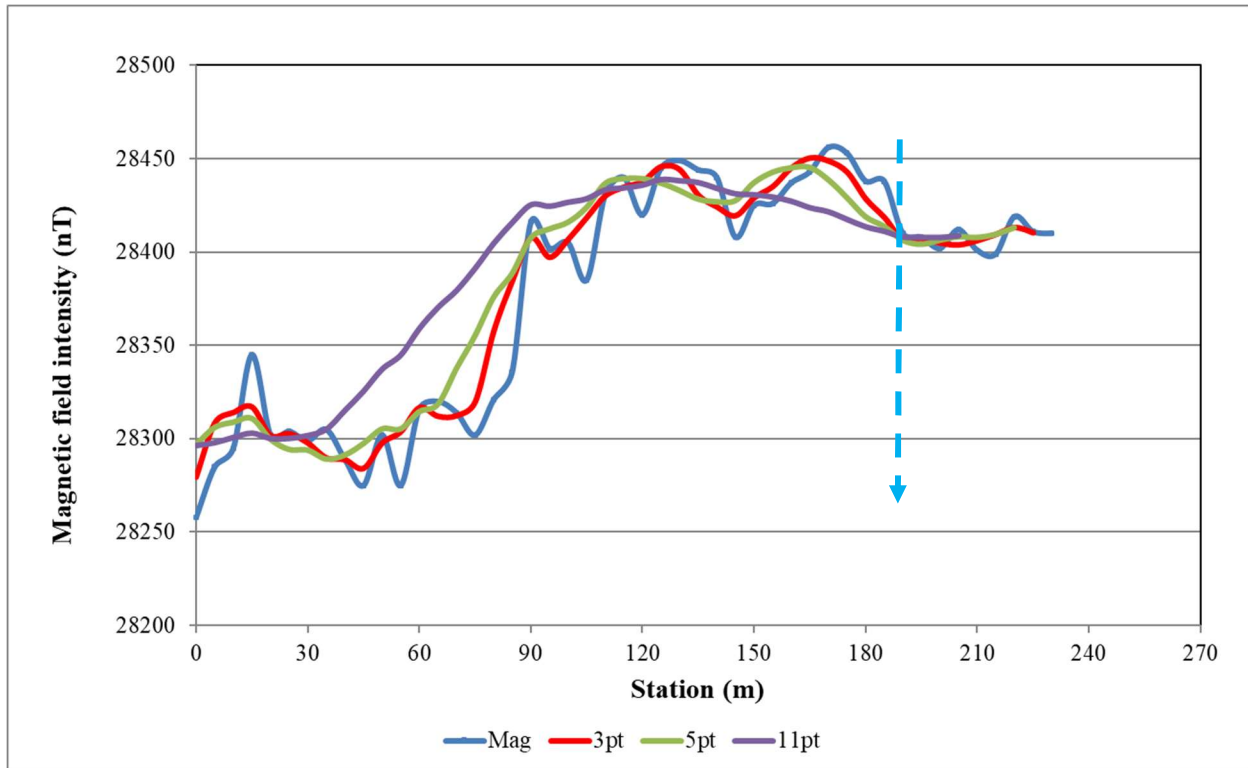


FIGURE 5 OORLOGSFONTEIN 45 KS TRAVERSE LINE 01

5.2.2 Pruisen 48 KS Traverse Line 01

It can be concluded from Traverse 1 that one (No. 01) significant anomaly was identified at station 20 m. The survey reveals that weathered and fractured zones represented by a low magnetic zone were detected at stations 50 m. The provided potential zones of groundwater where boreholes can supplement the community water needs can be drilled.

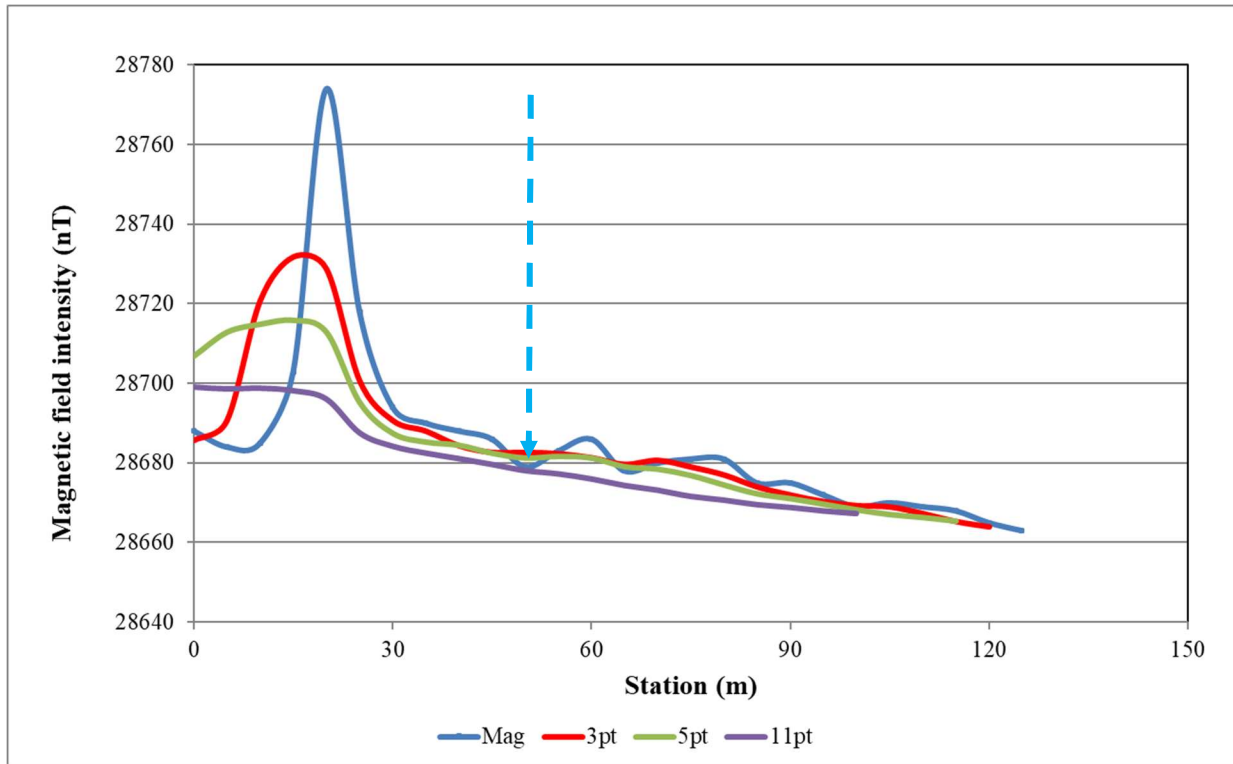


FIGURE 6 PRUISSEN 48 KS TRAVERSE LINE 01

5.2.3 Pruisen 48 KS Traverse Line 02

It can be concluded from Traverse 1 that two (No. 02) significant anomaly was identified at station 10 and 90 m. The survey reveals that weathered and fractured zones represented by a low magnetic zone were detected at stations 110 m. The provided potential zones of groundwater where boreholes can supplement the community water needs can be drilled.

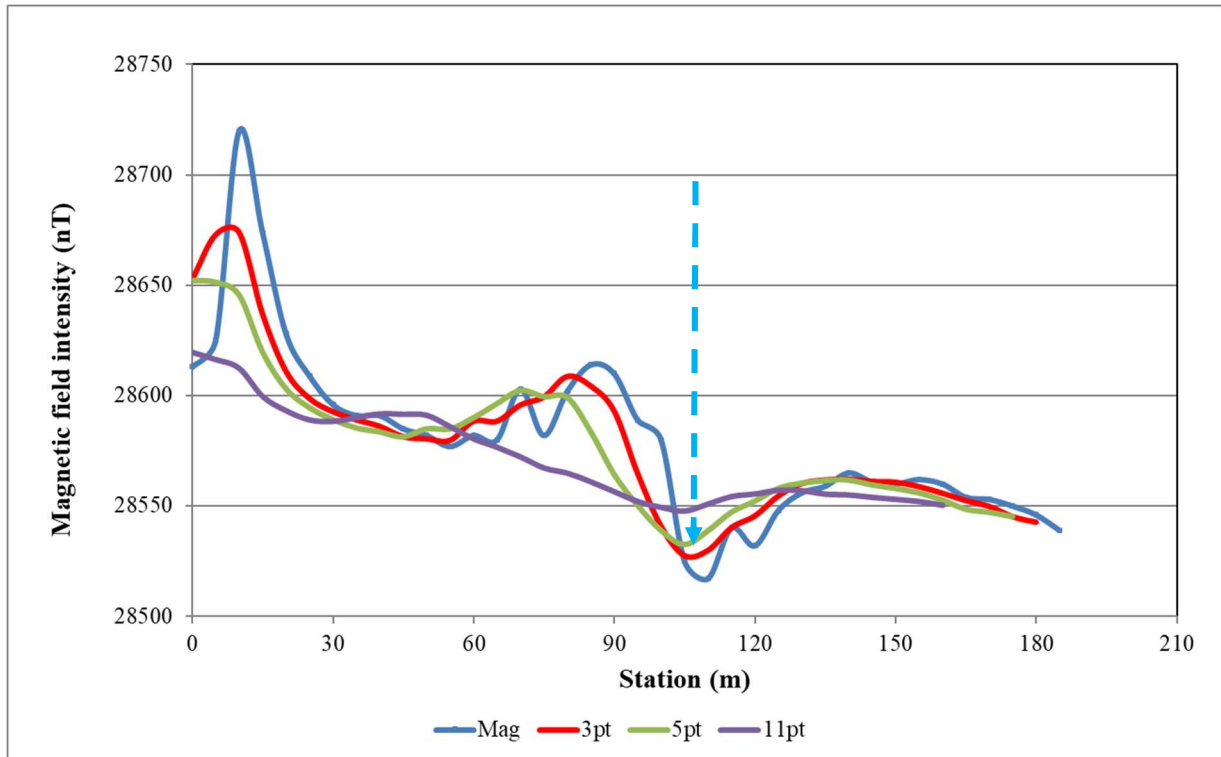


FIGURE 7 PRUISSEN 48 KS TRAVERSE LINE 02

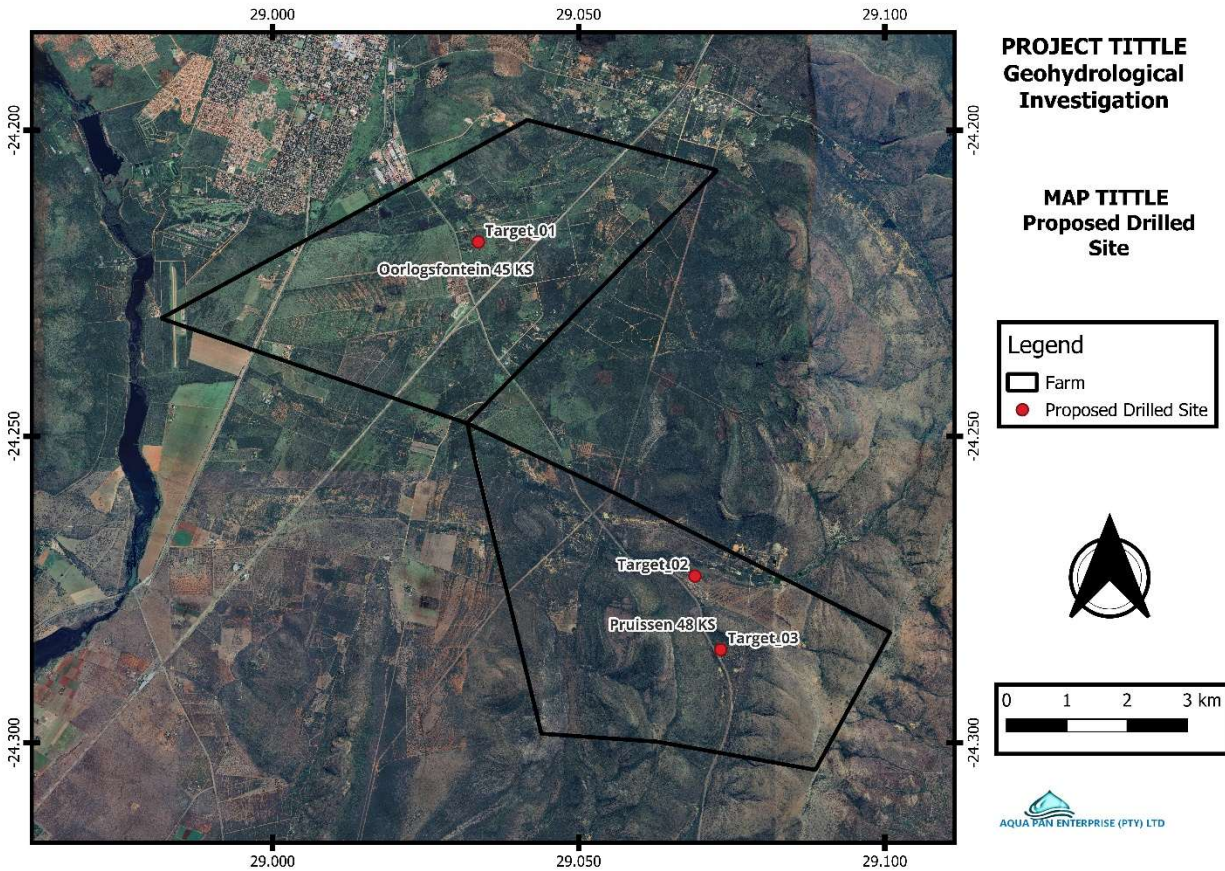


FIGURE 8 MAP SHOWING THE DRILL SITE

5.2.4 Geophysical Conclusion

A geophysical field survey was performed with the aid of a G5 magnetometer, which was used to record the magnetic readings over traverses at the site of investigation. No dolerite outcrops were found on site. The possible presence of a dolerite intrusion increases the vulnerability of the groundwater with respect to groundwater contamination. The investigated area has limited available space.

Groundwater is geologically controlled, and thus, the optimal drilling depth is to be determined based on the geology. For the project to be successful, shallow aquifers that are characterized by weathered granite and deeper aquifers characterized by fractured granite should be targeted.

This equipment was used to detail the selected stations on the magnetic profile. The equipment used was PQWT S-300. This equipment can measure up to 300 m depth.

TABLE 1 SUMMARY OF GEOPHYSICAL SURVEY

Target Number	Latitude	Longitude	Station	Geological Target	Priority
Target_1	-24.218264	29.033623	190	Weathered/Fractured Zone	01
Target_2	-24.272642	29.069814	90	Weathered/Fractured Zone	02
Target_3	-24.284804	29.073208°	110	Weathered/Fractured Zone	03

6 CONCLUSION AND RECOMMENDATIONS

Based on the investigation, the following conclusions can be drawn:

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- According to the 1:250 000 Geological Map of 2428 Modimolle, published by the Council for Geoscience, the investigate site at Oorlogsfontein 45 KS is regionally characterized by the Gabbro, norite belonging to RUSTENBURG LAYERED SUITE, while the Pruissen 48 KS investigated site is underlain is by Shale, quartzite, conglomerate, breccia, diamictite of the PRETORIAL GROUP.
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- A geophysical field survey was performed with the aid of a G5 magnetometer, which was used to record the magnetic readings over traverses at the site of investigation. Based on the geophysical investigation, it does coincide with the information obtained from the desktop study performed at the site that there are mapped geological structures.

- This equipment was used to detail the selected stations on the magnetic profile. The equipment used was PQWT S-300. This equipment can measure up to 300 m depth.
- The survey reveals a lineament represented by low magnetic zones associated with dolerite dykes, which are of considerable importance for groundwater exploration as they serve as conduits and storage for groundwater.
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- As part of the groundwater management program, a groundwater monitoring program should be implemented. Should it become evident from the monitoring program that pollution of the groundwater occurs or anomalous lowering in static water levels occurs, corrective and remedial actions should be implemented.
- The borehole is to be drilled to a maximum depth of 120 mbgl.
- The borehole should be drilled in the presence of the geohydrologist.
- The geological conditions of the underlying formations, both in terms of lithology and depth extent, are very favorable.
- The line was pegged during the field investigations, and its coordinates were obtained using Global Positioning System (GPS).

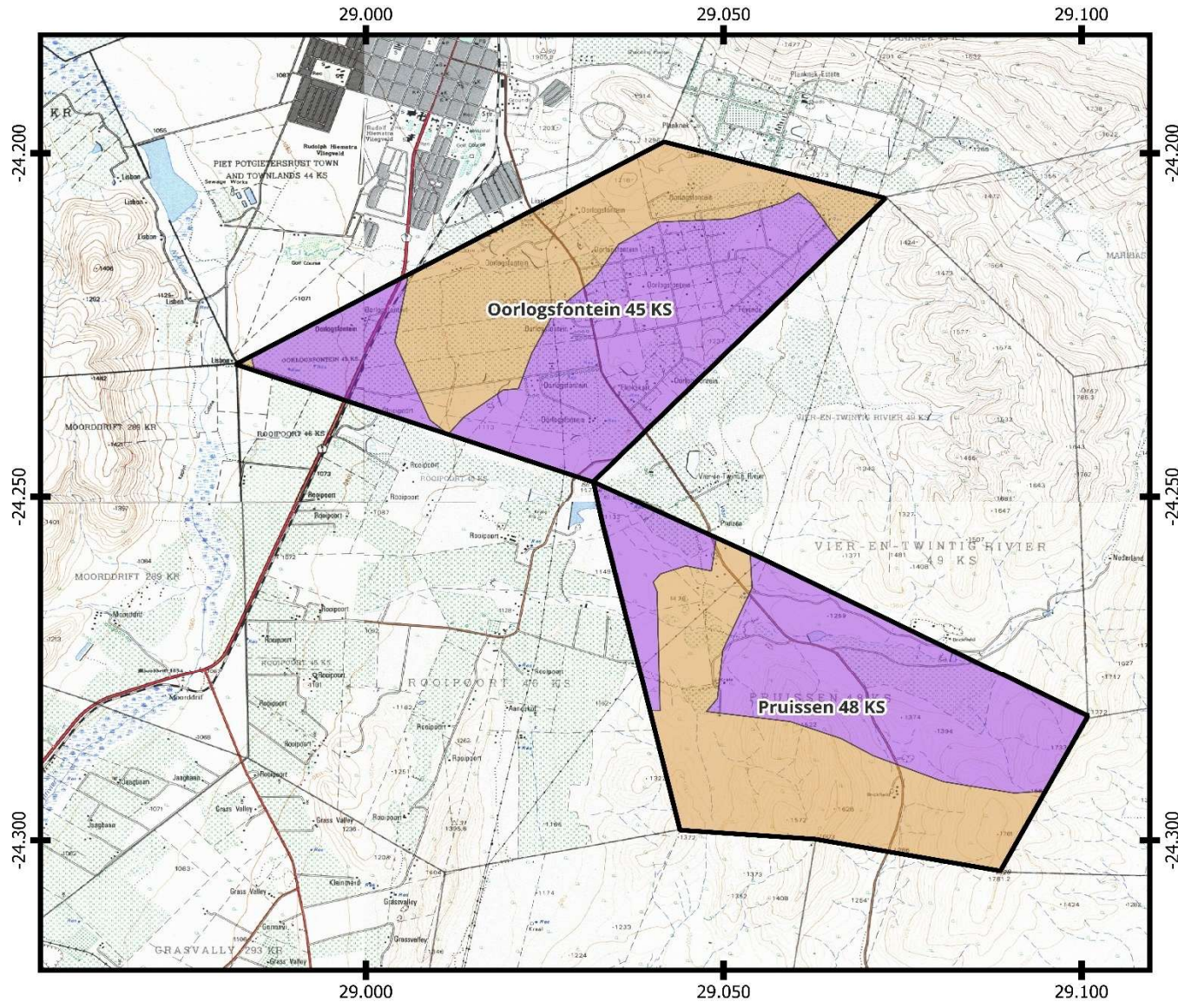
7 APPENDICES

APPENDIX A: REGIONAL GROUNDWATER WATER QUALITY

APPENDIX B: REGIONAL GROUNDWATER LEVEL

APPENDIX B: GEOLOGICAL STRUCTURE AND EXISTING BOREHOLES

APPENDIX A REGIONAL WATER QUALITY



PROJECT TITLE
Geohydrological
Investigation

MAP TITLE
Water Quality (EC)

Legend

- Farm
- Water Quality (EC)**
- 0 - 70 mS/m
- 70 - 300 mS/m

